SECURING THE OCEANS

ESSAYS ON OCEAN GOVERNANCE

– Global and Regional Perspectives –

Chua Thia-Eng • Gunnar Kullenberg • Danilo Bonga
EDITORS

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PEMSEA

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SECURING THE OCEANS: ESSAYS ON OCEAN GOVERNANCE — GLOBAL AND REGIONAL PERSPECTIVES

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Preface

This book originated from several purposes. The primary one is our concern for the oceans and coasts and the life-supporting systems therein. The declaration of the Year of the Ocean in 1998 brought some of these concerns to the forefront and thus received global attention of the need for coastal and ocean governance. Although some actions have been initiated in the ensuing years, ocean management is still in its early, infant stage. UNCLOS is not yet universally ratified, and sustainable ocean development is not even being attempted. There is an obvious need to continue the momentum of building public awareness and advocacy for sustainable ocean development.

The authors of this book have all, over several decades, been associated with the ocean and coasts, particularly with respect to marine environmental management, in their different capacities as scientists, economists, lawyers, teachers, managers, users of marine resources, national and international civil servants, and administrators. We have all understood the immense importance of the ocean and its resources for our human society and have, at the same time, seen the following: the gradual decline of ocean living resources; degradation of coastal areas, gulfs, and inland seas; losses in biodiversity; destruction of habitats and ecosystems; degradation of water quality by organic and inorganic wastes; and the impacts of natural and manmade disasters on coastal communities, properties, infrastructures, and industries.

We have also been associated in different ways with the evaluation of climate change and witnessed the apparent trends of changes associated with climate variability. We have seen that efforts to implement management of human uses of the marine resources and the environment can, at least locally and subregionally, reverse the deterioration and improve the socioeconomic conditions without compromising environmental quality (as demonstrated by several coastal management programs of PEMSEA in the East Asian Seas region). These observations are very encouraging indeed. However, these efforts are far from being sufficient. Governments and industries are not taking sufficient care of our ocean and coastal environments especially in sustaining environmental services. Apart from representing an immense natural capital, the coasts and oceans are necessarily parts of our life-supporting system: without a healthy ocean, there will be no healthy life on Earth. We realized the urgent need for serious implementation of ocean governance especially in implementing proactive and adaptive management measures to regulate human activities.

We understand the common interest of stakeholders in the sustainable use of coastal and ocean resources and that ocean affairs should be collectively governed by governments, local communities, industries, nongovernmental organizations, and other stakeholders, through national and international laws, policies, customs, traditions, culture, and related institutions and processes. This implies a systems-oriented approach in ocean governance, which is the basic philosophy used in preparing the overview chapters of this book. The overview relates both to the existing mainstream scientific understanding of the ocean, its environment, and the international legal framework. The significance of specific ocean resources is brought out in separate chapters, for instance on minerals, oil and gas from the seafloor, on other energy extractions, on fisheries and aquaculture, and on transportation. Food from the ocean is given a separate chapter, but oil and gas resources from the sea are discussed in the chapter on other ocean resources, and ocean circulation is discussed in the chapter on weather, climate, forecasting, and climate change.

It has not been the aim, and indeed not feasible, to cover these subjects in detail in this book. We have instead aimed at comprehensiveness in covering the whole, following the seminal idea of Arvid Pardo that "the problems of ocean space are closely interrelated and should be considered as a whole." The aim here has been to bring out the interactions: the linkages between different components of the life-supporting system, the resources and their uses, and the assets and their sustainability.

Based on our insights regarding major assets of the ocean, Part 1 summarizes their significance for both the human society and the marine ecosystem, covering: ecological conditions, the life-supporting system, living and nonliving resources, the hydrological cycle, the weather and climate conditions, as well as challenges to their management and sustainable development.

Several chapters in Part 2 provide comprehensive reviews covering a wide array of subjects relevant to ocean governance including international trade, regional cooperation, effectiveness of marine governance, public awareness and information dissemination, coastal governance, and lessons learned. This is aimed at elucidating the dynamics of regional cooperation and bringing out the experiences and challenges from ongoing regional actions especially in relation to the implementation of the global legal framework. Part 3 on the other hand, gives several reviews of case studies in selected regional seas ranging from the Arctic Ocean to the Wider Caribbean region. A wealth of valuable information, experiences, and lessons learned characterizes the chapters in this part of the book.

Parts 1, 2, and 3 bring out the global perspective on ocean governance. The various case studies clearly put forward the interconnectivity between each and every regional sea in terms of political, socioeconomic, cultural, and especially ecological linkages. The various chapters of this book, although authored by different experts appear to reach one consensus: There is only one ocean and one people; thus, we need one vision to tie us all together in ensuring that the only ocean we have on Earth can continue to provide the ecological services that mankind has been enjoying since time immemorial.

The lone chapter in Part 4 underscores the paradigm shift in the traditional concept of ocean governance to a more proactive and dynamic approach in securing the ocean for peaceful use. The fundamental conceptual change stemmed from the increasing interest in the exploitation of the exclusive economic zone, the relatively underexploited high seas, the realization of the economic and ecological significance of a healthy ocean to human lives, property, and economic well-being of the future, as well as the rising importance of maritime trades and increasing concerns for maritime safety and security. This chapter includes the conclusions forwarded by the participants in a regional workshop at the 2006 East Asian Seas (EAS) Congress on "Securing the Oceans" which are published in *Tropical Coasts*. We thought this published article, after some minor refinements, might serve as the concluding chapter of this book as this would provide a new direction to ocean governance.

This book is primarily aimed at increasing the awareness of the general public on coasts and oceans and at strengthening their understanding of the functioning of the ocean, land-sea interactions, ocean dynamics, and ecosystem functioning. We believe that a well-informed general public can facilitate or increase government commitments in ocean governance that would ultimately lead to a wider acceptance and ratification of the UNCLOS and put pressures on local and regional governments and industries to act decisively in coastal governance.

We also hope that this book can be a very useful reference material to educational and research institutions in maritime studies, marine affairs, environmental, and natural resource management.

The publication of this book is made possible through a grant from The Nippon Foundation in support of the Research Task Team on the Dynamics of Regional Cooperation on Oceans and Coasts. The grant is managed through the Partnerships in Environmental Management for the Seas of East Asia (PEMSEA) which also provided co-financing in the implementation of the Task Team activities. Two workshops were organized: one in London in 2004 and the other in Haikou City (China) during the 2006 EAS Congress. The outputs of the two workshops as well as those from invited writers form part of the contents and conclusions of this book.

Appearing a decade after the Year of the Ocean 1998, which included the release of the report of the Independent World Commission on the Oceans, it is hoped that this book will further stimulate and strengthen the pursuit of sustainable ocean development so as to secure the ocean and its resources for our future generations.

Chua Thia-Eng
Gunnar Kullenberg
Danilo Bonga

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Chua Thia-Eng
Gunnar Kullenberg
Danilo Bonga

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Part 1

Introduction

A coastal scene in Central Vietnam (Photo: CHUA THIA-ENG)

CHAPTER 1

Securing the Oceans: Executive Summary

Janet Pawlak, Gunnar Kullenberg, and Chua Thia-Eng

The oceans play a vital role in the life-support system of our planet and also serve important human uses including for transportation and, particularly in the coastal area, as a source of food, renewable energy, recreation, fossil fuel, and other goods and services. Vast though the oceans and their resources may seem, however, the large growth in human population during the past century, human exploitation particularly of the living resources, and the influence of human activities such as pollution, habitat destruction, and the increasing releases of carbon dioxide and other greenhouse gases reveal the vulnerability of the oceans and their coastal margins to unsustainable practices. This book provides a summary of the socioeconomic and cultural importance of the coasts and oceans in terms of the exploitation of living and nonliving resources, transportation, maritime trade, tourism, recreation, and other uses, emphasizing the need for appropriate management and governance systems to provide for the sustainable and rational use of ocean resources. The book also highlights the perspectives on and essential elements of regional and ocean governance with numerous case studies around the world. Without adequate governance and effective management of human activities, rapid economic development will continue to lay the foundation for environmental disasters, resource depletion, and use conflicts.

Given the size of the oceans and the regional seas and their interconnections, to be effective ocean management will require regional and international cooperation. International cooperation is particularly necessary to effectively and comprehensively address the global issues of control of greenhouse gas emissions contributing to climate change and the long-range transport of toxic chemicals and heavy metals. On the other hand, regional cooperation is essential for strengthening implementation in different geophysical, ecological, socioeconomic, political, and cultural environments.

In addition, ocean management needs to be integrated to cover all relevant sectors and industries. The challenges involved are enormous and although there are relevant international conventions and organizations, as well as a large number of regional initiatives that contribute to some aspects of marine management, the system is complex with many gaps in coverage and problems in engaging countries and in enforcing agreements.

Economic Value of the Oceans

The ocean holds and provides a large number of assets that are extremely important for our economy, security in the broad sense, and development. These assets, discussed in the various chapters of this book, include living resources — marine plants and animals such as fish and shellfish — and a wide range of nonliving resources including salt, other minerals (for example, magnesium, bromine, titanium, iron, chromium, and deep-sea magnesium and phosphorite nodules), and sub-sea oil and gas deposits. However, ultimately the most important resource of the ocean may be the water itself, as freshwater from desalination, which will become increasingly important as terrestrial sources of freshwater are depleted. The ocean is also a source of renewable energy, from tides, currents, winds, waves, and temperature differences between surface and deep water layers. Market values can generally be assigned to the value of the living and nonliving resources taken from the oceans, as well as to the other services provided including transportation and trade, renewable energy, and tourism and recreation.

The oceans also play a very large role in the Earth's climate and hydrological systems, serving to transport heat from warmer to cooler sea areas and, together with the atmosphere, forming weather systems that influence both land and sea. The ocean provides much of the evaporation that later precipitates back to marine areas and to land as rain or snow;

the precipitation that falls on land supports terrestrial ecosystems and agriculture, with some of it sinking as groundwater or ultimately flowing from catchment basins into rivers and back to the ocean, completing the hydrological cycle. It is not possible to set market values on these life-support systems of the Earth, nor on the oceanic and coastal habitats and ecosystems that support marine life in all its diverse forms. Nonetheless, degradation of marine and coastal ecosystems by human activities and especially changes to oceanic and atmospheric processes as a result of human-mediated global warming will result in large economic impacts that will ultimately affect all countries.

Management of Human Uses of Ocean Resources

In order to govern and manage human uses of the assets of the ocean, it is necessary to have a knowledge and understanding of these assets and the impact of their use by humans. The study of commercial fish stocks and the impact of fisheries on them has been an important field of marine study for more than a century; while knowledge of the main commercial fish stocks is generally adequate to serve as a basis for fisheries management, factors such as multi-species interactions, food chain disturbances, and the impact of rising water temperatures and increased carbon dioxide concentrations in the sea (creating acidification) are additional sources of uncertainty. Further important sources of uncertainty, however, usually arise from incomplete, false or nonreporting of fish catches, unreported discards of large quantities of unwanted fish, and illegal catches, which complicate the scientific assessment of fish stocks.

Marine and coastal habitats and ecosystems provide the basis for life in the sea, supporting marine productivity and food webs, and serving as spawning, nursery, and feeding areas for marine organisms. However, our knowledge about specific marine ecosystems and the nature and locations of sensitive or critical habitats for marine life is often not adequate to provide for sustainable use or adequate protection from inappropriate use. Such knowledge is essential for effective management.

Currently, ocean and coastal resources are being used in an unsustainable manner worldwide. Many of the fish stocks preferred for human consumption show serious signs of overfishing and important habitats for fish, such as coral reefs and seagrass beds, are being destroyed by damaging fishing practices such as trawling or by polluted runoff from rivers and land. Important coastal ecosystems, particularly wetlands, are under increasing stress owing to increasing urbanization in coastal areas, discharges of pollutants from industries, agriculture, and human settlements, coastal mining and aquaculture, and land reclamation. This depletion or destruction of coastal and marine ecosystems and resources is non-sustainable and damages the economy, security, and development.

Maritime trade continues to play an important but also increasing role in the marine economy of the coastal nations throughout the world particularly with the improvement of shipping and port facilities. Advanced maritime transportation already enables speedy delivery of manufactured goods or their parts from one country to another. On the other hand, the projected demand for energy in the coming decades will certainly accelerate the rate of offshore exploration for oil and gas and the development of alternative sources of energy especially those generated by tides, currents, waves, and wind. Maritime boundary and resource-use conflicts are expected to accelerate as coastal nations are now looking to the seas and oceans, especially their exclusive economic zones and the high seas, as the emerging targets for their economic expansion.

Understandably, effective systems for governance and the management of human activities to promote sustainability, peace, and security of the ocean are urgently required.

As described further in this book, there are a number of regional and international conventions, together with supplementary agreements and protocols, which have entered into force that would, if fully implemented, go a long way toward providing for the governance and management required to attain a better level of sustainability. Under the UN Convention on the Law of the Sea, coastal states have the right to extend their jurisdiction to the continental margin or to a distance of 200 nautical miles from land — the exclusive economic zone (EEZ) — and thus have the right to the resources located in this area. The importance of the EEZ is demonstrated by the fact that about 50 percent of the ocean is claimed by coastal states and there are presently disputes concerning extensions of this area, showing the empowerment potential of the EEZ.

However, in addition to the right to exploit resources such as fish and minerals in their EEZ, coastal states are also expected to accept responsibility for management in these areas, particularly with regard to the prevention of marine pollution from all sources — land, sea, and the atmosphere — and the protection of threatened or endangered species and sensitive habitats, such as wetlands. While management measures to carry out these responsibilities usually are based on national policies and laws, regional and/or international programmes or conventions often serve as the basis, or the requirement, for such measures. Regional seas organizations serve as forums for the discussion and agreement of policies and types of management measures to be taken on a regional level; the programs and activities of a number of these organizations are described here. Relevant international agreements include the UNEP Global Programme of Action for the Protection of the Marine Environment from

Land-based Activities (GPA), with regard to pollution, and the UN Convention on Biological Diversity, for species and sensitive area protection.

The effectiveness of these regional and international programmes and conventions depends completely on the acceptance and implementation of their requirements by national governments and this has been a very slow process. However, as seen from the various case studies in this book, apart from one or two specific cases, many regional conventions have fallen short of effective implementation often resulting in a weak and unsustainable secretariat and ineffective programme implementation.

Nonetheless, regional cooperation can be made to work, given time and a reasonable focus with political will. A paradigm shift in the ways in which the coasts and oceans are being managed might be timely. The partnership approach for regional collaboration as shown in this book presents an alternative to the current regional convention approach by creating a working partnership between state and non-state partners in addressing coastal and ocean issues. It is increasingly recognized that governments alone cannot address the complex, transboundary management problems of the coasts and oceans. The involvement of stakeholders in planning and management is critical to forge a common vision, set targets, and develop and implement management interventions.

Integrated management is a key element in coastal and ocean governance, particularly policy and functional integration at all levels of governance. The need to place more focus on protecting the functional integrity of the ecosystems is even more urgent given the rapid rate of damage done to natural resources and ecosystems. Ecosystem-based management is a subsidiary principle of sustainable development and is an accepted management approach of UNCED and Agenda 21 as well as that of the WSSD. It may be advantageous for coastal and ocean governance to re-emphasize the sustainable development objective and streamline management actions towards this end. Because a large part of human activities is located in the coastal areas as compared to human activities in the EEZs and the high seas, major management priority should still be directed towards coastal governance to address the more immediate and urgent resource-use conflicts and other sustainable development issues.

Perhaps the goals and objectives of coastal and ocean governance could be more readily achieved if they were to be guided by the popular advocacy of "think globally (and regionally) but act locally." It is indeed an opportune time now to take advantage of the achievements made in integrated coastal management (ICM) as illustrated in this book (for example, in systematizing and codifying ICM), to effectively implement ICM at the local government and community level and replicate the ICM practices through a systematic scaling up process.

International Issues

As the rights of coastal states are linked to their coastal waters and EEZs, the rights of the international community are linked with the high seas and the portions of the international conventions and agreements that concern the high seas. For example, under the UN Convention on the Law of the Sea, the mineral resources on the deep ocean floor beyond the EEZ are beyond national jurisdiction and considered part of the Common Heritage of Mankind. However, currently large parts of the resources contained in and under the high seas are not covered by conventions. Jurisdiction over these resources is subject to increasing debate in the international community, emphasizing the potential empowerment related to these resources.

Clearly, there is a need for a system of governance in relation to the resources contained in and under the high seas that will provide for their sustainable use and equitable sharing, as well as the adoption of appropriate environmental and other relevant measures. It will be a challenge for the international community to develop a system of governance with an appropriate balance of the many competing interests — economic, environmental, and ethical — that can be agreed, established, and implemented.

Indeed, the challenge of ocean governance as a whole, also including the EEZ, must be met directly and without undue delay to enable avoidance of the serious consequences of overexploitation of resources and the impacts of pollution and, particularly, global climate change.

The editors hope that the ideas and examples presented here will provide material and inspiration for informed discussion of the concepts and practical application of ocean governance and management, leading to the development of management systems that provide for the rational and sustainable use of ocean and coastal resources, as well as the protection of the environment and biodiversity towards achieving a more secure ocean. An important aspect of securing the ocean is the acceptance of these goals by all stakeholders, which requires at least a basic understanding of the underlying environmental and economic principles on which the governance systems are based. This implies the need for education for policy- and decisionmakers, resource users, and the general public concerning the risks to the resources and the environment as well as to the economy and security, and even cultural systems, of unsustainable activities; likewise, the rewards associated with sustainable use of resources and a healthy environment must be made apparent to all.

Part 2

The Case for Ocean Governance: An Analysis

CHAPTER 2

The Freedom of the Seas

Gunnar Kullenberg

The Need for Ocean Governance

Ocean governance may be defined as the means by which ocean affairs are governed by governments, local communities, industries, nongovernmental organizations, and other stakeholders through national and international laws and policies, as well as customs, traditions, culture, and the institutions and processes that these create. This definition was given by Elisabeth Mann Borgese (1918–2002).

Several questions come to mind when discussing the issues of ocean governance: Is it possible to make a persuasive case for ocean governance? Why is it needed and how can it be achieved? Finally, can ocean governance be legitimized? The analysis herein starts with some considerations of the long-standing maritime practice of the freedom of the seas, wherein the seas are primarily used as means of transportation. The analysis follows with the implications resulting from the changes brought about by scientific and technological development, including requirements for greater equity among nations.

The Principle, Its Motivation, and Its Challenges

Contrary to land space which is mostly owned property, the open seas were, until very recently, regarded as common property. Everyone had free use of ocean space beyond a small territorial sea for transport, fishing, diving, treasure hunting, placement of submarine cables and pipelines, and even waste disposal. There was no governance or management of the open waters; it was a free-for-all. However, the situation gradually changed during the second half of the last century. Attempts to introduce responsible management were made. The concept of the Common Heritage of Mankind was introduced. The United Nations addressed the problem and the Third United Nations Convention on the Law of the Sea (UNCLOS) was adopted in 1982. It entered into force in November 1994. However, challenges and conflicts brought on by the conventional concept of freedom of the seas remained.

The concept of "Common Heritage" originated from 17th century Dutch jurist and philosopher Hugo Grotius (1583–1645), who is also considered as one of the "fathers" of international law. He saw the ocean as a great "integrator." In his *Mare Liberum* [Grotius, 1609], he defined Common Heritage as follows: "God Himself says — speaking through the voice of nature in as much as it is not His will to have Nature supply every place with all the necessaries of life, He ordains that some nations excel in one art and others in another… So by {the} decree of divine justice, it was brought about that one people should supply the needs of another. Those therefore breaking this law destroy this most praiseworthy bond of human fellowship, remove the opportunities for doing mutual service, {and} in a word do violence to Nature Herself. For do not the oceans, navigable in every direction, with which God has encompassed all the Earth, and the regular and the occasional winds blow now from one quarter or another give to all peoples a right of access to all other peoples."

The principle of the freedom of the seas was accepted long before Grotius. It was already recognized under Roman law, the doctrines of which were essentially based on the Rhodian Maritime Code developed approximately around 800 BC. It was also established as a principle in Asian Seas and in the Indian Ocean, where peaceful maritime trade ruled. Grotius prepared his thesis to defend the rights of the Dutch East India Company to navigate and trade freely in these regions, where Spain and Portugal endeavored to establish a monopoly on maritime trade, with the use of armed vessels. At the time, European powers were developing trade with India and other parts of Asia where spices, particularly pepper, were plentiful. At about the same period China closed itself to outside trade by land and sea, and destroyed its huge merchant fleet.

In a bilateral treaty in 1494, Spain and Portugal divided the world between themselves. The demarcation line was slightly to the west of the Azores; Spain had all the land west thereof and Portugal claimed all the land lying in the east. While the treaty had the blessings of the Church, it was not accepted by the other nations of Europe. The freedom of navigation and peaceful maritime trade had long been established in the Indian Ocean and the Asian Seas, and had even been codified. In fact, as early as the end of the 13th century, maritime codes had been compiled in Macassar and Malacca [Anand, 2002].

In Europe, freedom of the seas has often been challenged. It did not prevail after the fall of the Roman Empire. By the 13th century, European regional seas were practically appropriated by different European nations or trade groups. This was motivated by competitive trade and led to serious and long-lasting conflicts. Nearly 400 years passed before Ambassador Arvid Pardo of Malta revived Grotius' freedom of the seas. He initiated a process through which the international community would endeavor to declare the resources of the open ocean and subsoil thereof as the Common Heritage of Mankind. As such, they are beyond national jurisdiction. This effort can be seen as a precursor to sustainable development.

In the years between Grotius' and Pardo's time, freedom of the seas was continually challenged by various sea powers. During the Middle Ages, in the Mediterranean and the Black Seas, Venice and Genoa strongly opposed it; in the Baltic and North Seas, Sweden, Denmark, the Hanseatic League, the Netherlands, and England did the same and even aspired, at various periods, to dominate the sea trade. The continued regionalization of the marine environment was commercially motivated. Clearly, there was a need for some governance system applicable to all, based on internationally agreed rules.

In the beginning, England was very much against sea dominance and strongly defended the freedom of the seas. However, it changed its stance when it developed into a sea power. Following the publication of Grotius' book, England made a counterproposal against the freedom of the seas. A book written by John Selden, entitled *Mare Clausum*, was published in 1635 [Fulton, 1911 and 1976]. His thesis, written for the English Crown, was to prevail as the main reference for maritime law in Europe for about 2 centuries. European states tried to maintain control over as much of the sea as their power permitted. Then, England changed its stance once more. As the country's sea power grew, it decided to support free trade over the ocean. As the dominating sea power throughout the 1800s and part of the 1900s, England became, once again, a very powerful advocate for freedom of the seas. This stance became instrumental in helping the principle gain general acceptance.

The support for freedom of the seas in Europe was commercially motivated. Countries embraced it to satisfy their industrial needs. However, the freedom was basically limited to navigation and trade. The freedom of fisheries was very much disputed, with continued conflicts between European states. The maritime law practiced by the European states was, to a large extent, controversial and ambiguous. Freedom of the seas mainly implied non-regulation and a free-for-all attitude. Again, a need for placing all nations under some internationally agreed rules-based system is imperative. Unfortunately, no system of this kind was implemented until the end of World War II. Most nations believed that the ocean and its resources were not really important. This view changed dramatically after 1945.

The Change: Resources, Competition, and Jurisdiction

Coastal states accepted the principle of freedom of the seas, particularly in the context of global or regional maritime trade. This, however, did not stop them from gradually expanding the adjacent zones of the sea under their jurisdiction, to protect their own land and the shelf sea resources. This action led to the establishment of many different zones providing for preferential treatment, exclusive rights, or full sovereignty. The process gradually but considerably reduced the parts of the ocean where freedom of the seas prevailed. After World War II and triggered by the Truman Proclamations of 1945 [Anand, 2002; Mann Borgese, 1995], the process accelerated and resulted in a "terraneization" of the ocean.

The development of marine technology during and after World War II led to discoveries of vast resources of enormous industrial and economic importance in the ocean and the seafloor and changes in the fishing industry. The ocean became a supplier of very significant resources. Proclamations of continental shelves were made and exclusive fishery zones were established and pushed further and further seawards. The Geneva Conventions on the Law of the Sea of 1958 did not stop the process and neither did the supplementary effort of 1960. At the time, the continental shelf was defined as the area of the ocean floor from the mean water level at the coast to the sharp change in slope of the seafloor marking the inner edge of the continental slope. Slope changes occur at varying depths, normally in the range of 130–150 m. The continental slope extends from the shelf edge to the deep ocean floor. The width of the shelf thus defined can range from 1 to 800 nautical miles. With this definition, it constitutes less then 10 percent of the ocean floor.

The First United Nations Conference on the Law of the Sea, or UNCLOS I, resulted in four conventions, which were adopted in Geneva in 1958. These were the Convention on the Territorial Sea and Contiguous

Zone, the Convention on the Continental Shelf, the Convention on the High Seas, and the Convention on the Fishing and Conservation of the Living Resources of the High Seas. These conventions reflected a sectoral approach and failed to resolve a number of issues, such as the legal definitions of the territorial sea and the limits of the continental shelf [Mann Borgese, 1995]. The conventions were negotiated upon and ratified by some maritime states. However, most of the developing countries emerging as a result of decolonization were not involved.

The second UNCLOS was convened in 1960. Its goal was to address the problems left unresolved by UNCLOS I. However, UNCLOS II ended without concrete results.

The Malta Initiative

From a newly independent nation, there emerged one individual who used the United Nations to prick the conscience of the world. On 1 November 1967, Ambassador Arvid Pardo of Malta delivered, on behalf of his government, a 3-hour lecture to the General Assembly. He introduced Item 92 of the Agenda of the General Assembly's 22nd Session entitled, "Examination of the question of the reservation exclusively for peaceful purposes of the seabed and the ocean floor, and the subsoil thereof, underlying the high seas beyond the limits of present national jurisdiction, and the use of their resources in the interest of mankind." Pardo presented an analysis of the causes of the erosion of the traditional Law of the Sea and the implications thereof. He drew attention to the large resources, living and nonliving, available in the ocean, as well as in and below the ocean floor. He stressed that the problems of ocean space are closely interconnected and need be considered as a whole. The presentation, together with proposals for alternative approaches, was done in such a convincing way that the General Assembly listened and acted.

Among the many concerns raised by Pardo was the disposal of radioactive wastes into the ocean and the seafloor. This matter was a hotly debated issue at the time and the controversy continued until the 1970s, when dumping became prohibited. During Pardo's time, the London Dumping Convention had not yet emerged. The International Atomic Energy Agency was the international body charged with addressing the issue.

Pardo made other arguments for paying vigorous attention to the ocean. One was related to the need to assist poor developing countries emerging from the decolonization process. How could these independent states be helped, in the interest of all? One of the means possible was the effective use of ocean resources.

The initiative of Malta and Pardo was very timely. Alongside dreams of a new international economic order for a more equitable distribution of wealth and resources, the initiative paved the way for the initiation of UNCLOS III. The conference debated and attempted to resolve conflicts of interests between individual states and the global community as a whole. It became a match between the industrialized and non-industrialized countries of the world.

UNCLOS III: Opportunities and Challenges

UNCLOS III entered into force on 16 November 1994. It was a very significant step towards ocean governance for the benefit of all. The Convention, signed at the end of the negotiations in 1982, greatly extended the rights of coastal states, to the detriment of the global commons. The Convention agreed on limits of 12 and 24 nautical miles from the coastline, for the territorial sea and the contiguous zone, respectively. Additionally, it introduced what was then a new concept of an exclusive economic zone (EEZ) of 200 nautical miles which became apparent in the Santiago Declaration of 1952 [Mann Borgese, 1995].

The Convention defines the continental shelf of a coastal state as the seabed and subsoil of the submarine areas to the outer edge of the continental margin, or to a distance of 200 nautical miles from the land. The continental margin is where the deep seabed of depths above 2,000 m starts. The high seas are all parts not included in the territorial seas, or internal waters of a state, or in archipelagic waters of an archipelagic state. In the high seas, the earlier existing freedoms were essentially maintained. These freedoms, mainly involving activities on the surface and in the water column, include freedom of navigation, overflight, placement of submarine cables and pipelines, construction of various installations, fishing, and scientific research. All these activities were subject to the rules of the continental shelf, taking into account requirements for the conservation of living resources.

The Convention retained the customary principles. However, it introduced rules addressing pollution, safety regulations, conservation, and prevention of illicit traffic. Regrettably, there were no specified enforcement mechanisms, financial incentives, or an international tax system to support and stimulate implementation. There was no ecosystem or environment insurance system. Separate principles and regulations were then introduced proclaiming the seabed and ocean floor beyond the limits of national jurisdiction. These became known as the Common Heritage of Mankind, also referred to as "the Area." The principles and rules regarding the Common Heritage of Mankind form Part XI of the Convention. In it, an international tax system was initiated.

The extension of national jurisdiction went against the plea of Pardo. The 1982 Convention, however, also included a system for the settlement of disputes. This established the first international court, the International Tribunal for the Law of the Sea, which dealt exclusively with Law of the Sea matters, and is now headquartered in Hamburg, Germany.

UNCLOS III had other elements that were then considered unique in an international convention. However, some leading industrialized countries expressed strong reservations on Convention rules dealing with exploitation of the seabed and subsoil outside national jurisdiction. A special agreement on the Implementation of Part XI, "The deep seabed Area," was endorsed in 1994. And by November of that year, the necessary number of signatories for enforcement was reached. This was 500 years after Portugal and Spain divided the land east and west of the mid-Atlantic between themselves, in 1494.

The principle of the Common Heritage of Mankind is in the Convention, and so is the expansion of national jurisdiction in several forms. This went against Pardo's intentions. In particular, the EEZs provided for a major peaceful transfer, possibly the largest in history, of natural resources and gave responsibilities to national jurisdiction. The EEZ is a revolutionary feature in many ways. While land-locked states are excluded, only coastal states have the right and responsibility to exploit, develop, manage, and conserve all resources in the zone, such as fish, oil, gas, sand and gravel, sulfur and other mineral nodules, whether in the water, or in the ocean floor of an area extending 200 nautical miles from its shore. The EEZ added a new province to the country. Because of the EEZ, about 90 percent of all known and estimated hydrocarbon reserves in the seabed and below fall under national jurisdiction. The same is true for almost all known and potential offshore mineral resources. The mineral resources of the deep ocean floor beyond the EEZ are excluded; they are part of the Common Heritage of Mankind.

The most valuable fishing grounds are predominantly in the coastal waters, hence, EEZ waters. The desire of coastal states to control the fisheries in their adjacent waters served as the major driving force behind the creation of the EEZs. The benefits for the states are evident; but are they utilized? The Convention resolves conflicting claims, interpretations, and measuring techniques by setting the 200-nautical-mile EEZ limit as the boundary of the continental shelf for seabed and sub-seabed exploitation.

A coastal state is granted the jurisdiction to protect and preserve the marine environment in its EEZ. This also binds the state to control, prevent, and reduce marine pollution from all sources, be it from land, atmosphere, and sea. Additionally, a coastal state can control marine scientific research in its EEZ.

Research was accorded great importance in the Convention. It was given a separate chapter, Part XIII, in which rules are specified. Freedom to conduct marine scientific research is maintained, subject to limitations. Research was to be conducted exclusively for peaceful purposes, with appropriate methods and means. It should not interfere with other uses of the sea, and should be conducted in compliance with all relevant regulations adopted in conformity with the Convention.

International cooperation in research is strongly promoted. Within its own EEZ, a coastal state has the right to regulate any research conducted with the state's consent. Such consent shall, after appropriate application and in usual cases, be granted to other states or competent international organizations. However, a coastal state may withhold consent to research under certain specified conditions, particularly if the research is related to exploration and exploitation of resources.

Lack of Enforcement and the Need for Integration

UNCLOS III provides for many rights and duties. However, the vision of a more equal distribution of wealth and resources and economy is gone, except the potential that is available in the EEZ. The challenge now is to generate more equity within the EEZ, and help achieve sustainable use of the EEZ resources. To achieve this goal, different governing mechanisms at local, national, regional, and global level are required. The Law of the Sea, as a constitution for the ocean, can serve as the legal framework. However, its provisions must be translated into concrete and doable actions.

At the global level, an important step in this direction was achieved through the United Nations Conference on Environment and Development held in 1992. This and subsequent actions at global levels during the 1990s generated a number of supplementary agreements and conventions. Of particular relevance for the ocean are Agenda 21, Chapter 17; Convention on Biological Diversity; Framework Convention on Climate Change; Agreement on the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks; Code of Conduct for Responsible Fisheries; Global Programme of Action for the Protection of the Marine Environment from

Land-based Activities; and the Barbados Programme of Action for the Sustainable Development of Small Island Developing States.

During the 1980s and the 1990s, the focus shifted to a new economic order: liberalization, privatization, and globalization. Instead of providing for a more equitable distribution of wealth and resources, all three resulted in the opposite. The Convention on the Law of the Sea of 1982 and the UNCED 1992 conventions and agreements are all very significant and have been generally accepted. However, they have not been able to prevent the gap between rich and poor countries from becoming even larger. Economic battles over the subsidies of fisheries have been and still are being fought elsewhere, such as between the International Monetary Fund on the intergovernmental side and at the Global Economic Forum on the nongovernmental side. As a consequence, organizations embroiled in these battles are now widely recognized and appear frequently on the front pages of newspapers.

Although environmental battles and conflicts over fisheries have been very serious, they have not addressed the key issue of poverty alleviation. Thus, there is a need for enhancing awareness and improving enforcement mechanisms, such as economic incentives at the international level, to help implement ocean governance and promote solidarity.

Environmental and business interests do not belong in the same camp. This needs to be changed. As part of the current World Trade Organization (WTO) negotiations, an opportunity is emerging between environmentalists and free traders. They are coming together to call for an end to fishing subsidies at the global level. The significance of this was pointed out recently by the Chief Executive Officer of Oceana and the Vice-Chair of the U.S. Council for International Business.

Globally, fishing fleets are 250 percent larger than is advisable for sustainable fisheries. The Food and Agriculture Organization of the United Nations reports that over 75 percent of fish population is in jeopardy. In 2003, the international journal, *Nature*, announced that 90 percent of tuna, marlin, and swordfish were gone [Myers and Worm, 2003]. This is alarming because between 1–2 billion people depend upon fish as their only source of animal protein and about 200 million people are employed in the fisheries sector. WTO is the organization that addresses subsidies problems. Its agreements are binding and they come with an enforcement mechanism. Success in solving overfishing problems through combined actions would further stimulate integrated efforts of the environmental and business communities.

It is unfortunate that the globalization process has pushed back efforts to achieve more equity, a balanced economic growth, and more respect for the environment, including marine resources. This economically driven process is a political choice. The case of shipping, or the transport of goods across the ocean, is one good example of the implications of the process.

Globalization, liberalization, and privatization have led to the concentration of wealth and abilities to a few dominating shipping companies. These companies alone — most of them mega-operators with integrated transport operations — have the economic power and mastery of technology to survive present conditions and policies, which allow for "the legal fiction of flag territory at sea." Developing countries cannot compete and have been essentially shut out from the scene. Still, the freedom of the seas has been maintained in this case, implying that the international community has not been able to put in place the required governance system. The flag of convenience implies the absence of a genuine link between flag states and vessels carrying the flag [Behnam, 2004].

The situation demonstrates the weakness of the conventions; they have no enforcement mechanisms. They are without real teeth. It is only, possibly, with an acceptance of all the four dimensions of Pardo's Common Heritage of Mankind — economic, environmental, peace and security, and ethics — taken together as a whole, that we could achieve what appears to be more necessary and urgent: a global solidarity to achieve at least a minimum equity of wealth and resources.

Reservations are growing socially and politically about globalization, which is primarily motivated and driven by economic interests. The rich are getting richer. The imbalance and inequity are increasing. Such things could only lead to an economic crisis of global dimensions, if not a total collapse of globalization. The first globalization of 1800–1900 ended with the Wall Street crisis in 1929 and the Great Depression. These two events led to the gradual establishment of the social democracies in Europe with more equal distribution of resources and a greater solidarity.

However, the current globalization process is weakening the foundation of that social order. One possible response to these current concerns is regionalization, in the form of trade and investment blocs. As indicated above, this approach was used in earlier times to protect trade interests. We are currently seeing trends towards this. In the 1970s, regionalization was the initial response to concerns about the marine environment.

The International Ocean Institute (IOI) studied the development of the Mediterranean region and its relation to marine environment. The study found that the Mediterranean Basin forms the basis for a broadly defined social and economic community of interests, as well as a natural ecosystem. It also found that it was timely to move towards the strengthening of that community, so as to enhance the welfare of all nations and peoples in the region. This analysis was published in 1972. The IOI study stressed that increased comprehensive cooperation among all Mediterranean countries would create conditions for peace and enhanced security. It identified the following needs: *(1)* the need for an environmental early warning system; *(2)* the need for immediate attention to the pollution problem; *(3)* the need for improved use of fisheries resources; *(4)* the need for integrated programs of soil, water, and forest management; *(5)* the need for harmonizing key national economic policies; and *(6)* the need for planning for regional development and environmental conservation. The study was considered revolutionary and was deemed 20–30 years ahead of its time. The findings contributed to the momentum that led to the development of the Mediterranean Action Plan, through the UNEP Regional Seas Programme, and the related Barcelona Convention, which originally limited itself to the environmental sector.

The enforcement of UNCLOS in 1994 put emphasis on implementation; the UNCED 1992 agreements and conventions pointed to the same direction. The international community has agreed that some sort of ocean governance is needed. Implementation must be achieved through the will and direction of governments. The private sector, civil society, and nongovernmental organizations (NGOs) must be included in the process and must play their parts. This participation highlights the present need for adjustment of the national and, to some extent, international institutions so that they transform from being sectoral to intersectoral.

New institutional models must be tested before they are adopted and put in place. One requirement is openness or transparency, which will create and stimulate trust; and vice-versa, trust will stimulate openness. This was stressed by Niels Bohr in his Open Letter to the United Nations in 1950 bringing out the need for an international mechanism to control nuclear power uses and nuclear proliferation [Rozental, 1985, 1994 and 1998]. The requirement of openness needs to be met by individuals, institutions, societies, and nations.

References

Anand, R.P. 2002. "Non-European sources of Law of the Sea," pp. 9–20. In: *Proceedings of Pacem in Maribus 2000, XXVIII*. Compiled by J. Wesnigk and edited by S. Rolston. International Ocean Institute, Halifax, Novia Scotia, Canada.

Behnam, A. 2004. "The ocean trade in the new economy: A keynote address." *Ocean Development and International Law*, 35(2):115–130.

Fulton, T.W. 1911 and 1976. *The sovereignty of the sea*. London (1911), reprinted New York (1976).

Grotius, H. 1609. (Published anonymously). *The freedom of the seas or The right which belongs to the Dutch to take part in the East Indies trade.* Translated by R.V.D. Magoffin and edited with an Introduction by J.B. Scott. New York 1916.

Mann Borgese, E. 1995. *Ocean governance and the United Nations*. Dalhousie University, Center for Foreign Policy Studies, Halifax, Nova Scotia.

Myers, R.A. and B. Worm. 2003. "Rapid worldwide depletion of predatory fish communities." *Nature*, 423(6937):280–283.

Rozental, S. 1985, 1994 and 1998. Niels Bohr-Memoirs of a working relationship. Christian Ejlers Publishing, Copenhagen.

CHAPTER 3

Sustainable Development and the Ocean

Gunnar Kullenberg and Ulf Lie

Sustainable Development

The term “sustainable development” appeared in the vocabulary of international organizations as early as the 1960s. However, it attained international attention only with the publication of the report of the World Commission on Environment and Development (WCED) in 1987. In this report entitled *Our Common Future*, sustainable development is defined as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs.”

The report demonstrates the relationship between environmental issues and the problems of inequity and poverty. It lists the following requirements in the pursuit of sustainable development:

- a political system that secures effective citizen participation in decisionmaking;
- an economic system that is able to generate surpluses and technical knowledge on a self-reliant and sustained basis;
- a social system that provides solutions for the tensions arising from disharmonious development;

- a production system that respects the obligation to preserve the ecological basis for development;
- a technological system that can search continuously for new solution;
- an international system that fosters sustainable patterns of trade and finance; and
- an administrative system that is flexible and has the capacity for self-correction.

Our Common Future contains detailed descriptions of the state of developmental and environmental issues in a number of its sections, specifically, *Part II – Common Challenges*. The state of the world's oceans is discussed under the chapter *Managing the Commons*. It begins with: "In the Earth's wheel of life, the oceans provide the balance." It goes on to describe how this essential balance is threatened by human activities, such as overfishing, marine pollution, and various land-based developments. While these threats are particularly felt in coastal areas, the WCED also draws attention to possible threats to the open ocean posed by long-range transport of environmentally harmful substances, by ocean currents or atmospheric movements. In the discussion about the need for improved ocean management, the WCED "is convinced that sustainable development, if not survival itself, depends on significant advances in the management of the oceans." In its call for improved ocean management, the Commission draws attention to the need for efforts at national, regional, and global scales, but emphasizing their interdependence in the realm of ocean.

Sustainable development has become almost a household term in our time. It is used in a very wide, and perhaps often misunderstood, context among internationally oriented, progressive individuals. The term clearly belongs to the realm of social sciences with strong normative overtones; the goal of sustainable development being the achievement of social justice and equity in time and space. Although the destruction of important life-supporting functions of ecosystems is seen as a threat to sustainable development, the term is clearly anthropocentric. Human welfare is the starting point and thus the justification for sustainable development; ecological sustainability is not a goal in itself.

Sustainable development may also be given a more descriptive connotation: it implies economic and social development maintained over time. It also implies empirical issues, such as sustainable use of renewable and nonrenewable resources, sustainable waste management and sustainable organization of economic and social systems. Such issues are global in scope. However, their basic underlying theme is concern for equal opportunities to reap benefit from global economic potential, as well as the common responsibility to protect the Earth's life-support system.

Values of the Ocean

The economic potential of ocean resources clearly plays an important role in the sustainable development of coastal and island states. However, it is not easy to estimate this potential. One reason is that many ocean economic activities are very closely interwoven with land-based activities [Mann Borgese, 1998]. While there is little doubt that the first-hand value of fish landings is a part of ocean economy, it is debatable whether this is also true for the related land-based industry, such as canneries or factories for processing to fishmeal and oil. Similarly, the value of offshore crude oil production is undoubtedly part of ocean economy. But where does the value added by land-based refineries belong?

More than 90 percent of the goods in international trade are carried by ships; does it make sense to include the value of the shipment as part of ocean economics? According to Mann Borgese, the answer is yes because were it not for opportunities for shipping, much of the goods would not be produced. A good example that drives this point across is the case of the tourism industry. Enormous tourism-related investments are made in hotels, restaurants, shopping areas, and golf courses in coastal areas. These activities are still deemed parts of ocean economy because it is highly unlikely that the investments would be made if the ocean were not there.

There are other difficulties in quantifying the ocean's potential. One is the fact that a large portion of the ocean's wealth is based on a non-property and nonsovereignty concept. Another is that a large part of the ocean's value is nonquantifiable in market value. A third is that risks are much greater in the ocean than on land, as was amply demonstrated by the first development of insurance related to maritime trade [see Chapter 4]. Ocean economics goes beyond the market economy and must deal with resources that need to be governed and managed, but cannot be appropriated. The size of marine living resources is changing due to variability of physical and climatic conditions. Attempts to introduce property concepts into the management of the ocean's living resources have failed [Mann Borgese, 1997]. The ocean is part of our life-support system and this role cannot be quantified in terms of market value.

Unfortunately, the institutions that we have are not equipped to deal with such a situation. The incentive structures of present governance and institutions are mismatched; and short-term local incentives are not effective in achieving long-term, regional-to-global goals. Overfishing is an example. Short-term economic interests led to exploitation of resources to the point of collapse [Costanza et al., 1993]. Mann Borgese [1997, 1998] analyzed the impact of this to ocean governance and development. One important point is that ocean development requires advanced technology and hence, technological cooperation in the marine sector is very essential.

Without much-needed technologies, developing and least developed countries cannot meet the responsibilities inherent in the international legal instruments and other international agreements that they have signed on to. Shipping is one example that demonstrates this situation [Behnam, 2004].

Sustainable ocean development and management can contribute to the solution of some major problems that we face today, including diminished work opportunities in developed countries and poverty in developing ones. The sustainable use of ocean resources forms part of the Plans of Action of the 2002 World Summit on Sustainable Development (WSSD). Ocean management requires new sources of funding support. The systems of international taxation on industries, as envisaged in the United Nations Convention on the Law of the Sea (UNCLOS) Part XI, should be seriously considered and pursued. Sustainable ocean development requires a longer time frame and the development of ocean economy is generally not compatible with those market-oriented enterprises that are driven by short-time benefits. To adjust to this requirement, we must provide education on long-term development and its benefits. We need a common vision on how to use our oceans including the development of a functional insurance and legal systems as well as good governance. The achievement of sustainability should become an incentive not just a tradeoff [Cross and Guyer, 1980, cited by Costanza et al., 1993].

The ambiguity of what to include or exclude in ocean economy is reflected in published estimates of the worth of global ocean economy. In the report of the Independent World Commission on the Oceans (IWCO), the gross domestic product (GDP) of the ocean is estimated to be USD 1 trillion [IWCO, 1998]. Mann Borgese, on the other hand, included the total value of ocean-related goods and services and came up with a gross ocean product of about USD 7 trillion. The major part of the difference is attributed to Mann Borgese's inclusion of the value of the goods transported by ships at USD 5.2 trillion and international communications in submarine cables, with a value of USD 1 trillion. These were not counted by IWCO.

Regardless of which estimate of ocean economics one prefers to use, both estimates are dwarfed in comparison to the estimated global gross national product (GNP) of USD 18 trillion [Costanza et al., 1997]. In an era of market economy and associated politics and confronted with such disheartening facts, one can understand the lack of enthusiasm for investment in ocean affairs. However, those facts are limited to the commercial value of the ocean, whereas an estimate of the noncommercial value of the ocean to the global life-support system is normally not included due to lack of data. Still, there is a widespread, intuitive acceptance that economic worth of ecosystem services, such as nutrient cycling, gas regulation, recreation, and natural defense against natural disasters, can represent real values. The tricky part comes in the conversion of such perceived values into its monetary equivalent.

In the last decades, we have witnessed the coinage of a new term: "ecological economy." This is a new branch of economy that endeavors to develop methods for estimating the value of nonmarket commodities. As a rule, these values are not based on hard, statistical data, but rather on indirect assessments including interviews and other methods for measuring the public perception of ecological values. In particular, the "willingness-to-pay" method is used.

This approach has not escaped criticism. Some environmental groups find the idea of setting monetary values on ecological services almost immoral and they fear that the next step might be a discounting of the natural capital that ecological services represent. On the other hand, the criticisms of economists focus on the lack of realism and precision in the methods. However, as this branch of economy is still in its infancy, ecological economists accept such criticism. Even so, they maintain that the values should be real and increased attention to methodology development will enhance the precision of estimated values.

In an article published in *Nature* [Costanza et al., 1997], a group of ecological economists attempted to estimate the global value of 17 ecological services. The mean global annual value was estimated to be in the range of USD 16–54 trillion and was pegged at approximately USD 33 trillion. Of this, the contribution of ecological services of ocean ecosystems amounts to 65 percent, or USD 21 trillion. It must be noted that this is nearly 20 times the commercial added value of ocean activities, and is about equal to the total world GNP of USD 18 trillion. The authors took into consideration the various sources of uncertainty affecting the estimates, but they are of the opinion that with improved methods, the estimates would be higher rather than lower. At any rate, the approach of ecological economics is an important starting point towards a more precise valuation of ecosystem services. Furthermore, it emphasizes the serious consequences if irreversible changes occur in the components of the global natural capital.

The 1992 United Nations Conference on Environment and Development (UNCED)

Among the International Commissions established under the auspices of the United Nations for the consideration of global issues, the World Commission on Environment and Development (WCED) appears to be the most successful in generating and stimulating public debate. The main reason may be that WCED preceded a major international conference, the United Nations Conference on Environment and Development (UNCED). UNCED further developed the issues considered by WCED and suggested instruments for political action.

UNCED, also known as the Earth Summit or the Rio Conference, took place in Rio de Janeiro, Brazil, in 1992, 20 years after the Stockholm Conference on the Human Environment and 5 years after the release of the WCED report. The Conference was meticulously planned by the UNCED Preparatory Committee (PrepCom), which was established in 1990. The five PrepCom meetings, held between 1990 and 1992, were open to all UN Member States. Representatives of UN organizations participated in the meetings as observers.

Perhaps the most remarkable and valuable characteristic of PrepCom was the involvement of nongovernmental organizations (NGOs) in the preparations. Statements of NGO representatives contributed significantly to the process. More importantly, the NGO representatives had the opportunity to discuss the issues among themselves. In addition, an effective electronic communications system was established, which provided updated information about the PrepCom process and stimulated the NGOs' participation through electronic networking. The efficient dissemination of information led to a number of preparatory meetings on different segments of society; an example was the international conference on an Agenda of Science for Environment and Development into the 21st Century (also known as ASCEND 21), which was held in Vienna from 24 to 29 November 1991.

UNCED was attended by representatives of 182 governments, in addition to a high number of representatives of intergovernmental and nongovernmental organizations and more than 8,000 representatives of the media. At the end of the conference, more than a hundred Heads of State attended the Earth Summit. As activities were closely followed by the international news media, debates on issues were quickly brought to the attention of the general public.

Parallel to UNCED, another major meeting also took place in Rio de Janeiro. This was the 1992 Global Forum, in which thousands of individuals and organizations debated issues on environment and development, in a considerably less formal but equally serious environment than that of the official conference.

A Growing International Framework: Challenges of Implementation and Enforcement

The main outcomes of UNCED were: the Rio Declaration on Environment and Development, the Framework Convention on Climate Change, the Convention on Biological Diversity, and Agenda 21.

Rio Declaration

The Rio Declaration is a set of key principles to guide future development.The principles are built on ideas from the Stockholm Declaration of the 1972 United Nations Conference on the Human Environment [Agenda 21, 1993; UN, 1972]. These principles, which have been in the forefront of public debate during recent decades, touch on timely issues, such as: the right of nations to exploit their own resources while ensuring environmental protection; the need to eradicate poverty; the need to ensure women's full participation in all efforts to achieve sustainable development; and the interdependence of peace, development, and environmental protection. As the principles were selected by consensus, they are hardly controversial. All Heads of State present adopted the Declaration.

The Rio Earth Summit adopted two conventions, one on climate change and the other on biodiversity.

UN Framework Convention on Climate Change

The United Nations Framework Convention on Climate Change is based on the scenario that greenhouse gases resulting from human activities contribute to climatic changes that may have adverse effects on natural ecosystems and hence, on human society. The Convention's aim is to stabilize greenhouse gases in the atmosphere, thus allowing ecosystems to adapt naturally to climatic changes. The goal is to reduce the emissions of carbon dioxide and other greenhouse gases to 1990 levels. Such reduction will require drastic changes in the energy policies of states and thus have major economic and political consequences. In the realization that most greenhouse gases are emitted from industrialized countries, the Convention suggests that these countries take the lead in fighting human-induced climate change. In addition, these countries are enjoined to help developing countries deal with the requirements of the Convention.

The roles of the ocean in the control of climate change and the possible effects of climate change on the ocean system have been central themes in the climate debate. The enormous ocean water masses have a large capacity for uptake, storage, distribution, and release of heat and carbon dioxide, which control the climate development to a considerable extent. Global warming may cause thermal expansion of the seawater and melting of land ice, resulting in rising sea levels. This is a major concern for many low-lying countries and small island states that fear increased flooding and saltwater intrusions in aquifers. Improved knowledge of the ocean system is, therefore, necessary to reduce uncertainties about the causes of climate change and to improve predictions about its effects.

Convention on Biological Diversity

The initiative to adopt the Convention on Biological Diversity was based on the realization that human activities of our time threaten species and ecosystems at an unprecedented rate. About 1.7 million species are known to science, but the high rate of discovery of new species indicates that the number is grossly underestimated. Human activities, particularly in terrestrial and freshwater ecosystems, have destroyed natural habitats for many species. In fact, it is estimated that 2–8 percent of the Earth's species will become extinct in the next 25 years.

The consequences of species extinction are not easily ascertained because in the present state of our knowledge, the biological role of individual species is not very well known. However, the consequences of overexploitation on species populations and ecosystems are more readily discernable. Indiscriminate use of pesticides, large-scale slash-and-burn practices in forests, overgrazing of rangeland, overexploitation of marine fisheries, pollution of freshwater and the coastal seas, and other human practices of a similar nature may seriously affect the global life-support system.

International concern in the reduction of biological diversity was voiced at the 1972 Stockholm Conference and intensified in recent decades. During that period, there was also a rapid development of biotechnology and a considerable interest in utilizing genetic and other biological material in various commercial enterprises. While these two developments are mostly seen as a threat to biodiversity, it is undeniable that new concepts, such as the concept of "patent on life," could further enhance the existing economic inequality.

Time, therefore, was ripe for a legally binding document in the form of a convention at the 1992 UNCED. Its purpose is to safeguard biological diversity and ensure a sustainable and just utilization of biological resources. Biological diversity, as specified in the Convention, "means the variability among living organisms from all sources including, *inter alia*, terrestrial, marine, and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species, and of ecosystems." Biological resources are defined as "genetic resources, organisms or parts thereof, populations, or any other biotic component of ecosystems with actual or potential use or value for humanity." Such all-encompassing definitions are, on one hand, a guarantee that no aspect of the biological variability will be neglected. On the other hand, they set the stage for complex identification and interpretation of the consequences of possible violations. The future will show if national and international control mechanisms are sufficient to meet the expectations of the convention.

Agenda 21

Perhaps the most important outcome of UNCED was Agenda 21, a 300-page comprehensive strategy for action for the global community, describing how population growth, consumption patterns, and technology are the major driving forces of environmental changes. Policies and programs to achieve a sustainable balance between consumption, population, and the Earth's life-supporting capacity are suggested. National governments are charged with the major responsibility for change, in close partnership with international organizations, businesses, regional, state, provincial and local governments, NGOs, and citizens' groups.

Eradication of poverty by ensuring poor people's access to the resources they need to live in a sustainable way is a central theme in Agenda 21. By their adoption of Agenda 21, industrialized countries recognized their responsibility for improving environmental conditions, as well as providing help to other nations so that they can develop in ways that have less environmental impacts. A major element in such help is capacity building, or building the expertise to plan and carry out sustainable development decisions.

Agenda 21 consists of 25 chapters dealing with all major issues of environment and development. Ten of the chapters address protection and management of components of natural systems. Chapter 17 is entitled "Protection of the oceans, all kinds of seas, including enclosed and semi-enclosed seas, and coastal areas and the protection, rational use and development of their living resources." The chapter is divided into seven program areas, namely:

- Integrated management and sustainable development of coastal areas, including exclusive economic zones;
- Marine environment protection;
- Sustainable use and conservation of marine living resources of the high seas;

- Sustainable use and conservation of marine living resources under national jurisdiction;
- Addressing critical uncertainties for the management of the marine environment and climate change;
- Strengthening international, including regional, cooperation, and coordination; and
- Sustainable development of small islands.

Each program area of Agenda 21 includes detailed discussions on the basis for action; objectives; management-related activities and data and information; international and regional cooperation and coordination; means of implementation, with financing and cost evaluation, scientific and technological means; human resource development; and capacity building. Agenda 21 is not a convention in which the commitment of states are legally binding, but rather a "code of responsible conduct."

The difference between the two types of instruments is demonstrated in the use of language. While the articles of the conventions often start with "States shall," the comparable term in Agenda 21 is "States should, where and as appropriate." However, the mere existence of Agenda 21 is a constant reminder for governments and a reference for NGOs in their efforts to enhance awareness of the general public. It sets the stage for concerted actions towards sustainable development and global equity. Several regional and even national Agenda 21s have subsequently been developed.

With sustainable development as the common vision, there is a need for integration, intersectoral work, and institutional reorientation. The Brundtland Report, *Our Common Future* [WCED, 1987] and Agenda 21 [1993] give guidelines on the institutions needed for achieving sustainable development. These needs can be contained under four headings [Mann Borgese, 1997]. The institutional framework must be: *(1)* comprehensive; *(2)* consistent; *(3)* trans-sectoral and multidisciplinary; and *(4)* participatory and bottom-up, rather than top-down.

A comprehensive framework is one that provides linkage from local levels of coastal communities to provincial and national levels of governance to regional and global international organizations. This meets the needs of transparency.

A consistent framework is one where regulatory and decisionmaking processes and mechanisms at all levels of governance are compatible. For the ocean environment, this need is very clear and refers to fisheries, pollution, and shipping.

A trans-sectoral and multidisciplinary framework recognizes the fact that "the problems of ocean space are closely interrelated and need be considered as a whole." Additionally, it means that all actors or stakeholders in the marine environment should play active roles. Boundaries between levels of governance, sectors, and disciplines are transparent, and the scientific community must be in a position where it can participate in decisionmaking and management.

Institutional arrangements based on these principles will vary from region to region. However, ongoing evolution is in this direction. One example is the approach adopted by the Partnerships in Environmental Management for the Seas of East Asia (PEMSEA), which involves intergovernmental, interagency and interstakeholder partnerships at regional, national, and local levels. PEMSEA's approach brings forward a new concept that the efforts of governments alone is not adequate to resolve the complex problems of ocean governance and that a combination of efforts from governments and all stakeholder partners are essential in achieving sustainable development. Such partnership will strengthen the commitments of all sectors of the governments and civil society to implement international instruments, agreements, and protocols more readily than it used to be [PEMSEA, 2004; Chua et al., in this volume].

The need for followup is evident and should constitute a major requirement for the adjustment and restructuring of the United Nations Environment Programme (UNEP) Regional Seas Programme, which has also been initiated through the linkage with the implementation of the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (GPA). Mann Borgese [1997] identifies six institutional implications for regional cooperation, namely: the mandate of the conventions, their geographical scope, integrated coastal and ocean management, representation in convention organs and in their executive bodies, the creation of regional commissions for sustainable development, and linkages from the local, national, regional, and global levels.

UN Informal Consultative Process on Oceans and the Law of the Sea (UNICPOLOS)

Following UNCED, the UN system acted quickly in order to ensure an effective followup of Agenda 21 and to monitor the implementation of the Earth Summit agreements at national, regional, and international levels. In December 1992, the 53-member Commission on Sustainable Development (CSD) was established under the UN Economic and Social Council. The basic elements of CSD's mandate are:

- To review the progress at international, regional, and national levels of the implementation of recommendations and commitments contained in the final documents of UNCED;

- To elaborate policy guidance and options for future activities to followup UNCED and achieve sustainable development; and
- To promote dialogue and build partnerships for sustainable development among governments and major nongovernmental actors who have a role to play in the transition towards sustainable development.

From 1993 onwards, the CSD has reviewed subject chapters of Agenda 21. Chapter 17, *Oceans and Seas*, was considered at CSD 7 in 1999, based on a report prepared by the Department of Economic and Social Affairs of the UN. The report provides a review of the conditions of coastal and marine areas, living marine resources, and marine pollution. It also calls attention to the GPA, needs for improved fisheries management, and enhanced international cooperation and coordination.

Even after the Conference, the UNCED process continued in other ways and several additional international instruments were agreed upon by the governments in the UN system. These relate to fisheries management through "The Agreement on the Implementation of the Provisions of the UNCLOS of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks" and the "Code of Conduct for Responsible Fisheries." These fall under the responsibility of the Food and Agriculture Organization of the UN.

An important part that was not included in Chapter 17 of Agenda 21 concerns the need to manage activities on land so as to minimize impacts on the ocean and marine environment. This was covered through the GPA and was concluded through a Washington, DC Conference in 1995. It falls under the responsibility of UNEP, as the leading international body. In order to specify actions for small island developing states, the Barbados Conference in 1994 was called. During the Conference, the Barbados Programme of Action for the Sustainable Development of Small Island Developing States was agreed upon. All these agreements and the conventions adopted at UNCED, together with UNCLOS, form a fairly complete constitution for the ocean as a whole. What is missing is the government with implementation and enforcement authority.

There are overlaps between the agreements addressing specific areas of concern and relevant parts of UNCLOS. This is unavoidable due to the interdependencies of the natural and social systems. However, it is also indicative of the challenges present in the implementation and the financial and institutional means for doing so. In order to address this and at the same time ensure coordination, cooperation, and broad participation, the UN General Assembly decided, in November 1999, "to establish an open-ended informal consultative process in order to facilitate the annual review by the General Assembly, in an effective and constructive manner, of developments in ocean affairs by considering the Secretary General's report on oceans and the Law of the Sea and by suggesting particular issues to be considered by it, with emphasis on identifying areas where coordination and cooperation at the intergovernmental and interagency level should be enhanced."

The process, later called the Open-ended Forum for the Law of the Sea, was open not only to member states and parties to the conventions, but also to those with competence in ocean affairs. This decision was a major step in the gradual development of a global ocean governance system, as pointed out by Mann Borgese [2000], who, through the International Ocean Institute (IOI), had for several years argued for such a step. This reflects the complexity to "consider the closely interrelated problems of ocean space as a whole" in that the problems transcend the interests of all. The only global body representing all parties is the UN General Assembly. This is the only body with the competence to address the matter and it needs processes to assist it in fulfilling the task. Thus, the open-ended informal consultative process is an essential element in the ocean governance system that encompasses the coastal community and, through the state and the region, to the global level of the UN.

The analysis of Mann Borgese [2000] brings out the common goal of the conventions and agreements to have sustainable development based on equity and eradication of poverty. The common means to achieving this are integrated coastal management, which includes monitoring, surveillance, control, and enforcement; advancement of science and technology; development of human resources; and provision of necessary financial means.

There are other positive developments between 1992 and 2002. The international conferences agreed upon at UNCED have been successfully implemented, with strong participation of civil society. Related international institutions and secretariats have been created and have been put to work. Unfortunately, one problem is apparent in all of these developments. Support and funding from nations and international funding agencies are very inadequate for the tasks agreed upon. The political will to change this situation does not appear to be at hand. An essential principle of the Rio Declaration, the "cooperation to eradicate poverty as an indispensable requirement for sustainable development," has not been achieved. The disparities in standards and quality of living are increasing rather than decreasing. At the same time, there appears to have been some changes in public awareness about concepts such as security, sustainable development, climate change, and biodiversity. This increased awareness, however, regrettably seems to be related more to negative consequences rather than to the considerable actions that have been done within the system to address these issues.

Fortunately, the more active role played by civil society, particularly NGOs, considerably counter the lack of political momentum. The focus now must be on implementation, enforcement, and more complete integration of the security issue. It must include capacity building, science and technology cooperation, and enhancement of fairness and equity. The emerging emphasis on regional cooperation and organization prove that problems can be tackled at the regional level. Networking, partnership generation, and cooperative financing mechanisms are more easily stimulated at that level compared to a larger-scale one. Regionalization may also help balance or counter the problems present in globalization.

The 2002 World Summit on Sustainable Development (WSSD)

The UN General Assembly decided to hold the WSSD in 2002, partly in order to review the progress made since UNCED and give new momentum to the process, and partly to focus attention on the need for integrated consideration of the key elements of sustainable development such as ethical management of natural resources, fairness and equity, poverty alleviation, environment protection, peace and security. These elements were all included in Arvid Pardo's 1967 specification of the Common Heritage of Mankind.

The 2002 WSSD was convened in Johannesburg, South Africa. Towards its end, the Secretary-General of the UN concluded that "this Summit will put us on a path that reduces poverty while protecting the environment, a path that works for all people, rich and poor, today and tomorrow." The WSSD conceived partnerships as a means of implementation; partnerships were generated between governments, civil society, intergovernmental organizations, NGOs, and private enterprises. At the summit, Heads of State also agreed on the Johannesburg Plan of Implementation.

The Plan of Implementation is part of the many calls for protecting and managing the natural resource base of economic and social developments. With respect to oceans, seas, coasts, and islands, the Plan of Implementation:

- reconfirms that they form an integrated and essential component of the Earth's ecosystems and are critical for global food security and for sustaining economic prosperity and the well-being of many national economies, particularly in developing countries. The plan then gives a number of specifics in order to secure sustainable development of the oceans, including the implementation of UNCLOS and Chapter 17 of Agenda 21;

- encourages the application by 2010 of the ecosystem-based management approach;
- promotes integrated, multidisciplinary, and multisectoral management at the national level, as well as the development of national ocean policies and mechanisms for integrated coastal management;
- strengthens regional cooperation and coordination between the relevant regional organizations and programs;
- assists developing countries in coordinating, at the regional and subregional levels, policies and programs aimed at the conservation and sustainable management of fishery resources and implementation of integrated coastal area management plans; and
- considers the open-ended informal consultative process, the Open-ended Forum for the Law of the Sea.

Separate entities are included in the actions to: achieve sustainable fisheries; promote the conservation and management of the oceans, in accordance with Chapter 17 of Agenda 21; advance the implementation of the GPA and the related Montreal Declaration on the Protection of the Marine Environment from Land-based Activities; enhance maritime safety and protection of marine environment from pollution generated by activities at sea; and finally, improve scientific understanding and assessment of marine and coastal ecosystems as a fundamental basis for sound decisionmaking.

In the Plan of Implementation, a separate section is devoted to the sustainable development of small island developing states, these being a special case in both environment and development. A comprehensive review of the implementation of the Barbados Programme of Action was agreed upon, and was undertaken through the Mauritius Conference in 2005.

In the Plan, certain time limits for the implementation of several actions were indicated. However, there were no additional enforcement or financial mechanisms identified, except possibly through the application of the partnership concept. It must be noted that the integration of peace and security as one dimension of sustainable development is not made explicit. The shift towards renewed focus on the need for more equity and fairness in use and distribution of resources and the alleviation of poverty is evident. This paves the way for regional initiatives to take on all required dimensions. A good example, as well as being the first of its kind, is the *Sustainable Development Strategy for the Seas of East Asia*, developed through PEMSEA and adopted by all the regional states in December 2003 [PEMSEA, 2003; Chua et al., in this volume]. Implementation has been initiated.

Achievement of the goals agreed upon during the series of conferences depends upon complex interactions among governments and nongovernmental bodies, as well as the awareness of the general public. Success must, therefore, be considered in a long-range perspective as the result of a continuous process. Consequently, evaluation of the results must also be continuous. The Johannesburg Summit was the first comprehensive evaluation.

Looking Back

The decades since the Stockholm Conference in 1972 have seen many advances and setbacks. Death rates from diseases such as pneumonia, diarrhea, and tuberculosis have declined. The production and use of ozone-reducing chlorofluorocarbons have been phased out in developed countries, with developing countries phasing out by 2010. And information technology has greatly improved the basis for new industrial development, education, and international communication. One result of all these developments is the globalization of the marketplace; viewed by some as an instrument for a truly global sustainable development while seen by others as a new form of imperialism.

All positive developments cannot hide the setbacks. Wars and armed conflicts are as numerous as before. There has been at least a six-fold increase in deaths from HIV/AIDS. Despite a 30 percent growth in the global economy, there has been a reduction in foreign aid and an increase in Third World debt since UNCED 1992. Modest goals for reduction of greenhouse gas emissions in the 1997 Kyoto Protocol are not accepted or are challenged by dominant industrial states. Overexploitation of natural resources and destruction of the environment continue. Above all, global aspirations and expectations for an equitable and the sustainable development of economy and ecological systems have not been significantly advanced in the years since UNCED. Such setbacks were evident in the preparations for the Johannesburg Summit.

However, results of the WSSD suggest that new momentum has been injected in the process. This must be maintained. The increased acceptance by governments of the seriousness of the problem following the release of the 4th United Nations Report on Climate Change in spring of 2007, and the resulting inclusion of this in the political agenda and the security debate is another positive result of the consolidated efforts. Further development, implementation, and enforcement of ocean governance can lead the way.

To demonstrate that the establishment of an ocean governance system for the sustainable development of the ocean and coastal seas can benefit our society as a whole, the following chapters present some of the ocean's assets available for, and very much used by, society. Additionally, the chapters inform about the knowledge base available for the utilization of these assets.

References

Agenda 21. 1993. *Earth Summit. Agenda 21. The United Nations Programme of Action from Rio.* United Nations, New York. 294 pp.

Behnam, A. 2004. "The ocean trade in the new economy: A keynote address." *Ocean Development and International Law*, 35(2):115–130.

Costanza, R., L. Wainger, C. Folke and K.G. Maler. 1993. "Modeling complex ecological economic systems: Toward an evolutionary, dynamic understanding of people and nature." *BioScience*, 43:545–555.

Costanza, R., R. d'Arge, R. de Groot, S. Farber, M. Grasso, B. Hannon, K. Limburg, S. Naeem, R.V. O'Neill, J. Paruelo, R.G. Raskin, P. Sutton and M. van den Belt. 1997. "The value of the world's ecosystem services and natural capital." *Nature*, 387:253–260.

IWCO (Independent World Commission on the Oceans). 1998. *The ocean: Our future.* Edited by M. Soares. Cambridge University Press, New York. 248 pp.

Mann Borgese, E. 1997. *Sustainable development in the oceans.* International Ocean Institute, Canada and Dalhousie University, Halifax, N.S., Canada.

Mann Borgese, E. 1998. *The oceanic circle: Governing the seas as a global resource*. United Nations University Press, Tokyo. 240 pp.

Mann Borgese, E. 2000. *The UNCLOS-UNCED process: A comparative study of eight documents*. International Ocean Institute, Canada and Dalhousie University, Halifax, N.S., Canada.

PEMSEA. 2003. *Putrajaya Declaration of regional cooperation for the sustainable development of the Seas of East Asia: Sustainable Development Strategy for the Seas of East Asia: Regional Implementation of the World Summit on Sustainable Development for the coasts and oceans.* GEF/UNDP/IMO Regional Programme on Building Partnerships in Environmental Management for the Seas of East Asia, Quezon City, Philippines.

PEMSEA. 2004. *Sustaining benefits*. PEMSEA IEC Material 1. GEF/UNDP/IMO Regional Programme on Building Partnerships in Environmental Management for the Seas of East Asia, Quezon City, Philippines. 38 pp.

United Nations. 1972. "Report of the United Nations Conference on the Human Environment, Stockholm, 5–16 June 1972," Chapter 1. United Nations Publication Sales No. E.73.II.A. 14 and Corrigendum.

WCED (World Commission on Environment and Development). 1987. *Our common future*. Oxford University Press, Oxford.

CHAPTER 4

Transportation across the Sea

Gunnar Kullenberg

The sea is crucial to trade and this has been the basis for the governance of the seas in historical times. The Rhodesian law of the sea, which is a private law that essentially dealt with trade, was developed as early as 800 BC on the Greek island of Rhodes. It was used by the Roman Empire and later, by European states.

The role of the ocean in human development, the exchange of all things, including the exchange of people as shown by Grotius, is well documented throughout history. Across the sea, goods, culture, knowledge, inventions, diseases, religion, conflicts, challenges, and opportunities are transported. In many regions of the world, the establishment of different cultures and economies, as well as their development and resilience, depended mainly on the accessibility to, and relative importance of, maritime transport. This is clearly demonstrated by the development of leading historical coastal cities near the Black Sea, Mediterranean Sea, Persian Gulf, Arabian Sea, parts of East Africa, and parts of the Seas of East Asia. In these places, maritime law was codified long before the development of its European counterparts.

The dependence of early coastal urbanization on maritime transport is demonstrated by the decline of leading historical coastal cities. The power of these cities dwindled when alternative routes of transportation were found and established. In recent historical cases, these new routes were associated with the discovery of other maritime passageways, such as the path around Africa to Asia.

The role of sea routes in adjacent land development is also shown in the construction of important canals, such as the Suez and Panama. Additionally, power struggles have often been motivated and waged, out of the desire to keep passages through important straits open for trade. Examples are the opening to the Baltic Sea through the Oresund, also known as "The Sound," the Straits of Gibraltar, and Bosporus and Hormus. The strategic significance of passages such as the Torres Strait and the Straits of Malacca and Singapore are also well proven. It is thus not surprising that, until recently, major interest in the ocean was limited only to its role as conveyor of various goods.

How Vital Is Shipping?

The shipping industry is an important component of the transportation of goods. A world without shipping, or maritime transport, is unthinkable. How can oil be transported from recovery sites to major consumer places? How can goods and produce be carried from one continent to another?

International trade route: Malacca Straits (Photo: PEMSEA)

As stated above, shipping is such an important part of civilization that the growth of coastal megacities has been directly linked with the development of shipping over the last decades.

Shipping is as vital to the development of culture and ideas as it is to economic progress. Every day, an enormous number of goods and people are transported by ship. Considering the magnitude of shipping operations, it is perfectly logical to ask: “How long can we continue to depend upon shipping for the orderly flow of goods, people, and even ideas?” The question makes perfect sense. In fact, the moment we raise it, we would find other questions cropping up as corollaries. Can the ocean and coastal areas sustain continued shipping operations? Can development in technology, management, legislation and maritime insurance support it? Can sufficient safety-at-sea be maintained and the desired economy achieved to allow for availability of risk capital? Can conflicts, piracy, and other crimes-at-sea be controlled? Can we achieve increased equity and fairness in the distribution of both goods and maritime transport capacity?

Disasters-at-Sea

All of us have probably read about disasters-at-sea. After all, nothing pricks human curiosity more vividly than dramatic catastrophes, be these on land, air or sea. The discovery of the *Titanic* wreck and the search and retrieval of the treasures from the wreck were followed with intense interest. The whole process stirred our imaginations. It fascinated us almost as much as man’s first step on the moon. The debate on the *M/S Estonia* disaster in the Baltic, particularly the possible recovery and identification of victims, has generated attention extending beyond the nearby Baltic Sea states. The tragedy that befell the submarine *Kursk* has been followed worldwide. The plights of boat migrants, both legal and illegal, are documented in almost all regional seas.

Torrey Canyon, *Amoco Cadiz*, *Exxon Valdez*, *Braer*, *Erika*, and *Prestige* have practically become household names and the media coverage that surrounded the accidents and their aftermath brought the tragedies to countless living rooms around the world.

These disasters are events we hope we never see again. The one good effect of these disasters, however, is that it boosts public awareness on issues surrounding the management of shipping. Additionally, it catches the attention of the international community and shifts it to national and international shipping legislation and its implementation. Other accidents such as the Chernobyl disaster and the chemical spills in the Rhine are tremendous shocks to our social and cultural value system. Because of

Oil spill response exercise (Photo: OSRL/EARL)

their horrific shock value, they galvanize people into taking action and stimulate changes in more sustainable ecological economic systems [Costanza et al., 1993].

Accidents or disasters triggered innovations and improved protection, management, and legislative and institutional reforms. So, from this perspective, we can clearly depend upon shipping accidents and disasters to persuade people that there is a need for some form of governance. Unfortunately, there is no system in place to ensure that the ecosystem and environment management agreements already in place are implemented beyond areas of national jurisdiction. No insurance or tax system exists at the international level.

Maritime accidents have a correlation with maritime transportation figures. Annually, about 3,000 tankers transport 1.9 billion tons of oil over an average distance of 4,700 nautical miles [Gold, 1998]. A very small fraction of about 5.10^{-6} of the oil is spilled. This gives us a figure of about 10,000 tons of oil annually. Unrefined crude oil is a natural product and generally does no harm when spilled in limited amounts in the open sea. It is when it impacts the coast, the wildlife at the coast, and our uses of the coast that the disturbances become of consequence.

The shipment of other goods is also an activity as massive in scale as oil transport. Every year, more than 2.4 billion tons of dry cargo crosses the ocean on board over 25,000 vessels [Gold, 1998]. Naturally, this figure implies that the same bulk of goods are transported on land and partly on air. This is because most of the goods travel over lands enroute to ships.

From the figures presented, it is apparent that the more goods and oil are shipped, the higher the chances of accidents taking place.

Have we made any improvements as a result of the disasters recounted above? The answer is a resounding yes. International cooperation has been strengthened, with resulting agreements on standards of equipment, training, and control. International conventions like the Safety of Life at Sea (or SOLAS) and the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 (or MARPOL 73/78), have been put in place. National control and legislation have been reinforced.

Navigation and Enforcement Challenges

In order to answer some of the earlier questions posed, we may take a look at the global map and consider where we would most likely find the greatest shipping problems. These problems are common in places such as crossroads of shipping traffic and narrow straits linking major ocean basins, where traffic congestion can occur. The problems may also appear in some regional sea areas where shipping traffic can be very congested. There, troubles often arise. Examples of these areas are the southern tip of Africa, the North Sea, the South China Sea, and parts of the Caribbean and the Mediterranean.

Busy Straits

The greatest safety problems for shipping, however, appear to occur in some of the most complicated and busiest straits connecting regional seas. These include the *Turkish Straits*, consisting of the Dardanelles, connecting the Aegean Sea and the Sea of Marmara, and the *Bosporus*, connecting the Sea of Marmara with the Black Sea. The Turkish Straits' total length is close to 260 km. The 30-km long Bosporus is the most complicated part. It is narrow and has sharp course changes that are, with 12 abrupt turns, a width from 750 m to 3.6 km, and depth ranging from 36 to 124 m. Furthermore, the Bosporus has strong currents and these make navigation difficult and dangerous. The Bosporus runs through or beside the city of Istanbul, the former Constantinople, which now has about 11 million inhabitants. Nearly 50,000 tankers and cargo vessels pass through this strip of water annually. In doing so, these ships move very close to the mosques of Istanbul, ancient Ottoman and Byzantine palaces and castles, and elegant, expensive villas. Accidents happen frequently and disasters could occur at any time, given such proximity between ships and structures.

The Turkish Straits have become an artery of the world's oil supply, following the collapse of the Soviet Union and the opening of oil exports from the former Soviet republics of the Black Sea. Daily, very large tankers carry about 1.7 million barrels, or 230 thousand tons, of oil through the Straits. A cutoff of this transport could have very significant economic effects, starting with an impact on world oil prices.

Through the Montreux Convention of 1936, the Bosporus was made an international sea lane. Turkey was given the responsibility to maintain a safe navigation and traffic control system. Recently, the country installed a modern system for controlling ship movements using radar and satellite. This system cost USD 20 million. There is also a traffic separation scheme with a Turkish contingent in control. However, with an average of 130 commercial ships passing through the Bosporus every day, the task of traffic management is formidable.

Transit through the Turkish Straits is controlled by Turkey, which exercises sovereign power over the Straits. But movement across the Strait is governed by the Montreux Convention. This means Turkey cannot prevent innocent passage. This is in recognition of the principle of freedom of transit and navigation in the Straits. However, significant limitations are put on free passage. The Turkish Straits are referred to in the present Law of the Sea Convention as being governed by "long-standing international conventions." As such, the Straits are unaffected by the Law of the Sea Convention. The naval ships of the riparian states of the Black Sea have the right to pass through the straits while other states must seek permission before they can do the same.

There are several other straits where navigation is hazardous due to heavy traffic and navigational problems. Among them is the *Strait of Dover*, which links the Atlantic Ocean to the North Sea and where the density of traffic is very high and is perhaps even the highest in the world. Vessel traffic there has been managed for about 150 years. Carefully identified traffic separation schemes have been established through national, regional, and international organizations. Cooperation between all parties has also been established. As a result, the number of collisions in the Strait of Dover has greatly declined. However, while traffic control is apparently working well, the same is not the case for pollution control. It has been very difficult to enforce pollution control regulations. In order to remedy this situation, an approach called "port state control" was first put into practice in Europe. Under this approach, ports are given the responsibility to monitor vessels entering their areas and port authorities can take appropriate actions whenever required. This system of enforcement replaces, or at least supplements, the flag state enforcement system that has become inadequate due to the use of flags of convenience.

Another very complicated area is the *Straits of Malacca and Singapore*, also called the Straits of Malacca, which links the Pacific and Indian Oceans. It is a very important maritime transport link for the entire Southeast and Eastern Asia, particularly Japan. The three "Strait States," namely Singapore, Malaysia, and Indonesia, all have a strong interest in the safety of navigation. However, the first interest of Singapore is the freedom of navigation.

Through the Straits of Malacca, about 90,000 ocean-going vessels of more than 100 GT pass per year. This is about twice the number of ships that pass through the Bosporus. The Straits of Malacca is a shallow area, with tidal variations of the water level ranging from 1.6 to 3.7 m, depending upon locality and shifts in the seabed, through wandering banks or dunes. Thus, there is risk for ships of running aground. There is also a high risk of collision due to heavy traffic and high shipping speeds.

Many efforts have been made to survey and chart the Straits of Malacca and at the same time, establish modern navigation and control systems. However, a major obstacle to these efforts is the cost of updating and maintaining the said system and providing real-time observations of sea levels and currents. At present, a traffic separation scheme has been introduced. Additionally, a limitation to the size of ships has been established. Under this limitation, ships must have an under keel clearance of at least 3.5 m at all times. This limits fully loaded tankers, which can pass, to not more than about 230,000 dead weight tonnages (DWT).

Malaysia and Indonesia have asserted their right to control the Straits of Malacca. The two countries claim that the body of water is part of their territorial area and as such, is not an international strait. Today, the Straits remains open to all international transit. In 1993, however, the states opposed and blocked the passage of a Japanese plutonium ship, for safety reasons.

The *Strait of Gibraltar* is another strait where maritime commercial traffic is of worldwide importance. The Strait is primarily controlled by Spain and Morocco. The right of passage through the Strait is not governed by any specific treaty. The customary international law guiding transit passage in peacetime is the commonly upheld rule.

Still another important strait is the *Strait of Hormuz*, connecting the Persian Gulf to the Gulf of Oman. It is strategically, politically, and economically valuable because of the flow of oil through the Strait. Applying the 12-nautical-mile territorial extension, the Strait falls within overlapping Iranian and Omani territorial seas. Both countries are jointly maintaining unimpeded transit by means of a Joint Patrol of the Strait of Hormuz.

The *Baltic Straits* are as vital as the Strait of Hormuz when it comes to economic activity. Through the Kattegatt, it connects the North Sea to the Baltic Sea. The Straits are narrow, with shallow sills evident when one is entering the Baltic Sea. Denmark collected transit duty on ships passing through "The Sound" for over 4 centuries, from 1429 to 1857. The Straits are, however, too shallow for large vessels, even if these pass through the Great Belt passage. Denmark, Sweden, and Finland have stated explicitly during the Law of the Sea negotiations that the Baltic Straits should fall under the special regime established by "long-standing international conventions," referring to the Copenhagen Convention of 1857, which provided for free transit passage through the Straits.

It has for long been agreed by maritime nations that international law permits transit passage through international straits. This position was adopted by the Law of the Sea Convention of 1982. It is important to note that some important straits are governed by other legal regimes and are not affected by the Law of the Sea:

> *"The Law of the Sea of 1982 defines some restrictions on transit passage through straits. One is that passage must be only for the purpose of continuous and expeditious transit. Another is that ships must comply with generally accepted international regulations, procedures, and practices for safety at sea. For prevention, reduction, and control of pollution from ships, ships must proceed through the strait in question without delay. Moreover, there must be no use of force or threat during the passage."*

The Convention also allows states bordering the Straits to adopt laws and regulations for "the prevention, reduction, and control of pollution, by giving effect to applicable international regulations regarding the discharge of oil, oily wastes, and other noxious substances in the Strait" [Article 42(1)(6)]. Thus, we can conclude that if these internationally agreed provisions were implemented, much of the fears and conflicts — now occurring in relation to very significant maritime transport through some straits — would be substantially reduced.

Traffic in the South China Sea

There are, of course, other areas that experience congestion of sea traffic. One such area, also with rather high national stakes and potential for conflict, is the South China Sea, extending from slightly south of the Equator at 3°S to 23°N and bordering several countries, such as China, Singapore, Malaysia, Thailand, Cambodia, Indonesia, and the Philippines. In the north, it ends in the Formosa Strait; in the west, it is reached through the Straits of Malacca and Singapore; and from the south, through the Karimata Strait. The South China Sea is part of the most direct route between the Pacific and Indian Oceans. Hence, almost all maritime traffic between the Far East and Europe, Africa, the Middle East, and South Asia passes through it. More than 41,000 ships pass through annually — more than double the number passing through the Suez Canal and nearly triple the total for the Panama Canal [Ji, 2001].

The area is in the Asian monsoon region, with southeasterly winds in northern winter and spring, changing to northeasterly winds in northern late summer and fall. The wind-driven currents can be quite strong and may go up to 1–2 knots along coastal boundaries, following the monsoon seasonal pattern. Severe weather conditions are also to be expected at any time. However, the typhoon season is only from June to November, with wind speeds of 120 km per hour or about 35 m per second. In addition, the sea area is shallow and the navigational charting, or hydrography in

Oil tanker traffic through the Malacca Straits classic terms, is uncertain or incomplete. There are many unsurveyed or poorly surveyed areas. As a consequence of all these factors, recommended shipping routes are defined and chartered. These lanes also indicate the main directions. For example, there are lanes such as Singapore to Shanghai, Singapore to Hong Kong, and Singapore to Japan. The main trades are related to Japan, Malaysia, Singapore, Indonesia, and China.

As expected, accidents occur with frequency in this region. There have been 139 severe accidents over the past 20 years, involving about 930,000 DWT, a loss of 254 lives, and 8 reported cases of sea pollution [Olsen, 1996]. Between 1974 and 1994, 77 ships, inclusive of those carrying passengers, were reported to have sunk in the same area. This means that from 1974 to 1994, four ships sank per year! The loss of a ferry in August 1984 is the most serious example, with over 120 lives lost [Olsen, 1996]. In addition to this, the area is subject to relatively large incidents of piracy.

The traffic in the region has been increasing throughout the last few decades. Over the last 25–30 years, there has been about a four-fold increase of ships under the flag of the South China Sea littoral states. The size of the ships, especially the largest ones, has been regulated since the 1990s. It is worth noting that large ships, which are over 250,000 DWT when fully loaded, have drafts of about 20 m and additionally require several meters of water below the keel when cruising at normal speed. These figures are especially true for tankers. Container ships of about 4,000–5,000 twenty-foot equivalent units (TEU) in the 60,000–70,000 DWT ranges have a draft of about 13 m when fully loaded. So, it is necessary to be well aware of the depth and follow it enroute.

Piracy

While the dangers due to natural forces are very significant at sea, those due to human interference were and are still very dramatic. These generate conflicts and remain as challenges to international cooperation and security at large.

Piracy on the high seas is well known throughout history, and many romantic stories have been written about it considering how rose-colored and distorted most people's views of piracy are. But it is neither romantic nor amusing when you are onboard a ship being commandeered by pirates.

Sometimes, in situations of tension or conflict, piracy was even legalized. These crimes-at-sea have never disappeared. Today, there is considerable piracy in large areas of the ocean, particularly in the Caribbean, Western African waters, and in the Seas of East Asia. This situation calls for the implementation of governance. It also calls for reliable registries and the abilities of flag states to enforce control.

At present, crimes-at-sea occur in the form of traditional piracy and armed robbery, illegal fishing, and illegal transportation of dangerous goods, toxic wastes, drugs, weapons, and even human beings. Incidents of piracy involve all kinds of shipping and pleasure crafts. There has been a dramatic rise in piracy, specifically in Southeast Asia, the South China Sea, the Caribbean, and outside West Africa, and these incidents have almost tripled during the past decade. This was evidenced during the discussion of the issue at the 2nd Session of the United Nations Open-ended Forum for the Law of the Sea, in May 2001.

Crimes-at-sea cause serious threats to human life, the safety of navigation, international trade, property, and the environment. Victimized ships carrying toxic substances have been found drifting in congested sea areas such as straits, sometimes without steering and propulsion and at other times, with the crew killed or locked up by pirates. Efforts of international organizations, such as the IMO, and others have not been able to stop the phenomenal rise of these crimes. Acts of piracy are frequently linked to organized crime and syndicate groups that are involved in drug trafficking and illegal transportation of people and contraband goods.

What can be done about this? The situation shows that our influence on conditions certainly does not stop at the shores, but reaches across the ocean. Through the evaluation of the United Nations, several remedies have been proposed. Are we willing to pay to implement them?

Piracy and other crimes-at-sea have reached such dimensions now that they require cooperative action in an organized and legally accepted way. This way should be part of an appropriate and adequate ocean affairs management system, or an internationally agreed ocean governance system. The international legal instruments are available but they need to be implemented and enforced. When they are, there is every chance of effectively curtailing criminality at sea. One example that it is possible for this system to work is the prevention of the slave trade in the 1800s, after slavery had been demolished in Europe. Concerted actions by the sea powers of that time gradually stopped slave trade.

Structural and Technological Developments

Since the breakdown of the Soviet Union in the 1990s and the Asian financial crisis a few years later, many important economic developments have taken place. These developments have influenced the world market. The globalization of trade, finance, and communication, as well as the increasing awareness of environmental problems, are some of the most significant processes that have been ongoing over the last several decades. The importance of the breakthrough in electronic, nonphysical communication cannot be overemphasized. One very significant consequence has been the downsizing of mechanics and machines, as exemplified in the use of lighter and stronger production materials and small-sized, high-technology electronics. One significant impact of this process is the decreased importance of traditional raw materials and the transformation of the global economy into a service-oriented one.

The whole development has very clearly changed the demand for transport and related services. This, in turn, has brought changes in the transportation industry. Technological developments also made it possible for the shipping industry to meet changing transportation demands, in consonance with reforms to national policies. Responses to demands, however, have the tendency to remove protections, trade barriers, and restrictive bilateral agreements. State-owned shipping companies have mostly been privatized. All these factors led to an increased competition, with resulting enhanced flexibility of management and responsiveness to new challenges. Concurrently, concentration and restructuring also took place in order to meet economic demands.

Technology

We cannot discuss shipping without considering technology. Throughout history, many basic inventions have been made to make safe navigation possible. In some ways, the technological developments of ships and the development of navigation technology go hand in hand. However, the development of ships mainly responds to the economic need to transport goods. Development of navigation technology, on the other hand, arose out of the need for safe transportation.

Maritime transport has also stimulated many technical developments and discovery such as: ship design capable to meet different types and heights of waves as well as strong currents, including strong tidal currents; the inventions of the compass and the chronometer; and the invention of the sextant, which is used to take accurate sun and star heights and calculate ship position. Long voyages at sea also led to discoveries related to human health and the need for proper composition of food, particularly the idea that fruits provide vitamins and other necessary micronutrients that the human body needs. Those inventions and knowledge not only made secure navigation possible but also impacted on many other human activities.

Containerization

A major driving factor in all the recent developments has been containerization, which started in the early 1970s. Containerization is the process by which a large amount of merchandise is packaged into large standardized containers. This process has led to the creation of larger vessels and related cost reduction mechanisms. In 1985, only 15 percent of the world container capacity was based on ships of 2,000 TEU or more. In 1997, this figure rose to 60 percent. The world's 20 leading companies controlled about half of the world container capacity.

Containerization also stimulated much-enhanced cooperation in the industry, through the establishment of global alliances or partnerships. At the end of 1997, such alliances represented about 50 percent of the world fleet. The aim of the cooperation was to improve transport efficiency. At present, we can see the same development in the air transport industry.

It is unfortunate, however, that the containerization process has impacted on traditional ports very significantly. Due to increased vessel sizes, some traditional ports have been marginalized and a few others are said to have lost their usefulness because they did not adjust adequately to container technology. Another factor is the size and production of the hinterland the port is serving. Very large ports often mushroom where megacities do. This development has had severe consequences on land use patterns. Limitations on growth have, therefore, been initiated.

Chronometer

One of the most significant inventions is the chronometer. This instrument enables the navigator to accurately measure time relative to a fixed known position. This position was traditionally fixed as the Greenwich Meridian; the importance of the Greenwich Meridian Time (GMT) originates from this reference. The significance of the ability to measure time very precisely relates to astronomical navigation. Because the Earth rotates, the positions of stars and other celestial bodies vary with time. Thus, a reference point is needed. Time is measured relative to this point, or meridian. Not surprisingly, the invention of the chronometer was a major breakthrough in marine and astronomical navigation.

Increased knowledge in ocean dynamics

Developments in natural science and the practical applications thereof have been prompted by the ocean, through the needs of maritime trade and economy. One example is the importance of understanding and predicting tide levels for shipping. This stimulated the first insight into ocean dynamics, modelling, and forecasting. The regularity of the tides, forced by the regular motion of the Earth and its moon in our solar system, makes forecasting possible. The particular form and amplitude of the tidal motion in any place at the coast depends upon its morphology and bathymetry. This knowledge, apart from the need to know average depth, inspired the detailed mapping and preparation of navigation charts.

Hydrography

Depth sounding and preparation of navigation and tidal tables and related charts, has traditionally been the responsibility of national navies. This reflects the enormous importance of sea-borne trade for nations; that is, the national security associated with keeping trade routes open and protected, and the very large risks that are associated with human interference and which require considerable defense abilities, to protect national interests. The invention of the echo sounder made a great contribution to our knowledge of the ocean depth and shape of seafloor.

Electronic navigation

Navigation deals mainly with determining ship position and making passage and port visits safe. It was only recently that ship design and structure were influenced by requirements for the navigation function. This is due to technological developments in the form of satellite navigation, global positioning and tracking systems, and the increasing trend towards automation of ship operations. The recent technological change in navigation is nothing short of revolutionary. In my seagoing days, we used astronomical navigation. Coastal navigation depended mainly on light beacons, although radio beacons were also used. Electronic navigation with the use of networks of radio beacons was then in its infancy. These were the long-range radio navigation systems called Loran-C, Decca, Consol, and Omega. In the Baltic Sea, we used Decca navigation most of the time. In the North Atlantic, Loran-C and Omega were the systems of choice. Decca was also used in the North Sea. These systems were improvements to the early radio direction-finding systems used when approaching coasts, straits, and congested areas. In the open ocean, we used astronomical navigation, depending upon the sextant, the chronometer, and our knowledge of astronomy and mathematics.

Other elements of "electronic navigation" include radar and satellite navigation. *Radar navigation* is now a frequently used navigation system, with automatic plotting aid. In the early days, radar navigation could be quite hazardous. It was useful in following movements of ships at the coast. However, one had to be very careful in observing what the other ships did while they were being followed. Course and speed changes took some time to be registered in a handmade plot based on intermittent observations. This is why the automatic radar plotting aid is very important. In the old days, radar navigation in archipelagos and narrow straits was achieved by moving the radar picture manually along the chart. Today, this is done automatically and the motion of the ship can be followed on the radar screen in real time. There has also been a similar development with underwater mapping through acoustics. Bottom contours can similarly be followed on the screen.

Developments in *satellite navigation* are just as dramatic. It started in the U.S. Navy. Before, the system used was not global in scope and it took a considerable time to ascertain a position. Hence, the system was only used as a supplement to other systems. Now, however, the global positioning system (GPS or Navstar) can provide very accurate, global, and continuous determination of positions, even in three dimensions. Such a system consists of 20–30 satellites in geostationary orbits following the rotation of the Earth. These satellites are always in the same positions relative to the Earth, at altitudes of 12,500 miles or more. The accuracy makes it possible to find and even revisit deep-sea drilling holes.

Improved communication systems

The use of satellites has also advanced the development of communication systems. The International Maritime Satellite Organization (INMARSAT) provides maritime communication networks. Under this network, satellites are also geostationary and cover most of the world. By combining these systems of satellite navigation and communication, an integrated, safe, and fast system is created.

Electronic charts

Electronic charts are also gaining widespread use. Before electronic charts, ship positions were plotted using the Loran-C type positioning system, which could provide for continuous positioning. The addition of coastlines and depth contours led to the electronic chart. This, when combined with data from other systems and a radar overlay, results in an electronic chart display and information system.

Construction of ships

There is really no construction technology constraint in shipbuilding. Any type and size of ship can be built. However, it is advisable to consider its intended use. This can help ensure maximum transport safety. An example is the construction of double-hulled tankers.

Training

All these translate to the need for additional human resources manning the ship. The demand is not just for quantity but also for quality. It is not enough to have many personnel. Ship personnel must be well-trained and professionally up-to-date. The demands of international and varying national legislations are sometimes very high. The captain of a ship is the person who will be held liable for prosecution should any circumstance warrant legal action. Thus, ship captains must be trained not only in navigation skills; they should also be provided the requisite legal know-how. Training and professional upgrading is provided internationally through various IMO and ILO initiatives, and nationally through the state and by the shipping companies themselves. Statistics indicate that human error is mostly responsible for accidents. Therefore, continuous training is needed.

Technology and the Developing Countries

In the shipping industry, high technology is a necessity; competition is high and development occurs rapidly. This makes it all the more difficult for the developing nations to follow and compete with developed nations. The concentration of transport capacity rests in industrialized countries in the west and in Asia. However, according to the United Nations Conference on Trade and Development (UNCTAD), shipping is of relatively greater importance for the developing rather than the developed world.

Developing countries thus have every reason to be very concerned about their small share in the maritime transport sector. A small share in the maritime transport sector deprives them of the capacity to develop competent maritime authorities to exercise control and governance. What can be done to remedy this situation? If it is not changed, developing countries will become increasingly marginalized. Such a situation, although seemingly inevitable, is not in the best interest of developed countries. It appears that greater cooperation among the developing countries, the opening of boundaries, and the introduction of democratic, noncentralized governance and economy could help.

Development of Management Systems

Flag of Convenience

In 1990, about 36 percent of the world tonnage was in the flag of convenience open registry system. By the end of the century, it was 53 percent [Behnam, 2004]. Flag states need to be able to exercise their control and enforcement functions. However, they can only do so over the nominal owners occurring in the open registry. This system is ineffective. The United Nations Convention on the Law of the Sea (UNCLOS) specifies that there should be a genuine link between the flag state and the owner of the ship. However, the Convention does not specify what constitutes a genuine link. Thus, the flag state control is not fully functional and the required governance of the shipping sector cannot be achieved. The flag state control mechanism does not work in developing countries mainly due to the lack of competent national authorities.

Fishing vessels can also be registered under flags of convenience to avoid compliance with regionally imposed or other agreed management measures. In order to deal with this particular part of the problem, the Food and Agriculture Organization (FAO) has agreed upon a special binding agreement, the 1993 FAO Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas. This Agreement constitutes an integral part of the Code of Conduct for Responsible Fisheries. The agreement entered into force in April 2004 [Garcia and Doulman, 2003]. It defines the responsibilities of flag states, provides means to ensure the free flow of information on high seas fisheries, and creates a database of information regarding high seas fishing vessels.

Port State Control System

In some parts of the world, ports play increasingly bigger roles in the control of vessels previously resting with the flag state. This control is conferred on port authorities through the so-called port state control system. This is based on a Memorandum of Understanding on Port State Control, initially adopted in 1982 in Paris, by 15 European states. Canada is now a full member of the system; the U.S. Coast Guard participates as a cooperating maritime authority. Originally, the agreement was directed at ship standards and safety, particularly in the working conditions of the ship's crew. However, the *Amoco Cadiz* disaster in 1978 triggered a demand in Europe for more regulations promoting safety and pollution control. The port state control mechanism eventually covered working and living conditions on ships, safety standards, and marine pollution prevention measures. Although it originated as a regional effort, it gradually spread beyond Europe. The International Maritime Organization (IMO) and the International Labour Organization (ILO) are associated as partners in the governing body referred to as the Port State Control Committee.

This effort constitutes an example of an enforcement mechanism. International agreements such as those of IMO, ILO and others do not normally have such mechanisms. It is up to the individual member state to enforce agreements or conventions. The members of the Port State Control Committee commit themselves to the implementation effort. This is done in an international context through which member countries also demonstrate a political will to cooperate in the implementation effort. Undoubtedly, cooperation is the key. Each participating country commits itself to a 25-percent inspection level of the number of ships entering its ports over a 12-month period. At a regional level, this inspection level translates into an inspection rate of about 90 percent.

Inspectors who examine ships are normally part of the national shipping inspection services. Training for inspectors is arranged regularly to ensure that uniform standards and effective procedures are implemented in the whole region covered by the memorandum. The inspection itself usually involves scrutiny of relevant ship documents and a survey of the ship. If, in the course of the examination, significant deficiencies are found, the inspector can call for a more detailed inspection.

Inspectors have the authority to detain a ship. Normally, however, deficiencies can be corrected during the port call or at the next port, should this be nearby. Detention of a ship has legal implications. The decision to detain a ship rests on the professional judgment of the inspector. This is not an easy decision to make. Nevertheless, the fact that in 1992, 5–6 percent of the ships inspected were detained clearly demonstrates the need for such an inspection and enforcement system [Schiferli, 1994]. This example is presented here because it demonstrates that governance of at least some marine affairs can be done. Furthermore, it proves that regional cooperation can lead to a global action.

The system of port state control has gradually spread to become practically global. The U.S., Canada, the Russian Federation, Japan, Latin America, and other nations are involved. In the Asia Pacific region, a Memorandum on Port State Control was signed by 15 maritime authorities in Tokyo, in 1993. This Memorandum has also taken effect in the Caribbean. The IMO Assembly has adopted resolutions urging its member states to consider the application of port state control through regional cooperation.

There are other efforts to strengthen port control and these focus on enhancing port capabilities through regional cooperation. One example is the Port Safety, Health and Environmental Management System developed by the Regional Programme on Building Partnerships in Environmental Management for the Seas of East Asia (PEMSEA) and partly based on experiences in Europe. This system has been tested and installed in ports of Thailand and Malaysia and will lead to ISO certification. The management system responds to implementation requirements of several conventions, including the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, SOLAS and MARPOL 73/78.

The need for regional cooperation is obvious. However, there is also an equally pressing need for interregional cooperation, to ensure similarity in applications and avoid unfair competition. Through interregional cooperation, inspections will be widely accepted. In this context, present-day data generation and exchange systems can facilitate the process. Information can easily and quickly be exchanged throughout the network.

All inspection results can be linked and when they are, the linkage can help establish systematic and comprehensive safety profiles of ships. This would eventually direct attention to the portions of the fleet that truly require attention, thereby saving money, time, and other valuable resources. Interregional cooperation could also include the tracking of ships. A headway made in this direction could be used to address piracy and problems on illegal transportation. Such positive potential results are yet more arguments in favor of adopting standards and enforcing them through the industry itself, through a cooperative effort.

Risks, Uncertainties, and Maritime Insurance

Modern sea-borne trade, services, and institutions are of fundamental importance to society. According to the IMO, between 80–85 percent of the world's goods are transported by ship. Behnam [2004] estimates it to be much higher and pegs it at 90 percent. Among all maritime activities, sea-borne trade has the largest economic impact, with a total estimated value, including that of the goods, of USD 5–6 trillion annually [Mann Borgese, 1998].

The immense importance of the sea to trade is just as visible in individual countries. For example, 40 percent of the total value of U.S. foreign trade is carried by ships. The transport of oil and grain across the ocean is another example. Oil and gas go into the Seas of East Asia; grain goes out. At present, about two-thirds of the oil transported globally is carried by tankers across the ocean; the rest is carried by pipelines, mostly on land. Clearly, the ocean is an asset. But can we govern, manage, and maintain this asset so as to avoid conflicts and at the same time, achieve enhanced equity and sustainable development? The need to do so is urgent and immediate.

The risks associated with maritime transport and trade, as well as the very large potential economic gains from them, were recognized relatively early on. These became the basis for the development of a private legal insurance system. The concept of insurance was introduced through marine insurance long before other types of insurances were established. In Greek, Roman, and possibly even Phoenician times, there was a system that allowed a shipowner to borrow money on the ship and its cargo. If the voyage is successful, the shipowner repays the loan with interest. However, if the voyage fails, which could very well happen through a series of misfortunes, the banker loses money. The transaction represents a form of risk transfer from the shipowner and manager to the lender. This is similar in some ways to the modern concept of reinsurance. Another similarity lies in the interests charged. Lenders charge shipowners rates that are higher than normal because the risks associated with maritime transport are also higher than normal. This is similar to the risk premium that the insurance industry charges.

The next step in the development of maritime insurance was the introduction of a system for sharing risks through *Lex Rhodia de iactu*. The system guarantees that all parties in the maritime venture share the risks equally. If part of the cargo is lost, or the ship is harmed so badly that it needs docking, everyone involved in the venture will help cover the costs. Parties who receive their cargoes in full share in the loss of those parties who lost their cargoes. This means that all parties suffer from the same financial loss, and no one profits at the expense of others. Today, this system is still applied in a slightly more refined form called "general average" [Mellert, 1997].

To help secure peaceful maritime trade, practical rules and systems were put in place for the common good. These laws were generally of a private nature; governments and states were not involved. This hands-off approach was changed by the Catholic Church when, in 1236, it declared the charging of interest illegal. About 150 years passed before a new system emerged in Genoa, Italy. There, the assurance ideas, also known as *Assecura mentum*, and policy, or *polizza*, were first introduced and put in practice. About 200 years after the declaration in 1236, a sea ordinance was passed in Barcelona, Spain. At the end of the same century, specifically in 1492, Columbus reached America. At roughly the same time, several new sea routes were established, giving an enormous impetus to the growth of shipping and trade and thus, marine insurance.

The London Assurance and the Royal Exchange Assurance were established as marine insurers in 1720. Another insurer, Lloyd's, was initiated in 1666 in a coffeehouse owned by Edward T. Lloyd. It was incorporated as Lloyd's in 1871, with members agreeing to accept the various risks associated with maritime transport and the operation of ships against an insurance premium that was payable in advance. At first, the reliability of the risk transfer was based on an unlimited personal risk of each member. However, after Lloyd's incurred very large losses in the 1980s and 1990s, this practice was adjusted so as to allow for corporate or limited liability capital in 1994.

Through Lloyd's, many additional services were also established. These include cargo and vessel surveys, classification, registration, shipping intelligence, shipping publications, and claims settling; most of which still exist today. Lloyd's also developed its own marine policy, the SG–form, which was first released in 1779 and remained in active use almost worldwide until 1982. Then, a general revision of conditions made it outdated [Mellert, 1997]. Today, Lloyd's insures other properties, such as cars and houses. It is even said that Marlene Dietrich's legs were insured by Lloyd's.

Today, the global average market share of marine insurance is between 2–3 percent. However, in many developing countries that depend upon imports and have very little personal insurance in place, the market share can be as high as 50 percent [Mellert, 1997].

The story of the development of marine insurance illustrates the role of the ocean in shipping and development not only in trade but also in related management, economic security, protection, and eventually, governance. It is parallel to the influence of the ocean and the maritime sector in the development of international law. Wherever a major body of water is found, the foundations for governance are set in place. The first Regional Seas Convention of the United Nations Environment Programme was established in the Mediterranean under the name of Barcelona. A little earlier than that, the regional conventions for the Baltic and North Seas were established, also for seas where maritime transport and trade throughout history have been of utmost importance.

Safety of Life and Protection against Marine Pollution from Ships

It is interesting to note that the issue of human safety, in relation to maritime transport, entered the scene only quite recently. It was not until the *Titanic* disaster in 1913, which generated sufficient public and governmental upheaval that the call came for adequate protection and safety of lives at sea. This situation is very common in our society. Most of the time, we need a sufficiently dramatic accident or disaster to be goaded into taking precautionary actions.

The International Convention for the Safety of Life at Sea (SOLAS) was initiated after the *Titanic* disaster; so was the requirement for continuous radio watches on all merchant marine traffic. SOLAS is administered by the IMO. The latest version of the Convention is from 1974, which entered into force in 1980. By the end of the 20th century, it lists 140 states as contracting parties [IMO, 2000]. Presently, the parties have increased to 158 [IMO, 2007].

The Convention covers practically all aspects related to safety at sea. Concerns related to substance, amendments, renewal, and coverage fall under the responsibility of a national Maritime Safety Department. Several elements of this convention are also highly relevant to the safety of marine environment. Two examples are the International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk and the International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk. The SOLAS Convention also has a protocol and a special agreement concerning stability requirements for Roll-On Roll-Off (RORO) passenger ships operating regularly between ports in Northwest Europe and the Baltic Sea. The rules and regulations are in place, but as many recent incidents show, they are not sufficiently enforced; governance is not implemented.

There are a number of other conventions related to safety at sea, as well as the protection of marine environment from maritime transportation and other maritime operations. Possibly the most important environmentally oriented convention is the International Convention for the Prevention of Pollution from Ships (MARPOL), which the IMO adopted in 1973. It was modified by the Protocol of 1978 and is known as MARPOL 73/78. MARPOL provides regulations on practically all potential sources of pollution from ships. It has six annexes, aiming at controlling ship releases of oil, noxious liquid substances, harmful substances, sewage, garbage, and air contaminants. These annexes specify technical details regarding controlling measures, discharge criteria, standards for tankers, washing of tanks, packaging, stowage, and documentation. Annex IV provides regulation for discharge of sewage; Annex V provides regulation for discharge of garbage. The latter requires that garbage reception facilities be available in ports. By the year 2005, Annexes I, II, III, IV, V, and VI have officially entered into force. As of 30 September 2006, the convention has 138 contracting states, the combined merchant fleets of which constitute approximately 98 percent of the world merchant fleets' gross tonnage [Beckman, 2006]. Are all these regulations being implemented? Again, the need for governance involving all stakeholders is evident. One particular aspect in which this is apparent is the ability of flag states to exercise control and enforcement of agreed rules.

It is important to note that MARPOL 73/78 developed and reviewed the technical Annexes in close cooperation with scientific bodies. In 1969, an impetus supporting the establishment of the Joint Group of Experts on the Scientific Aspects of Marine Pollution of the United Nations, (GESAMP) — later renamed as the Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection — was provided by the work for this Convention. There was a need for an independent scientific body that could evaluate substances, including oil, and examine their degree of harmfulness to the marine environment. GESAMP filled this role amply. It evaluated hazardous substances carried by ships according to a criteria derived on a scientific basis. At present, it remains the reference body for this task.

The dumping of wastes at sea has received special treatment. The intergovernmental conference held in London in 1972 gave rise to the London Dumping Convention; it was recently renamed the London Convention. The purpose of the convention is to control any deliberate disposal at sea of wastes, materials, or other substances from ships. It does not include materials occurring from normal operations of ships, oil platforms, aircraft, or other manmade structures at sea. The Convention entered into force in 1975, and presently has 81 contracting parties [IMO, 2007]. The Convention has amendments that specifically deal with radioactive wastes, industrial wastes, and incineration at sea. These are prohibited and are covered in a Protocol of 1996 superseding the convention.

Another convention of interest, in relation to specific protection of coastlines and their sensitive areas is the International Convention on Oil Pollution Preparedness, Response and Cooperation of 1990 (OPRC), which entered into force in 1995. This Convention aims at contracting parties being prepared to combat and respond properly to oil pollution incidents from ships, oil platforms, ports, and oil handling facilities. It identifies required and appropriate measures, such as: emergency plans, reporting procedures, and systems for response. The need for just such a high level of preparedness is amply demonstrated in most regions of the world through recent incidents, including those that occurred in the Seas of East Asia and Western Europe. A major oil pollution catastrophe in 1967 triggered the development of most of these environmentally oriented conventions.

The protection of marine environment from accidents and deliberate crimes-at-sea is also pursued at the regional level. The “particularly sensitive sea area” and the “special area” concepts have been established by IMO. Guidelines for designation of special areas under MARPOL 73/78 and the identification of particularly sensitive sea areas have been adopted. Such areas are defined as “areas which need special protection through action by IMO because of their significance for recognized ecological or socioeconomic reasons and which may be vulnerable to damage by maritime activities.” Criteria for such designation are based on ecological, social, cultural, economic, scientific, and educational considerations. Whole regional seas, such as the Baltic Sea, have been given this kind of status.

References

Beckman, R. 2006. Panel discussion on the Workshop on Regulating International Maritime Shipping — IMO Conventions and Their Implementation during the East Asian Seas Congress, 12–16 December 2006, Hainan, China.

Behnam, A. 2004. "The ocean trade in the new economy: A keynote address." *Ocean Development and International Law*, 35(2):115–130.

Costanza, R., L. Wainger, C. Folke and K.G. Maler. 1993. "Modeling complex ecological economic systems: Toward an evolutionary, dynamic understanding of people and nature." *BioScience*, 43:545–555.

Garcia, S.M. and D.J. Doulman. 2003. "Toward responsible ocean and coastal capture fisheries: The FAO programme in a WSSD perspective." In: *Proceedings of the Global Conference on Oceans, Coasts and Islands, 12–14 November 2003, Paris.*

Gold, E. 1998. "World shipping: A global industry in transition," pp. 267–283. In: *Ocean Yearbook* Volume 13. University of Chicago Press, Chicago and London.

IMO (International Maritime Organization). 2000. "Status of multilateral Conventions and Instruments in respect of which the International Maritime Organization or its Secretary-General performs depository or other functions." Document J/7339 of IMO. 4 Albert Embankment, London SE 1 7SR, UK. 358 pp.

IMO (International Maritime Organization). 2007. "Conventions." Available at http://www.imo.org/. [Accessed 5 May 2007].

Ji, G. 2001. "Rough waters in the South China Sea: Navigation issues and confidence-building measures." *Asia-Pacific Issues*. Analysis from the East-West Center No. 53. August 2001.

Mann Borgese, E. 1998. *The oceanic circle: Governing the seas as a global resource*. United Nations University Press, Tokyo. 240 pp.

Mellert, W.M. 1997. *Marine Insurance*, Swiss Reinsurance Company, Zurich, 12/97 3000 en, www.swissre.com (Research & Publications: Property & Casualty).

Olsen, H. 1996. "Marine traffic in the South China Sea," pp. 137–153. In: *Ocean Yearbook* Volume 12. University of Chicago Press, Chicago and London.

Schiferli, R.W.J. 1994. "Regional concepts of port state control: A regional effort with global effects," pp. 202–217. In: *Ocean Yearbook* Volume 11. The University of Chicago Press, Chicago and London.

CHAPTER 5

Food from the Ocean: Will It Be Enough?

Ulf Lie

The Role of Seafood in Nutrition

In the 20th century, as human population grew rapidly and living standards improved in most parts of the world, total and per capita consumption of food increased. Population growth and the improvement of living standards will continue in the 21st century. Thus, there is a strong concern that global food production will not be able to meet future demand. The linkages between demand, supply, and prices in a market economy will also most possibly lead to further enhanced global inequity. This is because prices increase with dwindling supply.

From 1961 to 1999, the world population increased from 3.1 billion to 6 billion. Fish catch increased from 39.3 million tons [World Bank, 1992] to 84.1 million tons [FAO, 2000]. If we subtract the quantity used for industrial production of fishmeal and oil, with the value of 28 percent in 1961 and 36 percent in 1999, the annual global average per caput consumption of marine captured fish decreased slightly, with 9.4 kg in 1961 and 9 kg in 1999.

In the global average human diet, seafood contributes only about 1 percent in terms of calories, 5 percent in terms of proteins, and 1 percent in terms of fat [FAO, 1994]. The highest values for all three categories are posted in industrial countries. It can thus be seen that although approximately half the human population lives near the coast, seafood accounts for a rather small part of the human diet. Such global averages, however, do not fully reveal the fact that a major part of animal protein comes from seafood in many developing coastal and island states. Furthermore, marine fat, particularly from high latitude species like salmon and herring, is high in omega-3 fatty acids. These acids are found to have favorable effects on a number of human ailments. So, even if in a global context, seafood does not appear to be particularly important in the human diet, it is, in fact, important regionally and from a human health perspective.

Because many of the fish stocks preferred for human consumption show serious signs of overfishing, it is, therefore, pertinent to ask a very important question: "Will there be enough fish to meet future demand?"

Natural Constraints

The Ocean's Food Production Capability

Why doesn't the ocean provide more of our food? Are marine ecosystems naturally less efficient food producers? These two questions are logical queries. After all, the area covered by water is about 2.5 times that of land. Logically, marine ecosystems should be able to produce food quicker and in larger quantities. But the ocean is not able to produce most of the food that we eat. The marine biological system is, indeed, different from that of the terrestrial environment. This accounts for the big disparity in food production between the two systems.

Plants are the basis for all food production. The primary requirements for the production of plants are water, light, and nutrients. There is, of course, no shortage of water for marine plant production. However, light is a problem. Light cannot make its way very deep into the ocean. The quantity of light for photosynthesis diminishes rapidly with every increase in depth. Therefore, plant production is limited to the upper layer of the ocean. The same is true for terrestrial plants; there is also very little photosynthesis a few millimeters down the soil. In fact, it could be said that as far as light is concerned, the ocean is a better place than the soil. In the ocean, some level of production can take place more than 30 m below, depending on the transparency of the seawater.

The major types of marine plants are seagrasses, in estuaries; green, red, or brown macroalgae, found particularly on the hard bottom of shallow waters; and microscopic, unicellular planktonic algae, or phytoplanktons, found in all parts of the marine area. The production and biomass of seagrasses and macroalgae is higher per unit area compared to the production and biomass of the phytoplankton. But because the total ocean surface is much bigger compared to the size of shallow water areas, microscopic algae contribute more than 90 percent of marine plant production.

Although light conditions are very important, the availability of nutrients seems to be the major limiting factor for marine plant production. Major inorganic nutrients, particularly nitrogen, phosphorous, and silica, are brought into the ocean by rivers, taken up by plants, and are regenerated or mineralized back to inorganic nutrients from decaying plants and animals. Much of these regenerated nutrients are quickly returned to plant production. However, part of the mineralization takes place below the depth level for plant production. Therefore, there is a rich pool of nutrients everywhere in deeper water masses. All a plant has to do is get hold of these nutrients.

So, why aren't more plants growing in the ocean? Evolution has not produced floating trees that have roots capable of stretching into nutrient-rich, deeper water layers. Therefore, the highest marine plant production occurs in areas with high input of nutrients in the upper layers. Coastal areas, in particular, have high marine plant production for two reasons. First, they are very near land-based nutrient sources. Second, waves and currents in shallow areas whirl nutrients up from the bottom layers.

The conditions in the open ocean are different. The open ocean is far from terrestrial sources, is deeper than, and has considerably less near-bottom turbulence in the water masses. Consequently, from a plant production vantage point, the major part of the open ocean is a desert. Marine plant production contributes only about 40 percent of the global plant production. This is why the marine ecosystem is not a very effective food producer.

This brings us to the next logical question: "If not primarily for consumption, then what is the ecological role of marine plants?" The main difference between marine and terrestrial plants is that humans rarely eat marine plants. In contrast, vegetables and cereals provide about 84 percent of the energy in the human diet while 15 percent of this energy comes from meat, that is, from plant-eating animals, or herbivores, such as cattle, sheep, and goats.

A highly different situation exists in the ocean. First of all, the microscopic phytoplankton, which are the first level in the food chain and dominate plant production, are not suitable as human food. The dominant herbivores that can utilize small plants such as zooplankton (the second level in the food chain) are also very small and are not suitable as human food either. Marine food for human consumption can partly come from the third level in the food chain, from carnivores such as herring, sardines, anchovies, and mackerel. However, people's preferred food comes from the food chain's fourth level. These are cod, salmon, and tuna.

Assigning a species of fish to a particular trophic level is not a trivial task because an individual fish may start its life as a carnivorous zooplankton, which is trophic level two, and end as a large predator, which is trophic level four.

Considering, as a rule of thumb, that there is a 90 percent loss in the energy transfer from one level in the food chain to the next, the same quantity of plants consumed by herbivores in the terrestrial system provides 10–100 times more human food than plants in the marine system. Therefore, the marine system will always be at a disadvantage in comparison with terrestrial food production. This disadvantage will only disappear when we learn how to incorporate marine plants and herbivores directly into the human diet.

The argument above applies to fish. However, there are many other groups of animals in the ocean that feed on plants or plant remains, also called detritus. Various species of mollusks are already important as producers of human food with total world production in 1997 at 12.5 million tons. There is a vast potential for further expansion of mollusk production, both in capture fisheries and aquaculture in marine environment. Production is sustainable because there is no need for feeds. Additionally, little pollution is attached to their production.

Fertilizing the Marine Environment

Organic production in the major part of surface waters is limited by lack of nutrients. This fact has tempted some to take a lesson from agriculture. Production can be improved by adding artificial fertilizers. Enhancing plant production through the addition of fertilizers has been proven in several experiments, in terrestrial and even marine environments. It is, therefore, natural to extrapolate the experience from agriculture to marine food for humans. Is it possible to add fertilizers to nutrient-poor water masses to enhance fish production?

Before we become too excited about the prospect, we have to keep in mind the difference between the terrestrial and marine food chains discussed earlier. In agriculture, fertilization leads to enhanced production of plants for direct human consumption. Fertilization in a marine environment also leads to higher plant production. However, the major contribution to human food would be at the third or fourth step in the food chain. These two levels provide between 100 – 1,000 times less food fit for humans, per unit fertilizer. Undoubtedly, adding artificial fertilizers for controlled production of grain and vegetables for humans or for livestock is a much better investment than pouring bags of fertilizer in the ocean and hoping for the best.

However, an unintended fertilization of the marine environment is already going on in a very large scale. In practically all coastal areas, large amounts of nutrients are disposed of in the sea in the form of household sewage and agricultural runoff. The result is massive algal blooms. These algae are perfect food for filtering organisms such as mollusks, particularly mussel. The filtering activity of mollusks has two beneficial effects: first, it cleans the water and second, it produces high quality food for humans. Unfortunately, some of the algae produce poisonous substances that limit human consumption of mollusks. Utilizing polluted waters for mollusk production could be a significant contribution to marine food production, when proper poison control mechanisms are developed.

The Potential of Marine Food Production

Capture Fisheries

Given that marine food production will not reach the level of terrestrial production, the next question becomes: "Are we utilizing marine food potential optimally and sustainably?" To answer this question, we need a global estimate of the marine food potential, which is not easy to come up with.

One attempt could be to estimate the present quantity of all commercially important fish stocks. Unfortunately, many important stocks are overfished while some are underfished, and such an estimate would not reflect long-term potential. Another approach could be to estimate how much of the energy in marine plant production is transferred, through the food chain, to the commercially important fish stocks.

Numerous attempts have been made to estimate potential harvestable fish production on the basis of global marine plant production. These estimates range from 100 to 200 million tons per year indicating the considerable uncertainty attached to global plant production, the ecological transfer efficiency from one level of the food chain to the next, and the relative role of commercially harvested species at specific levels in the food chain.

Fishing vessels at port, Kedah, Malaysia (Photo: I. STOBUTZKI/LEN GARCES, WORLDFISH CENTER)

A more reliable method is to estimate potential harvest on the basis of extrapolation of long-time series of catch data from various geographical fishing areas. In the application of the method, Gulland [1970] indicated an estimated potential catch of about 100 million tons per year. The estimate represents the catch of reported traditional, commercially exploited species. It is remarkable that more than 30 years after the estimate was made, the catch of marine species has not exceeded 84 million tons. This might leave the impression that everything is fine with fisheries because we have not yet reached 100 million tons! However, in the 30 years between the time the estimate was first made and the period when marine catch almost exceeded 84 million tons, a spectacular change in the catch composition became evident. As an example, the catch of Northeast Atlantic cod was reduced from 3.8 million tons in 1968 to 1.2 million tons in 1998. The catch of Northeast Pacific pollock increased from 0.5 million tons to 4.0 million tons during the same period. Obviously, there is a reduction in the catch of high-priced species, particularly demersal predators that dominate the consumer fish market. Additionally, there is an increase in the catch of lower-priced species, particularly small pelagic ones.

It is generally agreed that the reduction in the catch of high-priced fish species is a result of overfishing. However, there is some controversy regarding the reasons for the increased catch of smaller species. In an extensive analysis of the Food and Agriculture Organization's (FAO) global catch statistics from the early 1950s to present, Pauly et al. [1998] showed a decrease in the mean trophic level in the catch data. This decrease indicates that overfishing of species found high in the food chain increased the pressure on the species found lower in the food chain. The authors warned that if the trend of "fishing down the food web" continues, fisheries in many parts of the world may eventually face a complete collapse.

Caddy et al. [1998] agreed that a reduction in the mean trophic level in fish landings has taken place in some areas. However, they doubt that the FAO statistical data were sufficiently accurate to warrant detailed assignment of trophic levels. Increased capture of small pelagic species could be related to real growth of the stock, as a result of lessened predation by decimated predators, or to enhanced productivity in coastal areas due to organic pollution. However, the most probable reason for the increased catch of small pelagic species could simply be an increased interest in the fishing industry for these stocks.

Small pelagic species are the major basis for industrial reduction to fishmeal and oil, but they also play an important part in the diet of low-income segments of the human population. For hundreds of years, species like herring, sardines, and mackerel have been the staple food of poor people in coastal areas. Presently, there are concerns that "fishing down the food chain," in order to meet the demand for aquafeed in agriculture and aquaculture, may threaten the food security of poor people in numerous parts of the world.

Aquaculture

Although capture fisheries, in both marine and inland environments, have remained fairly stable during the last decade, there has been a marked increase in the total availability of fish. According to FAO [2000], the total fisheries production, including inland fisheries and aquaculture, increased from 97.2 million tons to 125.2 million tons between 1990 and 1999. This shows an annual growth rate of about 3 percent; 66 percent of the increase was attributed to aquaculture. Aquaculture is now the fastest-growing industry in the world and there is increased optimism that it will be one of the major producers of animal protein. In an article in *Worldwatch Issue Alert*, entitled "Fish farming may soon overtake cattle ranching as a food resource," Brown [2000], concluded that the growth in aquaculture production will also continue in the present decade.

Many tend to consider aquaculture a recent industry, but this is definitely not the case. In China, freshwater aquaculture started more than 3,000 years ago. Today, China remains the overwhelmingly dominating producer, with 71.2 percent of the total aquaculture production [FAO, 2004]. Freshwater aquaculture production is based on both herbivore and carnivore species and it takes place in ponds, lakes, reservoirs, and rice paddies. The

Floating fish cages in Xiamen, China, coastal waters (Photo: CHUA THIA-ENG)

limiting factors for production are land and water, but fish farmers have learned to enhance production by adding scraps from agriculture and grain concentrates as feed, and manure as fertilizers, to ponds. This has raised pond yields from 2.4 to 4.1 tons per hectare [Brown, 2000]. Food conversion efficiency is also much higher in aquaculture than in agriculture. While it takes 7 kg of grain to produce 1 kg of beef, only 2 kg of grain are needed to produce 1 kg of herbivore fish.

Freshwater aquaculture is also well-developed in other Asian countries, such as India, Indonesia, Bangladesh, and Thailand. There is every reason to believe that freshwater aquaculture will also increase in other parts of the world. The major advantage of traditional freshwater aquaculture is that production is based on low technology, thus requiring limited capital investment and maintenance. Consequently, the fish produced is low-priced and therefore, provides important food for the poorer segments of society.

Mariculture, or farming in the open sea, is also an age-old industry. Plants and different species of mollusks, such as oysters, scallops, and mussels, are among the major species in mariculture; prawns dominate in brackish water aquaculture. Culture of mollusks and prawns has enormous potential, as these organisms feed directly on marine plants or detritus. The dominant limiting factor to mollusk or prawn culture is space in suitable habitats. In prawn production, in particular, space requirement is a major environmental problem. Large parts of mangrove swamps in different parts of the world have been cleared to make room for prawn culture, resulting in coastal erosion and depriving people in coastal regions of traditional uses of mangrove areas.

Mariculture of finfish, that is, marine and diadromous[1] fish, is a more recent industry and it contributes about 1 million tons, or 8 percent of total mariculture production [Rana, 1997]. However, the major species, such as salmon, sea bream, sea bass, grouper, and turbot, are in very high demand and consequently, are highly priced. Considering the length of shorelines and the increasing interest in more open ocean mariculture, there is a considerable scope for growth even though user conflicts in coastal areas and pollution, both by and on the mariculture, may limit growth.

Finfish in mariculture are kept in enclosures, or intensive aquaculture. As they are carnivores, they have to be provided processed feed, or aquafeed, of various organic origins, particularly fishmeal. Cultured carnivore finfish in freshwater, shrimps in brackish water, and land animals, particularly pigs, also depend on feed based on fishmeal. It is, therefore, possible that the competition for aquafeed may limit future expansion of mariculture. The annual production of aquafeed is about 5–7 million tons [Tacon, 1997] and at least 50 percent of it is derived from pelagic fish. The combined need for marine and diadromous finfish and shrimps amounts to 1.5 million tons of aquafeed, which is equivalent to more than 5 million tons of pelagic fish. Fish in mariculture, thus, consume two to three times more fish than they produce. Ergo, there is an ethical dimension to an increased use of pelagic fish that might provide food for the poorer segments of the world's population.

New Species

Estimates of the production potential of ocean capture fisheries are based on known commercially exploited species. Could there be large, unknown, and unexploited fish stocks in the ocean?

Considering the efficiency of modern fish detection equipment, it is highly unlikely that there are large unknown stocks that can be harvested with existing technology. Currently, there is some interest in exploring the potential of deep-sea fish resources. But, considering that practically nothing is known about the ecology of such species, the precautionary principle is expected to delay their exploitation.

However, there is another group of species found in enormous quantities in the ocean, the so-called mesopelagic species. These are small

[1] "Referring to fishes that migrate between fresh- and saltwater, in either direction, at some point in their life cycle." (http://www.greenfacts.org/glossary/def/diadromous.htm)

fishes, ranging from 5 to 10 cm, which live in the upper 1,000 m in all parts of the ocean. An FAO report [Gjøsæter and Kawaguchi, 1980] indicated a standing stock of 1 billion tons. But the authors of the report wisely emphasized that the estimate was based on highly unreliable data. Because of their small size, mesopelagic fishes will probably not be found in the best seafood restaurants. However, they could be used as raw material for production of aquafeed, provided that an efficient and economically feasible catch technology can be developed.

The Antarctic krill, a small pelagic crustacean that used to be the major food item for large Antarctic stocks of baleen whales, has long been considered a potential candidate for increased ocean harvest. However, the catch has not increased during the last 25 years; it fluctuates between 0.2 and 0.5 million tons per year. Krill will probably be excellent as feed in mariculture, and if there is a demand in the market, the catch of krill could probably be significantly increased. However, the Convention on Conservation of the Antarctic Marine Living Resources (CCAMLR) attempts to regulate living resources of the Southern Ocean in an ecosystem context. A significant increase in the catch of krill would have to be viewed in relation to the important role that krill plays in the ecosystem.

Management

The total marine fish catch in 2002 was 84.5 million tons, of which about 63 million were used for direct human consumption [FAO, 2004]. About 75 percent of the main fish stocks were overexploited, fully exploited, depleted, or recovering from depletion. Only 25 percent of the stocks could be expected to produce more.

The goal in fisheries management is to keep each stock at a stable level where the output is at a maximum, without depleting the stock, that is, keeping it at the maximum sustainable yield (MSY). If this goal could be reached, the harvest from the sea would be the highest possible; stocks would not be overfished and the fishing industry would have access to a stable supply of raw material.

Determining the MSY of a fish population has been the major concern of fisheries biologists since the beginning of the 20th century, and the fact that populations are still overfished indicates that this is not a trivial matter. The basic idea behind the concept of MSY is that unexploited fish stock will grow exponentially, much like money in the bank. We know that the interest in a bank account may be used every year, without depleting the account. Similarly, the increase in fish stock can be fished annually, without depleting the stock. The comparison, however, is valid only up to a point. If money is not withdrawn from a bank account, it will continue to grow, whereas in fish stocks, there is an element of self-regulation. When a stock has reached a certain size, the carrying capacity of the environment tends to reduce its growth.

Carrying capacity represents elements, such as limitation in food and spawning areas and increasing cannibalism, which takes place as the density of the stock increases and food availability decreases. Finally, when the stock has reached its maximum size, net growth stops. Consequently, no fishing can take place without reducing the stock size.

The growth curve of a stock shows that there is minimal growth when the stock is at its lowest and highest levels. The highest growth rate occurs when the stock is at half of its maximum size. The increase of the stock at that size is the MSY.

In a pristine, unexploited population, it is an easy task to determine the MSY; the same task becomes considerably more difficult in an already exploited stock. However, there is a way around the problem. Considering that the catch increases with increasing fishing effort, the highest catch per unit effort (CPUE) must occur when the stock is at its highest production potential. Further increase in the effort, in the form of overfishing, for example, will increase the total yield but not the CPUE. The fishery could still be maintained at a sustainable level; however, the yield would be less than the MSY.

The MSY may, in principle, be approximated by analysis of long-time series of data on catch and effort. However the process is not that straightforward. The carrying capacity, and consequently the MSY, is not a constant but a variable that depends on environmental conditions, availability of food, and a host of other factors. Attempts to maintain the effort at a fixed level may, on one hand, miss the opportunity to take advantage of bumper crops, when environmental conditions are favorable; or lead to overfishing when the conditions are unfavorable.

The primary concern of fisheries biologists has been to estimate the size and productivity of stocks and to advise managers on biological consequences of management decisions. Clearly, knowledge about stock size and productivity is basic and important for management. In view of the many variable components in an MSY estimate, it may seem that biological information has reached an advanced level of diminishing returns on investment. Other factors, such as level of economic investment in fisheries, subsidies, and discards (that is, the unwanted large quantities of fish and other bycatch that are thrown from the ship), seem to be equally important for effective management. Additionally, they are more readily subjected to control.

Increasing the effort and consequently, the operational cost, in a fishery where the yield is below the MSY lead to lower CPUE. The outcome is reduced profit. When the cost of a fishery becomes higher than the profit, the fishing operation is, in principle, bankrupt. Fishing pressure should be reduced accordingly. However, there are two reasons why this does not necessarily happen. One is related to market mechanisms. When the supply of fish dwindles as a result of overfishing, prices increase and the economic breakeven point occurs at a lower level of the stock. Continued fishery will lead to further reduction of the stock. The other mechanism is related to social and political factors. Bankruptcies in fisheries may lead to unemployment at all levels of the fishing industry. The resulting social disruptions in coastal communities cannot go uncontrolled by governments. Governments may, therefore, issue subsidies to the fishing operations that allow them to be maintained beyond the breakeven point, resulting in further depletion of stocks.

Government subsidies to the fishing industry have reached very high levels on the global scale. It is possible that they are a major cause of overfishing. Subsidies are given either as direct economic support to the fishing operation or as indirect subsidies, in the form of various taxation exemptions to components of the fishing industry. Consequently, it is very difficult to get an accurate estimate of subsidies to fisheries at the global level. In a study of the viability of the world's fishing fleets, the FAO Fisheries Department collected information about the size of fishing fleets and recorded landings [FAO, 1992]. Based on the knowledge about fishing operations for various types of vessels and gear, FAO estimated that the operational cost of the global fishery exceeds income by more than USD 20 billions per year. Furthermore, assuming a 10 percent return on capital investment in the world's fishing fleet with a replacement value of USD 320 billion, the annual deficit of fishing operations would reach USD 52 billion! The inference is obvious. Such deficits could only be sustained with massive government subsidies to the fishing industry.

Many find it difficult to understand why fisheries, which are a major source of income and employment in many parts of the world, are grossly unprofitable. In response to the problem, FAO started a program that monitored the cost and income of the world's major fisheries [FAO, 2000]. Analysis of the data indicated a net economic surplus, except for some very small or very large vessels. This does not mean that subsidies do not occur in the fishing industry. What it means is that the practice does not reach the enormous dimensions indicated in the first global analysis of the economy of fishing operations.

Efficient fisheries management depends upon accurate information on catch quantity and composition. These are used as the basis for regulatory decisions, such as opening and closure of operations, the setting up of quotas, allowable catch, and the like. While such decisions are necessary for maintaining a sustainable fishery, they hamper the individual's opportunity to draw maximum profits from fishery operations. Understandably, this tempts people to neglect regulations.

Neglect of regulations is done through the use of illegal fishing gear, fishing in closed areas, tampering with reporting, selling catch outside normal markets, and many other activities of a similar nature. Such illegal, unreported, and unregulated (IUU) fishing has reached very high proportions and is found in practically all fishing areas and in all types of fishing [FAO, 2000]. The IUU fisheries are truly international mafia-type operations. Legal quotas are grossly overfished. The surplus is loaded onto waiting cargo ships and transported to harbors in different countries, where IUU catches are mixed with legal catches and then distributed in the market. Norwegian authorities, as well as nongovernmental organizations like Greenpeace and World Wide Fund for Nature, have reported large-scale IUU fisheries in the Barents Sea, amounting to more than 100,000 tons of Atlantic cod and 30,000 tons of haddock every year.

FAO adopted its Code of Conduct for Responsible Fisheries in 1995 and the International Plan of Action to Prevent, Deter and Eliminate IUU Fishing (IPOA-IUU) in 2001. Both the FAO Code of Conduct and the IPOA-IUU are voluntary in nature and are, therefore, not legally binding. In an era of diminishing catch and increasing prices for high quality marine species of fish, it is highly unlikely that voluntary agreements will be respected by all parties involved in fisheries operations.

The Institutions: Focus on Regional Cooperation

Fisheries technology and know-how developed gradually. But it took several thousands of years before humans became concerned about overfishing. Although the variability in yearly catches has been observed, this variability was more often blamed on fish migrations than on overfishing. To many, the ocean seemed endless, and its resources, inexhaustible. This viewpoint is evident in the statement of a leading scientist of the 19th century, Sir Thomas Henry Huxley. In 1883, he wrote: “I believe, then, that the cod fishery, the herring fishery, the pilchard fishery, the mackerel fishery, and probably all the great sea fisheries are inexhaustible; that is to say that nothing we do seriously affects the number of the fish. And any attempt to regulate these fisheries seems, consequently, from the nature of the case, to be useless.”

Perceptions of the ocean’s inexhaustible bounty changed after the introduction of steam-powered fishing vessels and more effective fishing gears. By the end of the 19th century, there were ominous signs in the North Atlantic that the variability in fisheries output was not merely local or annual fluctuation, but rather a system-wide reduction largely attributed to the growth of the fishing industry. As fisheries in several countries were afflicted by reduction of the same stocks, possible remedies were sought in an international context.

At the Sixth International Geographical Congress in 1885 and upon the initiative of the Swedish scientist, Otto Petterson, a resolution was passed to encourage international cooperation in fishery surveys. This resulted in the first International Conference for the Exploration of the Sea, held in Stockholm in 1899 at the invitation of King Oscar II of Sweden and Norway. It also led to the establishment in 1902 of the International Council for the Exploration of the Sea (ICES), the Secretariat of which is located in Copenhagen.

ICES was created in response to overfishing in the North-East Atlantic. Its scientific programs were related to fish migrations and their importance for fisheries and fish biology and the problem of overfishing. From the very beginning, a multidisciplinary approach was emphasized, first by establishing a hydrographical office, the Standard Sea Water Service, and later by including topics such as plankton, benthos, pollution, and recently, marine ecosystem assessment. The approach attracted scientists not only from fisheries laboratories but also from universities. As a result, ICES today is a strong regional institution for marine ecosystem issues, albeit with living resources as its central concerns.

At the 1899 conference in Stockholm that created ICES, participants came from eight North European countries. Emphasis was very much on the northeastern part of the world ocean. The geographic scope was enlarged when membership increased to 20, including the U.S. and Canada. Today, the ICES area of interest, as described in Article 2 of its 1964 Convention is: "The Council shall be concerned with the Atlantic Ocean and its adjacent seas and primarily concerned with the North Atlantic."

The duties of ICES as described in Article 1 of its convention are:

1. to promote and encourage research and investigations for the study of the sea particularly those related to the living resources thereof;
2. to draw up programmes required for this purpose and to organize, in agreement with the Contracting Parties, such research and investigations as may appear necessary; and
3. to publish or otherwise disseminate the results of research and investigations carried out under its auspices or to encourage the publication thereof.

In recent decades, ICES has also provided scientific information and advice on fisheries conservation and environmental protection to regional and international regulatory commissions, as well as to ICES member countries. The duties are carried out by convening annually more than 100 gatherings of committees, working groups, and study groups. The scientific work is carried out in laboratories in member countries.

After World War II, fishing capabilities of many states developed rapidly. In both the Northwest Atlantic and the North-East Atlantic, there were obvious needs for international cooperation to address the exploitation of resources. At a conference in the U.S. in 1949, 11 participating countries decided to form an International Convention for the Northwest Atlantic Fisheries. The Convention entered into force in 1950, after ratification by four signatory governments. By 1979, membership had increased to 18 governments, 14 of which were from Europe, in addition to Canada, Cuba, Japan, and the U.S. An International Commission for the Northwest Atlantic Fisheries (ICNAF) was established, with responsibility for investigation, protection, and conservation of fishery resources in the area. In that context, ICNAF recommended, among many others, international quota regulations, methods in fishery science and statistics, and international control measures on the high seas. In 1978, when the coastal states in the Northwest Atlantic had extended their jurisdiction over living resources up to 200 nautical miles, the ICNAF was replaced by the Convention on Future Multilateral Cooperation in the Northwest Atlantic Fisheries. This new convention established the Northwest Atlantic Fisheries Organization, which has similar responsibilities as the former ICNAF.

A similar development took place in the North-East Atlantic. There, however, the first steps were already taken as early as the 1930s. In 1953, a Permanent Commission on Overfishing was established by delegations from 12 contracting governments. The main responsibility of the commission was to deal with minimum fish size and use of various fishing gear. Between 1954 and 1958, new types of international regulations were discussed, resulting in the North-East Atlantic Fisheries Convention (NEAFC), which entered into force in 1963. The NEAFC was given authority to establish stricter conservation and management measures.

Until 1976, NEAFC played an important role in regulating fisheries in its area. In 1969, it recommended a ban on salmon fisheries outside of national limits. It was instrumental in enforcing the closed season for herring fishery in the North Sea in 1971. It was just as influential in the decision to close the industrial herring fishery in the North Sea in 1974. The Commission also had the power to set limits for total allowable catches for 15 stocks in the NEAFC area.

By 1977, the North-East Atlantic countries had established 200-mile fishing limits. In 1980, European countries decided to be represented by the European Economic Community as its signatory member in a new convention, the Convention on Future Multilateral Cooperation in the North-East Atlantic Fisheries. A new NEAFC was established in 1982, with roughly the same responsibilities as the former. But most of the fisheries in the area were, by this time, within the new national limits; thus, the role of NEAFC was reduced. However, the legal regime for international fisheries management changed in the aftermath of important and relevant international events, such as the United Nations Convention on the Law of the Sea, United Nations Conference on Environment and Development, and the United Nations Agreement on the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks. NEAFC found a meaningful role related to fisheries in its area, in the waters outside of national jurisdiction.

FAO is the organization concerned with marine living resources in a global context. It was established as a specialized United Nations agency at a conference in Quebec City, Canada, in 1945. The organization was first located in Washington, DC, USA. It moved to Rome, Italy, in 1951. FAO's mandate is to raise levels of nutrition and standards of living, and to improve agricultural productivity and the condition of rural populations. FAO's Fisheries Department is charged with the responsibility to facilitate and secure long-term sustainable development and utilization of the world's fisheries and aquaculture. FAO provides assistance to its member states on matters concerning all aspects of fisheries management. Additionally, it is strongly engaged in the development of international management procedures.

To address the problems of shared resources, FAO took the initiative to hold an international conference on management of such resources. The conference resulted in the adoption of the Convention on Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks.

In all parts of the ocean, there are incidents of illegal or irresponsible activities in various parts of the fishing industry. Incidental catches of unwanted species are dumped in the sea. Illegal fishing methods, such as poison or dynamite, are used. Various gear restrictions are not respected. Catches are not properly reported. Such practices represent unfair competition with participants in the fisheries sector who abide by the laws and regulations. They also deprive markets of their goods. The dumping of fish alone amounts to more than 20 million tons per year. This is about two-thirds of the entire global aquaculture production. Such behavior, which threatens the sustainability of marine living resources, has captured the attention of a number of international meetings.

In an attempt to improve the situation, FAO called a major international conference in 1995. The conference resulted in adoption of the Code of Conduct for Responsible Fisheries. The code is an attempt to obtain "effective conservation, management, and development of living aquatic resources, with due respect for the ecosystem and biodiversity" [FAO, 1995, 2001]. The Code of Conduct is voluntary. Hence, it does not have the international legal demands present in conventions. However, states and the fisheries sector are encouraged to abide by the principles and international standards in the code.

Pattani, Thailand purse seine catch sorting (Photo: I. STOBUTZKI/LEN GARCES, WORLDFISH CENTER)

Will We Have Enough Fish?

It has been estimated that the demand for fish will reach 180 million tons by 2030 [Garcia and Doulman, 2003]. At first glance, this figure may be possible to reach. The global annual production of fish increased from 112.3 million tons in 1994 to 133.0 million tons in 2003 [FAO, 2004]. During the same period, marine captured fish fluctuated between 80 million and 87 million tons. This indicates that the increase in total fish production is mainly from aquaculture, and there is considerable scope for further growth, particularly in Africa and Latin America. Other positive signs are the reduction in subsidies and discards in marine fisheries.

However, market-driven overfishing and IUU fishing continue. These increase the need for aquafeed and will only lead to more intensive "fishing down the food chain." In a study of future prospects for world fisheries and aquaculture, FAO forecasts a significant increase in freshwater aquaculture in 2015 [FAO, 2004]. In contrast, capture fisheries are expected to stagnate. A price increase is projected for all types of fish. This will affect low-income consumers most severely.

References

Brown, L.R. 2000. "Fish farming may soon overtake cattle ranching as food source." *Worldwatch Issue Alert*, 3 October 2000. 4 pp.

Caddy, J.F., J. Csirke, S.M. Garcia and R.J.R. Grainger. 1998. "How pervasive is fishing down marine food webs?" *Science*, 282(5393):1383.

FAO (Food and Agriculture Organization). 1992. *The state of food and agriculture 1992*. Special chapter. Marine fisheries and the Law of the Sea: A decade of change. FAO, Rome.

FAO (Food and Agriculture Organization). 1994. *State of food and agriculture 1994*. Electronic product. FAO, Rome.

FAO (Food and Agriculture Organization). 1995. *Code of Conduct for Responsible Fisheries*. FAO, Rome. 41 pp.

FAO (Food and Agriculture Organization). 2000. *The state of world fisheries and aquaculture 2000*. FAO, Rome.

FAO (Food and Agriculture Organization). 2001. *What is the Code of Conduct for Responsible Fisheries?* FAO, Rome. 13 pp.

FAO (Food and Agriculture Organization). 2004. *The state of world fisheries and aquaculture 2004*. FAO, Rome.

Garcia, S.M. and D.J. Doulman. 2003. "Toward responsible ocean and coastal capture fisheries: The FAO programme in a WSSD perspective." In: *Proceedings of the Global Conference on Oceans, Coasts and Islands, 12–14 November 2003, Paris*.

Gjøsæter, J. and K. Kawaguchi. 1980. *A review of world resources of mesopelagic fish*. FAO Technical Paper No. 193. FAO, Rome. 151 pp.

Gulland, J. A. 1970. *The fish resources of the ocean*. FAO Fisheries Technical Paper No. 97. FAO, Rome. 425 pp.

Pauly, D., V. Christensen, J. Dalsgaard, R. Froese and F. Torres, Jr. 1998. "Fishing down marine food webs." *Science*, 279(5352):860–863.

Rana, K.J. 1997. "Trends in global production, 1984–1995." In: *Review of the state of world aquaculture*. FAO Fisheries Circular No. 886, Rev. 1. FAO, Rome. 163 pp.

Tacon, A.G.J., 1997. "Aquafeeds and feeding strategies." In: *Review of the state of world aquaculture*. FAO Fisheries Circular No. 886, Rev. 1. FAO, Rome. 163 pp.

World Bank. 1992. *A study of international fisheries research*. Policy and Research Series No. 19. 103 pp.

CHAPTER 6

Other Ocean Resources

Gunnar Kullenberg

Without a healthy ocean, there can be no healthy life on Earth. Without the ocean, there can be no life at all. It is, indeed, as anthropologist and ecologist Loren Eiseley had written: “If there is magic in the planet, it is contained in water.”

Nothing could be more important to life than water. We have always drawn resources from the ocean. This is only natural — science teaches us that life originates from the ocean. Ocean resources, such as shellfish, seaweed, fish, and marine mammals are readily available along the coasts. From the very beginning, these resources have been used for food and other purposes. In time, people learned to use other coastal and marine resources, such as sand, gravel, minerals, salt, and groundwater as well as making use of the coastal areas for natural harbors and shelters.

Modern society uses the ocean as a source of food, recreation, adventure, renewable energy, minerals (ranging from diamonds and uranium to corals, sand, and gravel), fossil fuel (such as oil and gas), and various chemicals and medicine. In most cases, our ability to utilize these resources is closely linked with scientific discoveries and technological developments. Most of these breakthroughs over the past 100 years have contributed to the heavy exploitation and utilization of the coastal and ocean resources by almost every coastal nation around the world.

Salts and Water

One of the resources that come from the ocean is salt. Salt, or sodium chloride, has always been extremely important in our daily life. It is the most abundant chemical constituent of the sea. It accounts for three-fourths of the roughly 3.5 percent of dissolved chemicals in the ocean.

Throughout history, salt has been a principal article of trade. It is even used as payment. Roman soldiers were partly paid in salt. In fact, the word "salary" was derived from this salt payment, called *salarium argentinum* [Summerhayes, 1996]. At present, salt obtained from the sea accounts for about one-third of the world's supply. Majority of it is produced in France, Italy, India, Mexico, and Spain.

Magnesium and bromine are also commercially extracted from the ocean on a significant scale. About 20 percent of the magnesium used in production is acquired from the ocean. Magnesium and bromine, however, are not the only ones that can be obtained from the ocean. Some countries are researching the feasibility of extracting uranium from ocean water, in order to help achieve a stable energy supply in the future. For the time being, however, seawater extraction has not been made commercial.

Another important ocean resource is freshwater. After salts are drawn from seawater, freshwater remains. Coastal waters are becoming an increasingly important source of freshwater for arid coastal areas; it will become even more valuable as freshwater becomes increasingly limited and costly. In Malta and several other countries, most freshwater comes from desalination. In voyages across the ocean over the past 100 years, ships have used distilling plants to produce freshwater. If we can solve the energy problem, then we would also be able to solve the freshwater problem. This can be done by obtaining freshwater for agriculture and industry from the sea.

Marine Organisms

Marine organisms are just as important a resource as freshwater. Not only are they utilized as food, they can also be used for other purposes. For one, marine organisms have been used throughout history as sources of fertilizers and food for livestock. Moreover, a wide variety of pharmaceuticals are derived from the ocean. Antibiotics, antiviral coagulants, and substances active against various types of cancer may be found in marine life [Mann Borgese, 1998]. Marine toxins, extracted from marine plants and animals, are being used, for instance, in insecticides. Research on their use as pharmacological compounds and for the development of new synthetic chemicals is ongoing. Another example is the horseshoe crab. Its blood provides the most well-known source of a marine-derived reagent that is used for testing and detecting contaminants in medicines.

A strong interest has developed in the medicinal value of marine life, with the discovery of deep seabed ecosystems being associated with seabed hot vents. These ecosystems exist under very special conditions; they have high pressure, low ambient seawater temperature, no light, and very little oxygen. There is ongoing research on these ecosystems, with focus on using them as a source of pharmaceuticals and special bacteria.

Renewable Energy

Another resource, which is in the form of energy, is also found in the ocean. Renewable energy can be harnessed from the tides, wind, waves and currents, and the temperature differences between the surface layer and the deeper waters in tropical - subtropical zones. These large sources of energy have not been used because the price of oil is still low enough to continue being commercially attractive. However, alternative energy sources are gradually becoming more appealing to the public. Considerable research on renewable energy has been undertaken over the last several decades. Research, however, could even be more greatly advanced should the necessary funding be provided. A possible source of funding is subsidy that has been funneled to oil consumption. Most oil explorations and extraction are subsidized. These subsidies could be used for research on alternative energy sources, so as to help decrease our overall dependence on fossil energy sources.

During the period of sailing ships, the wind was the major source of energy. Today, sailing is mainly a sport and a recreation. There have been attempts to introduce sailing ships, which utilize computer technology to manage sails, as a commercial transport alternative. But these attempts have not found practical use. Wind energy is, however, being tapped for electricity generation in some countries where the topography of the land is suitable, such as in many European countries. Many of these countries also use coastal winds and sea-based windmills to generate electricity.

The energy of tides has been tapped for some time. This is especially true in areas where there are large tides with related strong tidal currents. Tides are predictable, regular, and sustained; these characteristics make them very suitable as a renewable energy source. Along European coasts, tidal mills have supplied mechanical power for hundreds of years, using the rise and fall of the tide or the tidal current. From Europe, this technology was then introduced in America.

In our time, technology permits the construction of large barrages in areas with high tidal range. An example is the Rance barrage in Brittany,

(Photo: NANCY BERMAS-ATRIGENIO)

France, which was built in 1966 [Summerhayes, 1996]. This generates half a million kilowatts of power per tidal cycle. The cost was USD 100 million. The operating costs, however, are lower than any other power station in France. Fuel is free and there are no waste products. Areas with a tidal range exceeding what appears to be the required range of 10 m still exist in many countries, such as the United Kingdom, Russia, Canada, and China. Tidal barrages have been constructed in these countries.

Clearly, the technology is available. Summerhayes [1996] presents the case of the proposed Severn Estuary barrage project. If implemented, the 16 km-long barrage would include 216 turbo generators that are 9 m in diameter, each giving 8,640 megawatts of power. The annual output would amount to 17 terrawatt hours of electricity, equivalent to the burning of 8 million tons of oil and corresponding to 7 percent of the electrical use of England and Wales. Environmental impacts must, of course, be assessed in detail, but early evaluations suggest they would not be adverse. They should also be evaluated in the context of the impacts of burning oil.

Another source of renewable energy is the wave. The force of ocean surface wind-generated waves is well known by all sailors. It can also be observed at the coast where this energy can cause considerable disruptions. If properly harnessed, this energy could be used more constructively to generate electricity. The power potential of an average wave per kilometer of beach is estimated to be 40 megawatts. In regions where such waves occur regularly, they could constitute a very substantial energy source with no other environmental impacts than that of the required construction.

As demonstrated in the case of windmills, construction work can have substantial impacts mainly with respect to limiting access to amenities and aesthetics.

Wave energy can be transformed by means of floating or fixed structures. The latter uses the oscillating water column generated by a wave to push air through a turbine. This concept has been proven by a pilot plant in the United Kingdom and is commercially utilized. Floating devices convert the wave energy by being lifted up and down through coupling to a hydraulic system, as in the case of Salter's Duck [Summerhayes, 1996]. The Duck is a 300-ton floating canister designed to drive a generator from the motion of bobbing up and down on waves like a duck. Other techniques for extracting wave energy are being developed and used in India.

Some ocean currents, such as those in the Gulf Stream off Florida, U.S.A., and the Kuroshio off the east coast of Japan, flow like enormous rivers carrying many millions of cubic meters of water per second, at speeds up to some 1 m per second. This energy source could potentially be utilized. However, the transformation is, thus far, not commercially viable.

In comparison, conversion of the thermal energy stored in parts of the ocean into electricity is a more viable option. The principle of ocean thermal-energy conversion, commonly referred to as OTEC, uses the difference in temperature between the surface waters and the subsurface waters, about 20–25°C over a depth range of 500–1,000 m in the tropical zones of the ocean. The first modern-type but very small closed-cycle OTEC plant was constructed in Hawaii in 1979. Of the electrical output of 50 kilowatts, about 80 percent was used to pump up cold water for the system. There is much potential in the OTEC principle for oceanic islands in the tropics which lack other energy sources. Considerable research in this is ongoing. Environmental impacts are mainly related to the lowering of the surface water temperature and the increase of nutrients in the euphotic zone. However, these could possibly enhance biological productivity.

One possibility of making the system commercially attractive is to utilize cold but nutrient-rich subsurface waters to support mariculture installations in association with the OTEC plant. These cold waters could also be utilized for air conditioning or to cool the soil or obtain clean freshwater through desalination. It is this combination of OTEC and mariculture that is currently being researched in order to make the integrated system commercially attractive. In an integrated system, it is possible to involve science, technology, and users in mutually beneficial partnerships.

Having considered all these sources of alternative renewable energy, and also knowing that in some parts of the world solar energy can be used directly with great advantage, we are still faced with the fact that ours is a carbon-driven society: oil, coal, and gas are our primary sources of energy — and we use a lot of them! The accumulations of oil and natural gas come from the decay of buried remains of marine and terrestrial plants deposited in basins with net sedimentation. Some of these basins were depressions on land, with accumulation of the organic material in lakes. However, most sedimentation basins occurred along the margins of the ocean, with the accumulation beneath the sea surface. Many of these marine sedimentary basins have become terrestrial through changes in sea level and seabed. This is where easily available oil was found, in highly-concentrated, rather shallow strata. The remaining reserves of oil are more difficult to get to, because they are in hostile offshore areas that take great effort to access. However, we are gradually developing the required technology to explore and exploit them. As early as 1894, oil was produced from offshore sources in California. In 1936, operations began in the Gulf of Mexico. And in 1948, the first offshore platform was completed off the Louisiana coast, together with its offshore pipeline [Summerhayes, 1996].

Presently, oil is produced in many offshore areas in the North Sea, the Black Sea, West Africa, California, the Gulf of Mexico, the Persian Gulf, South China Sea and several other places while further exploration is still ongoing in many other regions. At the same time, the exploitation is moving further and further offshore. Presently the limit is about a depth of 2,000 m [GESAMP, 2001]. Seabed installations directly connected to a pipeline are used. Clearly, safety is of major concern.

Data released by the United Kingdom Institute of Petroleum in 1992 gives an annual production of 3.2 billion tons of oil and natural gas liquids, or about 65 million barrels of oil per day, with 1 ton equivalent to 7.3 barrels. About 40 percent of this production comes from offshore sources. Concurrently, total world reserves were pegged at 137 billion tons.

At present, we have been able to find new carbon sources of energy. But there are no large reserves of oil beyond the continental slopes because the requirements for oil to be produced are not met there. For oil to be produced, sediments need to be buried deep enough to be cooked by the flow of heat from the Earth. But deep-sea sediments beyond the continental slopes are not buried deeply enough. However, the formation of natural gas occurs relatively early in the decomposition of the organic matter. It can also be trapped in deep ocean sediments through a process driven by the high pressure and the low temperature there. Within the pore waters trapped in the sediments, mixtures of water and natural gas (such as methane) form gas hydrates, also called clathrates. With increasing depth into the sediment, temperature increases through the flow of heat from the interior of the Earth, and these mixtures, which are like ice, are melted. The gas is, thus, freed; but then it becomes trapped below the hydrate layer. It appears that these layers are concentrated on the continental slope below 300 m, and can cover about 10 percent of the total ocean area [Summerhayes, 1996]. So far, there is no safe way to tap into this enormous source of natural gas. It should be noted that if the problem of fusion were solved, the deuterium in the seawater provides for 250 billion terawatt of potential energy.

Minerals

Aside from renewable energy sources, building materials in the form of sand, gravel, and corals are also found in the sea. So are various minerals. These are usually extracted from relatively shallow deposits found near the shore. Such areas around the world are mined for diamonds, gold, and many other minerals including tin, titanium, iron, and chromium.

Perhaps the most well-known and most written about ocean deposits are deep-sea manganese and phosphorite nodules. These were discovered in the late 19th century. The famous *Challenger* expedition, which was carried out from 1872 to 1876, recovered a number of these. Since then, similar deposits have been found in many deep-sea basins with low sedimentation rate. Great hopes were pinned on these resources as part of the Common Heritage of Mankind written into the United Nations Convention on the Law of the Sea (UNCLOS) of 1982.

A number of countries have been given the status of pioneer deep-sea miners, and have carried out extensive mapping of the resources in the area of the seabed allocated to them through the International Seabed Authority (ISA). This is one of the important institutions instigated through the Law of the Sea. However, the demand for minerals found in these deep-sea deposits has not risen to the levels anticipated in the 1960s and 1970s. This is mainly due to changes in the construction economy and the transformation of the economy into one that is service-oriented rather than production-oriented. Because of this transformation, raw materials did not have much of a market. Synthetics, chips, and other micromechanics which do not need much of the earlier industrial raw materials have completely altered demands. We have also changed the uses of substances, introduced many more synthetics than before, lowered the need for metals, and considerably increased recycling of natural materials. All these dramatically changed trade and transport patterns.

Despite these developments, interest in the deep seabed has not decreased; rather, it has intensified. This is due to recent discoveries of other minerals and biological resources in the seabed. Mud rich in metals like iron, manganese, zinc, copper, cadmium, lead, and silver was discovered beneath very salt-rich brines deposited on seabeds in several regions. The first of these discoveries was in the Red Sea in the mid-1960s [Summerhayes, 1996]. This mud is rich enough in metals to have economic potential. It is also perhaps the most likely of deep-sea deposits to be mined first, when and if the time for that comes.

Hydrothermal Vents

Another very important discovery, that of hydrothermal vents, was made in the Eastern Pacific in 1975. These vents are associated with metal-rich deposits, such as copper, zinc, and sulfide deposits. Hydrothermal activity has since been confirmed to occur along large parts of the crests of the mid-ocean ridge system, which goes across the world ocean. These ridges are formed as a result of the separation of the tectonic plates that form the outer shell of the Earth. The convergence, or collision, of the plates, on the other hand, occurs at continental margins where deep-sea trenches are found, outside Japan in the Pacific Ocean, for instance. Hydrothermal activity with related mineral deposits has also been found to occur where seafloor spreading takes place, such as in the marginal basins of the Pacific.

A vent is a habitat of extremes. It is under very large pressure from the water above; has low temperatures in the ambient ocean water; is very dark; and at the same time, it depends upon the warm, oxygen-free, acid water from hydrothermal vents. This water originates from the ocean's bottom water, which infiltrates the bottom and can reach depths of several kilometers into sediments. There, it is heated by heat from the interior, and rises back to the surface, carrying with it dissolved gases and minerals.

The significance of hydrothermal activity goes far beyond the supply of mineral deposits. It provides for a source of chemicals to the ocean, a source which is comparable to the inputs of chemicals from rivers. Moreover, it is also a potential source for totally unknown and extraordinary species. Seabed-dwelling megafauna, or large seabed-dwelling animals, are found living in entirely novel ecosystems. These ecosystems, which are associated with hydrothermal vents, can be traced back to the earliest life on Earth. The animals living in them derive their food from a chain that is driven by energy from the Earth, also called geothermal energy.

The basic process through which the supply of food is generated is referred to as chemosynthesis. It is based on the release of hydrogen sulfide, a chemical that is toxic to other forms of life than the sulfide oxidizing bacteria through which the process is generated. These are able to produce organic material from carbon dioxide, using the energy released when hydrogen sulfide coming from the vents interacts with chemicals in the seawater. About 95 percent of all animals discovered at hydrothermal vents are previously unknown species; so far, over 300 new species have been identified.

Hydrothermal vent fields are submarine oases in the otherwise desert-like plains of the deep seafloor. The life there includes large tubeworms (which can grow up to 2–3 m long), giant clams, mussels, and crabs. The total biomass is high but the diversity is low. Additionally, the species found on vent sites in different ocean basins show little similarity.

In the North Atlantic, there are no tubeworms or giant clams; what is found there are clusters of small shrimp. These differences, as well as the isolation of biological communities, raise scientific questions. How can species develop or migrate from one vent site to another when the time required for biological development is apparently longer than the time during which a particular hydrothermal vent remains active? Questions like this prove that discoveries only spawn more questions which, in turn, lead to more discoveries.

There have been many exciting considerations and growing investigations on the possibility to utilize properties and products of newly-discovered species and ecosystems for pharmaceutical and medical purposes, as well as for the production of other servicing material.

The situation illustrates both the coincidences and the opportunities associated with basic ocean research, scientific discoveries, and technological developments. The physical discovery of deep-sea mineral resources was made fairly early on; manganese nodules were brought home with the *Challenger* expedition. During the Law of the Sea Convention debates, mineral resources were high on the agenda and were considered as major resources. This was in conjunction with the application of the Common Heritage of Mankind Principle to the "Area," that is, the seabed beyond the limits of national jurisdiction. At the same time, marine biological and biochemical research in the deep sea went on. In the 1970s, the researchers made the formidable discoveries of deep-sea animal communities living in association with warm-water hydrothermal vents on the deep seafloor.

Since its first discovery, hydrothermal vents have been found in many seabed areas with tectonic activity. It takes a huge effort to research and map these areas and their associated communities because access to them is difficult. Deep-sea manned submersibles are used. There are very few of these. Moreover, the operation involves a fully equipped surface mother vessel, high technology operation, and highly trained personnel. Research undertaking of this magnitude can only be carried out by advanced and well-financed partnerships in a cooperative effort.

All organisms associated with deep seabed communities are of interest to science. However, of particular interest for microbiology and biotechnology are the bacteria. Microbiological research has shown that in extreme conditions, microorganisms with unique properties may exist. Hence, it is reasonable to speculate that deep seabed communities may contain microbes with unique genes, biochemicals, and biological processes. The biotechnology industry is interested in all these, particularly in the thermophilic and hyperthermophilic bacteria discovered in vent systems. The properties and enzymes of these bacteria have been found to be useful in many industrial processes, including food processing and pharmaceuticals. This is one of the commercial potential of microbial genetic resources from the "Area." Many others are emerging and will continue to emerge as research goes on. This is because there is significant biological diversity in vent system communities.

The Need for Governance

The irony, however, is that these resources are not included in UNCLOS, except in an indirect way. Furthermore, they do not fall under the jurisdiction or responsibility of the International Seabed Authority (ISA). Attempts are being made to convince governments to broaden the jurisdiction of the ISA. But this is a very slow and uphill process. What is the alternative? What would the situation have been if a comprehensive international, intergovernmental ocean agency had existed, as proposed by Arvid Pardo in 1967? More to the point, why doesn't this comprehensive international, intergovernmental ocean agency exist? These questions highlight the need for an internationally agreed ocean governance system that can be implemented and enforced.

Marine living resources and marine biodiversity in the water column and the coastal and estuarine areas need separate treatments [see Chapter 5]. However, it is sufficient to note that currently, fisheries production gives about 100 million tons of food and 30 million tons of feed or fishmeals. The demand on the other hand is expected to reach 180 million tons by 2030 [Garcia and Doulman, 2003; FAO, 2002]. Considerable conflicts have arisen as a result of the expansion of fisheries and the efforts made to protect the overexploited stocks and the ecosystems that generate these resources.

The conflict of interests between a heavily subsidized fishing industry (employing a large number of people), politics, and governments on one side and ecological, scientific, environmental, and conservation interests on the other is perhaps most noticeable in this case of management of marine living resources. The scientific advice received by decisionmakers and political bodies is not sufficiently used to set fisheries limits, except possibly when it is too late. Regional fisheries management bodies need strengthening, to enable them to set realistic, enforceable annual quotas and stop illegal, unreported, unregulated (or IUU) fishing activities.

It must be stressed that the required international agreements and UNCLOS are in place. They just need to be implemented. Regional cooperation in fisheries research and management is long-standing and appears to be the best way to achieve implementation. This is because it makes it possible to take into account the differences in natural and social conditions between regions. It clearly shows the need for an integrated approach where all interests can cooperate. At the same time, it brings out the difficulties faced in managing resources which cannot be subject to customary property rights.

References

FAO. 2002. *The state of world fisheries and aquaculture — fisheries resources: Trends in production, utilization and trade*. FAO, Rome.

Garcia, S.M. and D.J. Doulman. 2003. "Toward responsible ocean and coastal capture fisheries: The FAO programme in a WSSD perspective." In: *Proceedings of the Global Conference on Oceans, Coasts and Islands, 12–14 November 2003, Paris*.

GESAMP (IMO/FAO/UNESCO-IOC/WMO/WHO/IAEA/UN/UNEP Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection). 2001. *A sea of troubles*. GESAMP Reports and Studies No. 70. 35 pp.

Mann Borgese, E. 1998. *The oceanic circle: Governing the seas as a global resource*. United Nations University Press, Tokyo. 240 pp.

Summerhayes, C. P. 1996. "Ocean resources," pp. 314–337. In: *Oceanography: An illustrated guide*. Edited by C. P. Summerhayes and S. A. Thorpe. Manson Publishing Ltd., London.

CHAPTER 7

Weather, Climate, Forecasting and Climate Change

Gunnar Kullenberg

The Weather

The weather is the present or momentary state of the atmosphere. Its time scales, ranging from hours to days and weeks, are dominated by changes in the atmosphere. It is strongly influenced by the interaction between ocean surface water and the lower atmosphere. However, signals from this specific interaction, over time scales during which the weather changes, are carried mainly by the winds [Box 1]. In some cases, winds are generated by the interaction of the ocean and the atmosphere.

These winds blow at low heights over sea surface. Not surprisingly, they also generate a motion in the sea. This is due to the effect of friction. Due to the rotation of the Earth, the motion that has been generated will have a component towards the south and north respectively, on the Northern and Southern Hemispheres. Furthermore, due to the effect of the Earth's rotation, winds parallel to the coast will give rise to a motion with an offshore component in the sea's surface layer. Water driven offshore must be replaced by a return flow that occurs in subsurface layers, normally in the depth range of about 30–80 m. This water, rich in nutrients for biological production, rises towards the surface layer close to the coast. This is called coastal upwelling [Figure 1].

The wind's strength varies seasonally. The upwelling systems, therefore, vary seasonally, too. Their flow and strength also vary. The African and South American systems are the most marked ones, as evidenced by the existence of particularly rich fisheries in these areas. The upwelling system outside Somalia exists during the southwest monsoon only and is hence more markedly seasonal compared to the others.

The interaction between the air and the sea yields many good things for mankind. However, it also produces negative effects, such as hazards at sea, flooding of low-lying areas, and countless damages and personal losses particularly those produced from tropical cyclones [Box 2].

Box 1: The Global Wind System

The global wind system is dominated by the winds from the west, the mid-latitude Westerlies. These winds are driven by the difference in heating between the high latitudes, or the poles, and the low latitudes, or the equator. In the equator, the air rises higher because it is warmer there than in higher latitudes. At the height of around 10 km, a pressure gradient from the lower to the higher latitudes generates a tendency for air masses to spread towards higher latitudes. However, due to the effect of the Earth's rotation, the motion is deflected to the right on the Northern Hemisphere and to the left on the Southern Hemisphere. Thus, we can say that the Westerlies are driven from the west. The pressure gradient directed northwards or southwards is compensated by the opposite direction of the force generated by the rotation of the Earth. Deflection is generated once the motion has been initiated. The Westerlies reach their maximum speed at around 11–17 km high. The return flow in the atmosphere, which compensates for the Westerlies, generates trade winds that blow from east to west over 5–20° degrees latitude.

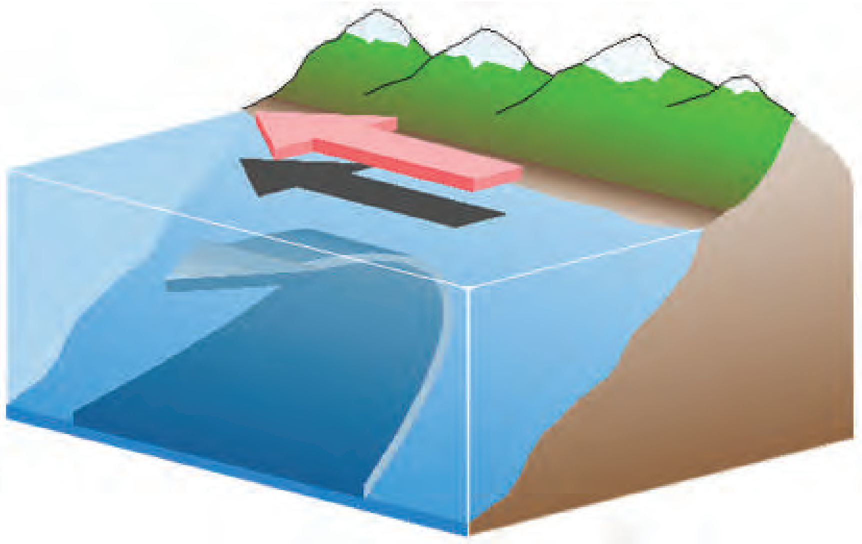
Trade winds are basically generated in the same way as the Westerlies. Due to the rising of warm air at a low latitude, a low pressure occurs at low heights in the atmosphere. At a higher latitude, there is high pressure due to the cooling of the warm air above. This pressure generates a sinking tendency and a high pressure. The pressure gradient is, thus, from higher towards lower latitudes, opposite the one at greater height. This pressure gradient is counteracted by the force of the Earth's rotation which, this time, generates winds that blow from the east to the west. These are the trade winds. They are called such because they are very persistent. They drive the equatorial current system transporting surface layer water towards

Box 1: (continued)

the west. At higher and polar latitudes, there are constant winds from the east. These carry the cold weather systems of the high latitudes and can break into temperate zones.

In the Northern Hemisphere, the wind system also has a northerly wind component which blows from north to south, along the eastern side of the ocean basin and between the mid-latitudes and the latitudes of the trade winds. In the Southern Hemisphere, this wind component blows from the south towards the equatorial trade wind, also along the eastern side of the ocean basin. These winds are mainly seasonal. They are generated by the pressure gradient set up by the heating of continental landmasses during spring or summer. The ocean, on the other hand, is not heated in the same way. Thus, there is higher pressure over ocean than over land, at low heights.

Figure 1: The Coastal Upwelling



"Strong southeasterly winds (red arrow) prevail along the coast of southern Ecuador and Peru. These winds, which blow during both normal and El Niño years, drag the surface water northwestward and cause cold, nutrient-rich water (dark blue) to upwell along the shore of the eastern Pacific."

Available at http://www.atmos.washington.edu/gcg/RTN/Figures/RTN13.html [Accessed 25 June 2007].

The Climate

Is weather more important than climate? What is the difference?

Weather is what we experience here and now or what we may feel tomorrow or the next couple of days. Climate, on the other hand, is what we feel when seasons vary. Climate shapes how we live; it determines our food production and survival. Scientifically expressed, climate is the summation of the weather or the synthesis of the weather over a sufficiently long period so that the statistical characteristics can be determined. This is the definition given by the World Meteorological Organization.

Climate constitutes of weather averaged over sufficiently long periods such as a season, year, or decades. There are various climate periods or cycles. This means that we have to observe a climate or cycle's characteristic

Box 2: Tropical Cyclones

Tropical or subtropical cyclones are also called hurricanes and typhoons. Tropical cyclones occur in relatively concentrated belts 20–25° latitude around the equator. They require about 26–27°C in the surface water to develop. They do not develop violently in a belt of 4–5° latitude around the equator since they require an effect of the Earth's rotation to spin. That effect is absent on the equator. In the Northern Hemisphere they are concentrated in the East Pacific outside central America, the Caribbean and other parts of western North Atlantic, the West Pacific at Japan-Asia mainland, the Bay of Bengal, and the Arabian Sea of the Indian Ocean. In the Southern Hemisphere, they are concentrated in a belt in the Indian Ocean running from Madagascar to Australia and in the western South Pacific, outside north Australia.

Cyclones are very significant events. Their occurrence varies with climate conditions which are, in turn, influenced by other more large and long-time scale variability that occur on a seasonal, interannual, or decadal period.

The word "cyclone" probably originates from the Greek word "cyclos," which means "coil of snakes." Cyclones are very intense low-pressure areas concentrated in the form of a coil or spiral of energy with a size of 100–150 km across. They rotate with an anti-clockwise direction on the Northern Hemisphere and a clockwise direction on the Southern Hemisphere. They are revolving storms with a high density of energy and are carried by prevailing weather conditions in a particular direction. Cyclones' wind speeds can reach as much as 120 km per hour.

Box 2: (continued)

Low pressure systems are classified according to wind speed. A depression has wind speeds in the range of 30–50 km per hour. A deep depression has wind speeds of 51–61 km per hour. A cyclonic storm has wind speeds of 63–87 km per hour. A severe cyclonic storm posts wind speeds of 90–116 km every hour. Finally, a very severe cyclonic storm is one that has hurricane winds moving at 118 km, or more, every hour. The average lifetime of a cyclone is about a week. The processes associated with cyclone formation are not well-clarified.

Cyclones are formed at sea and most die out at sea. However, those that hit the coast can make very substantial damage. Cyclones hitting the U.S. caused an annual average damage of USD 1.6 billion between 1950 and 1989, and USD 6.2 billion from 1989 to 1995. In China, losses amounted to USD 1.3 billion annually, from 1986 to 1994. The huge impacts of hurricanes *Andrew*, in 1992, and *Mitch*, in 1998, are well-known and documented. *Mitch* claimed 11,000 lives in Honduras and Nicaragua. The two hurricanes generated economic losses estimated to be between USD 40 to 50 billion. The devastating results of hurricane *Katrina* in 2005 also demonstrate just how destructive cyclones could be.

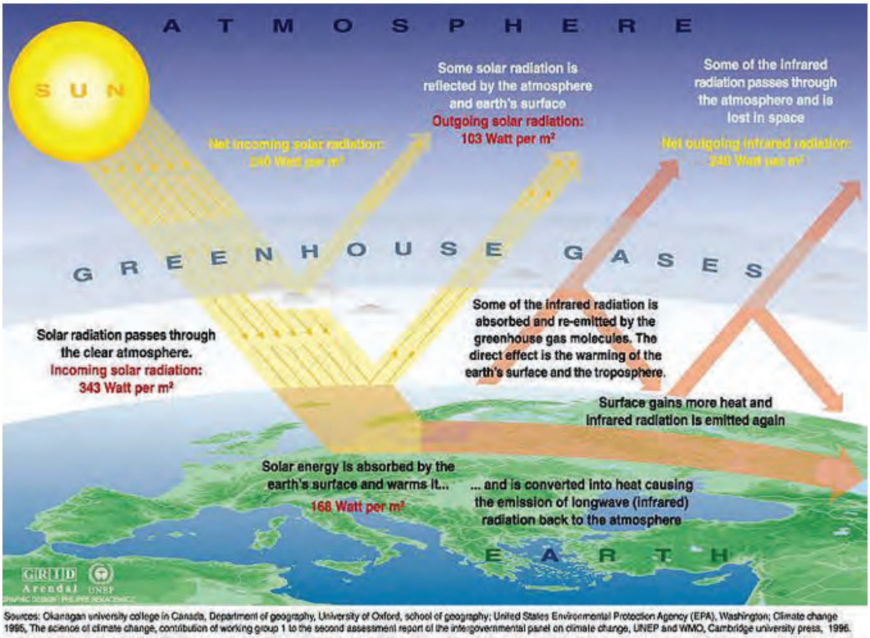
properties long enough to be able to identify its variation, how large it is, and how it occurs. The best known of such properties, called climate elements, are temperature close to the ground or the surface, and precipitation, or the amount of rain. These can individually or jointly characterize the climate. Climate elements are influenced or determined by processes or conditions that include solar radiation, regional distribution of land and water, size and location of landmasses and their height, the amount of water vapor in the atmosphere, and the greenhouse effect.

Incoming solar radiation provides energy. It penetrates the atmosphere as so-called shortwave radiation. It is mostly visible and near-ultraviolet. This is because the temperature of the sun is very, very high. By comparison, the Earth's temperature is basically zero, and the Earth radiates most (about one-third) of the incoming radiation back into the atmosphere in the form of longwave, invisible radiation. This kind of radiation is partially trapped in the atmosphere where it increases its temperature until a balance is reached between incoming and outgoing radiation in terms of heat. It is precisely this process that gives us the temperature we have on Earth. Without it, the Earth would not be habitable. This so-called greenhouse effect is mainly due to the water vapor in the atmosphere [Figure 2]. However, other gases, mainly carbon dioxide (CO_2), methane, nitrous oxide, and chlorofluorocarbons, are just as important. Such gases are produced and released to the atmosphere by natural and anthropogenic sources.

Sunlight penetrates the depths of the atmosphere but it does not penetrate deep into the ocean. The clearest water on Earth is found in ocean areas where biological primary productivity is very low, as is the case in Sargasso Sea in the subtropical North Atlantic. The ocean has deserts that are comparable to terrestrial deserts. The water there is comparatively old and is slowly sinking, due to oceanic circulation. Old water has no nutrients. There, the blue part of the sunlight can penetrate to about 400 m depth making water intensely blue. However, most of the sunlight is absorbed in the upper 100–150 m. In other regions of high biological activity, sunlight may only penetrate some tens of meters,

Figure 2: The Global Greenhouse Effect

The gases make the atmosphere function as a greenhouse; they essentially trap the relatively longwave radiation from the Earth while allowing most of the incoming radiation to pass through. The trapping of radiation is dependent upon the wavelength of the radiation itself. Red light, which is of longer wavelength, is radiated from the Earth. It is partially trapped in the atmosphere, where it remains as heat.



(Diagram: Philippe Rekacewicz, UNEP/GRID-Arendal) Available at http://maps.grida.no/go/graphic/greenhouse_effect. [Accessed 12 January 2008].

between 20 and 40 m, or even less than 10 m, as is the case in the high-productive upwelling areas with very rich fisheries. In areas like these, the water is greenish.[1]

Another very important climate factor is the upper ozone layer in the atmosphere. This protects the Earth from receiving too much ultraviolet radiation. The ozone is also a greenhouse gas, generating a certain warming at the layer of its maximum concentration, at about 25 km in height.

There are a number of climate zones on Earth, these are: tropics, subtropics, temperate, and polar zones. We can also separate between other types of climate, such as: mountain climate, plain climate, desert climate, or monsoon climate. The main point is that climate is very important to us. Without a hospitable climate, we would not be able to survive. This is demonstrated in extreme areas with large differences in temperature between winter and summer, or with very strong extremes in weather or climate. The former occurs in the center of big landmasses; the latter can occur everywhere but tends to be concentrated in certain belts, such as those referred to above. In both situations, the ocean plays a large role, be it absent or present in a special combination with landmasses, which can prompt special phenomena like coastal upwelling and on basin-wide scales, the monsoon.

A climate that does not change too much is obviously the most desirable for us. Since the last glaciation ended around 12,000 years ago, the temperature has shown remarkably small variations, from +2 to -2°C compared to today, when extremes are taken into account. Without considering any extreme, the difference is only in the range of +1 to -1°C. For this reason, the scientific community has, for some time, been seriously concerned about the potential warming of up to about 4°C, which could occur as a result of our greenhouse gas emissions from years 2000 to 2100. This is a short period of time compared even to the last deglaciation period, which lasted around 1,000 years and amounted to an average temperature increase of about 6°C only. At the root of the current climate change problem is the increase of the greenhouse effect due to emission of greenhouse gases and changes to the land surface, in the form of deforestation and desertification.

This concern has led to intensive research endeavors, and lately, just as intensive, to geopolitical efforts. There is also increased awareness that what we are dealing with is a system that consists of the atmosphere, the layers of gases around the Earth; hydrosphere, which is mainly the

[1] The color of the water is influenced by dissolved substances, particles in the water, and biological activity. In some areas, we can see red surface water. This is due to abnormally high biological activity, such as red tides. In low productive areas, including the Mediterranean, the water is as blue as a clear sky, for similar reasons.

ocean; lithosphere, near the surface of the Earth; biosphere, the Earth's surface; cryosphere or ice masses and glaciers; and temporal and spatial variation of solar radiation. All these constitute a very complex interactive system, the state of which cannot be precisely predicted. There will always be uncertainties. However, we may be able to forecast some statistics and their variability, as well as responses to changes in the major influencing factors. And this is exactly what is being done, what has stirred up interest, and what has confirmed earlier concerns of some members of the scientific community.

The Role of the Ocean in the Climate System

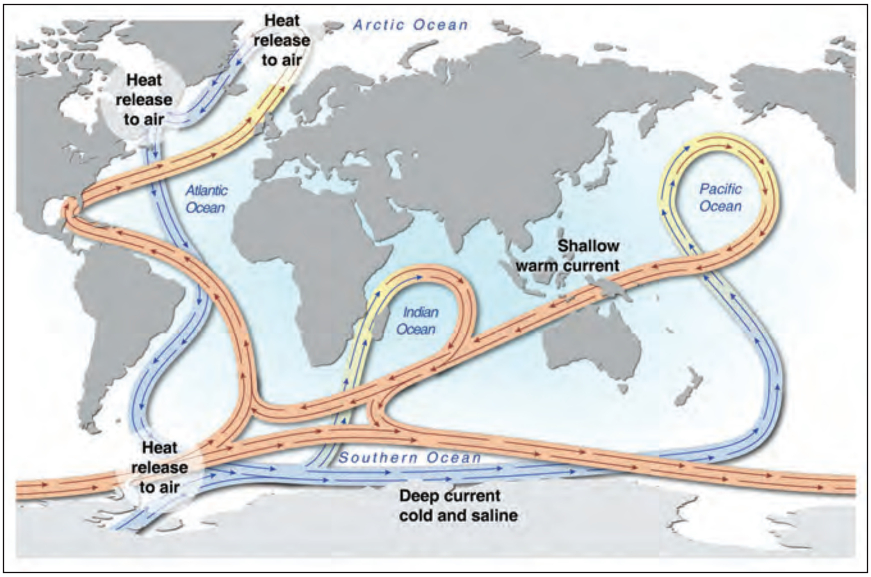
The Ocean Circulation

In order for us to understand that the ocean is a very important part of the climate system, we must first recognize the importance of water in the distribution of heat in the very same system. This entails appreciation of the fact that the ocean contains about 25 times more water than land and that the water in the atmosphere is only about ten parts in a million of the water in the ocean [Charnock, 1996]. Ocean surface currents transfer heat towards the pole in amounts equal to that in the atmosphere. However, there is also an exchange of heat between the ocean basins. The North Atlantic loses heat to the atmosphere. This heat is more than the North Atlantic gains from incoming solar radiation. Hence, there must be a net transfer of heat from the Pacific and Indian Oceans into the South Atlantic Ocean, and from there to the North Atlantic. This transfer is achieved through compensation flow to the deep and bottom water circulation called the thermodynamic or thermohaline circulation.

The waters of the ocean basins are interconnected through what has become known as the Global Thermohaline Conveyor Belt [Figure 3]. It is called thermohaline because both the heat (or thermo) and salt (or haline) content of the water are its important factors. The warm surface water flowing from the Pacific and the Atlantic keeps flowing until it reaches the Labrador, Norwegian, and Greenland Seas. There, as well as on its way there, the water is cooled off sufficiently so that it becomes heavier through lower temperature and somewhat higher salt content than the water below, thus sinking and forming deep water. This deep water can only return towards the south, part of it crossing the equator on its way to the South Atlantic. From there, it enters the Southern Ocean and flows towards the east, into the Indian and Pacific basins. In this way, mass balance and heat balance are maintained.

Figure 3: Global Thermohaline Conveyor Belt

"The Global Thermohaline Conveyor Belt consists of an interconnected network of warm surface currents (shown in orange) and cold deep water currents (shown in blue). Warm, salty, surface waters lose their heat to the atmosphere in the areas labeled *Heat release to air* and sink to the bottom of the ocean."



SOURCE: Intergovernmental Panel on Climate Change (IPCC), "Climate Change 2001: The Scientific Basis," in http://www.underground.com/education/abruptclimate.asp [Accessed 25 June 2007].
(Diagram: Hugo Ahlenius, UNEP/GRID-Arendal) Available at http://maps.grida.no/go/graphic/world-ocean-thermohaline-circ. [Accessed 12 January 2008].

These thermodynamic processes explain the relatively uniform and low temperature, that is, between 2–4°C, of waters that lie below about 1,000 m. These waters originate from the cool high latitudes. When sinking from the surface, water also brings with it oxygen, CO_2, salt, and other dissolved chemicals, as well as some suspended particulate matter and pollutants. These properties or characteristics of the water are maintained over considerable periods and distances, even if oxygen is gradually decreased through the oxidation of sinking organic matter.

Due to the differences in salt content between ocean waters, it can be said that the Conveyor Belt transfers freshwater. This compensates for the differences in inputs of freshwater to the ocean basins. These differences are due to precipitation, evaporation, the freezing and melting of ice, and runoff from land.

The density of seawater depends upon its temperature and salt content. The North Pacific has less salt than the North Atlantic because it experiences less evaporation and higher precipitation. Thus, the sea level of the North Pacific is higher than the sea level of the North Atlantic by about 70 cm. This also explains why there is no deep water formation in the North Pacific. Its surface water is not subject to sufficient cooling and evaporation to compensate for the low salt content, as well as to trigger sinking.

In the North Atlantic, the higher salt content of surface waters supports the density increase due to cooling. This triggers instability and sinking. Evaporation is the essential mechanism in generating cooling. But, it is mainly evaporation, in which the winds play a large role, that drives the density increase of the surface water in the North Atlantic, and thus, produce deep-water formation. However, the primary forcing function of the whole process is ocean circulation. Consequently, changes in ocean circulation can be expected to generate changes in the climate.

The time scale of the circulation through the Conveyor Belt is somewhat long compared to the time scale of a human life. This circulation time scale is pegged between 100 and 1,000 years. However, this is short compared to the time scales of dramatic climate changes manifested through the glaciations, or ice ages, which seem to occur at intervals of 10,000 to 100,000 years.

The problem with this scenario is that we do not know how fast the climate can change from one extreme to the other and what can trigger such a change. Since the ocean acts as the flywheel of the climate,[2] it becomes very important to better understand the ocean's circulation, particularly how it can change and what can trigger such a change.

The other part of the ocean circulation, specifically, the motion of the waters in the upper layers, is essentially driven by the *winds*. We have to realize that these winds are themselves generated by the transfer of heat and water vapor from the ocean to the atmosphere. This transfer is very uneven and creates high and low pressures which, in turn, generate winds to even out differences. These winds then drive the ocean surface motion.

There is also another motion that enters and complicates the system even more. This is the *rotation of the Earth*, which gives rise to a force that influences the motion on the Earth with time scales of a day or more. Directed to the right on the Northern Hemisphere and to the left on the Southern Hemisphere, the size of this force increases with the latitude. It is zero on the equator. This force puts many constraints on the motion of

[2] Elder and Pernetta [1991] described the oceans as "like a flywheel they store energy in the form of heat when it is in plentiful supply, during the day or summer, and release it to the atmosphere when sunshine is absent or during the winter."

both water and air, due to the tendency of a parcel to maintain its total speed of rotation, also called vorticity.

Continents and mountain ranges in the deep ocean force ocean circulation to adopt northerly and southerly directions. This is how the ocean transfers heat towards poles in the surface layers. This heat transfer in the ocean is of a similar size to the heat transfer in the atmosphere. As described above, warm water reaches high latitudes and cools off by giving heat to the air above. In the Atlantic, the warm and relatively salty water originating from the Gulf Stream cools off in the northern North Atlantic and sinks to become deep water, part of the Conveyor Belt. It then returns towards the equator as deep water flowing around 2,000–4,000 m. This process provides for warm European climate compared to the same latitudes in the Pacific. There, the northward transfer of heat by the Kuroshio current along Japan and the Kurilean Islands accounts is only about 65 percent of the heat carried north in the Atlantic.

Role of Ocean in Global Evaporation

Much of the *heat transfer* through the atmosphere is effectuated by water vapor, generated through evaporation from sea surface to the dry air above. This requires energy. The so-called latent heat in the water vapor is released to the atmosphere when water vapor condenses back into clouds and rain, or ice. Most evaporation occurs in lower latitudes. Meanwhile, condensation and the release of heat to the atmosphere occur at high latitudes. Evaporation also occurs over land, mostly as evapo-transpiration from vegetation. This is about 15 percent of the evaporation from the ocean. The precipitation or rain falling over land corresponds to about 25 percent of the evaporation from the sea and is, thus, much larger than the evaporation from land. It is estimated that 86 percent of global evaporation comes from the ocean and 78 percent goes back to the ocean as precipitation. The difference between evaporation from the ocean and return by precipitation to the ocean falls as rain on land. Whatever deficit there may be for the ocean is compensated by water flowing from land and into the ocean. Water, in the form of vapor, liquid, or ice, is the working substance of the global heat-engine [Charnock, 1996]. River flowing to the ocean carries with it a lot of salt and other materials.

Role of Ocean in CO_2 Absorption

The ocean absorbs CO_2. This is done through direct absorption from the air, by CO_2 being dissolved in the surface water, by sinking of cool water with relatively high amounts of CO_2, and through the so-called biological pump [Figure 4].

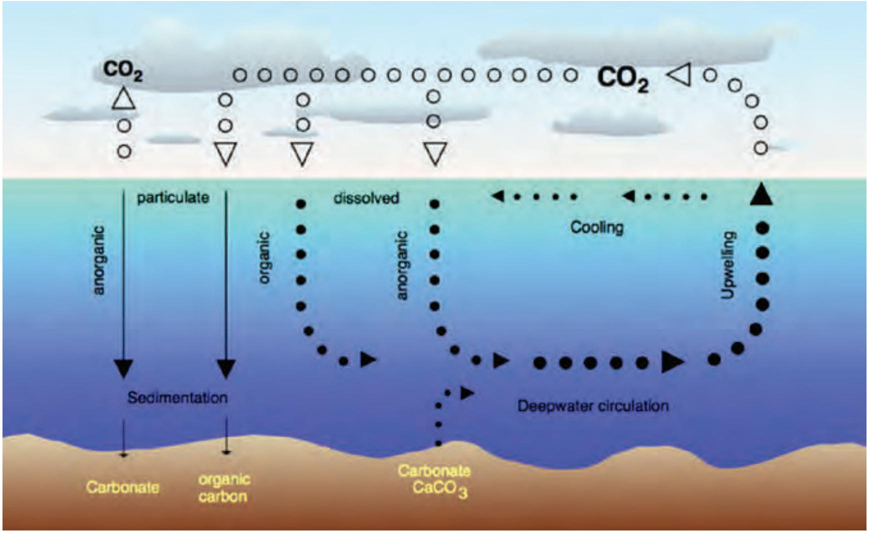
Just like plants on land, plants in the ocean utilize CO_2 in their biological production. However, a difference exists between terrestrial and marine utilization of CO_2. On land, the organic material remains on the surface; in the ocean much of it sinks and CO_2 is transferred into the ocean.

The ocean may also absorb CO_2 through the sinking of surface waters in cooling regions in the northern North Atlantic and in the Southern Ocean. Thus, ocean circulation is very important for the uptake of CO_2. The ocean acts as a controller, or buffer, of climate change. Current estimates suggest that the ocean's uptake of CO_2 is between 1.4–2.8 gigatons annually, or in the range of 30–40 percent of the fossil fuel CO_2 injected annually into the atmosphere.

The sediments of the ocean floor are the largest carbon pool on Earth. The carbon present in these sediments are about 50 times more than the carbon in the atmosphere and about 15 times more than those found in the biosphere [Lozan et al., 2001]. The absorption and release of carbon influence the oceanic uptake of carbon.

Figure 4: Physical and Biological Pumps of CO_2

CO_2 is dissolved in the surface layer, as required by the chemical balance. Marine primary production takes up CO_2 and this generates a fixation of carbon, which transfers carbon into the ocean, the sinking of cool water with relatively high CO_2 content, and the return to the surface of water with relatively low CO_2 concentration.



(Diagram: Hannes Grobe) Available at http://en.wikipedia.org/wiki/Image:CO2-pump-hg.png. [Accessed 25 June 2007].

Every day, considerable amounts of CO_2 and some other greenhouse active gases, such as chlorofluorocarbons and methane, are released into the atmosphere. Through observations of CO_2 levels present in the atmosphere since the 1950s, it has been established beyond any doubt that the level increases by about 20 units every 20 years. Overall, CO_2 levels have increased from 280 units a hundred or so years ago to about 350 units today. This rate of increase is unprecedented in the last 20,000 years. About three quarters of it is due to the burning of fossil fuels. This is according to observations in Hawaii. This data is one example of the importance of regular observations, maintained over long periods.

Balance estimates suggest that the combustion of fossil fuel has so far given the atmosphere about 6 gigatons of carbon per year. Deforestation yields between 0.6–2.6 gigatons of carbon annually. Of this, the ocean net uptake is in the range of 1.4–2.8 gigatons of carbon per year while the terrestrial ecosystem has an estimated net uptake of 0.5–2.5 gigatons, for the same period. It must be clarified that many uncertainties surround these estimates, as shown by the range of figures [Watson, 1992]. Presently, research is being conducted to: clarify the size of the oceanic sinks and sources of CO_2; how these respond to potential climate change; how this change influences CO_2 balance and how we can best follow developments involved; and where to make observations so as to obtain early warning signals. The most recent concerns address the gradual acidification of the oceanic waters due to CO_2 uptake and the saturation of the ocean sinks.

Freshwater, El Niño, and Monsoon

About 2.5 percent of all water on Earth, or 40 million km^3, is freshwater. Of this, approximately 0.3 percent is available as renewable freshwater for our total consumption. This is about 120,000 km^3 in all.

Where does this much water come from? The main source of freshwater is the ocean. The ocean brings freshwater to the land and river systems through rain or snow. River water largely originating from the ocean is extensively used by human society [Box 3]. An important source is also the continental glaciers, which likewise are receiving inputs through precipitation originating from the ocean.

The source of rain is the immense evaporation from the ocean supplemented by evapotranspiration, or sweating from the land. Evaporation from the ocean is the major source of water vapor in the atmosphere. This is a primary greenhouse gas, without which we would not be here. The warmer the air, the more water vapor can be stored in it. Very large air masses are carried by regular winds from the ocean towards land. There,

Box 3: Effects of Demography and Human Activities on Freshwater

Freshwater is a natural resource which society must treat with care and respect. Presently, about 550 million people live in areas with shortage of freshwater. This figure is estimated to increase to about 1 billion by 2010. Population increase has elevated freshwater usage and need. Concern for freshwater resources has stimulated much international activity and created the World Water Forum. The World Water Forum has organized systematic compilations, reviews, and research. In this, it serves a function similar to that of IPCC's.

Climate change and variability has much influence on the freshwater situation and distribution, in time and space. The global annual freshwater withdrawal at the end of the last century was about 3,800 km^3. This figure is projected to increase to around 5,200 km^3 during the first quarter of this century. While the human population has increased by a factor of three since 1900, the amount of freshwater has remained essentially the same. The volume of clean and safe freshwater has decreased considerably due to pollution and other uses.

River runoff is very considerably reduced through dam constructions. These constructions, however, resulted to serious deterioration of river deltas and estuaries. Suspended solids and dissolved substances, such as nutrients, are also withdrawn with the water. This means there are less nutrients in the estuary or delta for biological production. It also means that there is increasing erosion because solid material is still withdrawn from the ocean. This is well demonstrated in many cases, a good example of which is the Nile Delta in the Mediterranean. It led to a loss of habitable and productive land, as well as the displacement of millions of people. It also necessitated a change in agricultural practices.

Nampho dam, DPR Korea (Photo: PEMSEA)

Box 3: (continued)

Similar scenarios to the Nile are occurring in many large rivers that are subject to damming and diversion. A few examples are the Colorado, Ganges, Danube, and the Rhine. Most large river systems are, thus, polluted and overregulated. Of the major river systems, only the Amazon and Congo Rivers are considered to still be in a reasonably undisturbed or natural state. The Nile, Yellow, and Ganges Rivers are considered seriously disturbed. Through international cooperation over the last 2 decades since a major chemical spill occurred in the Rhine in 1986, the river has been cleaned and returned to such a state that salmon has reentered the river. Most of the cleaning effort has been devoted to establishing wastewater treatment plants. The lesson from the Rhine is that rehabilitation can be done. But, it requires determined efforts, transboundary cooperation, and financial means.

There are many activities on land which can increase material transports to the ocean through rivers. This can be due to increased soil erosion through deforestation and agricultural practices. Construction of dams, deforestation, building of roads, and many other large earth-moving activities tend to increase material transport to the ocean. The river flow also carries with it pollution, particularly contaminants, to the coastal areas, impacting marine life, food production, and the quality of life there. Pollution due to river inflows is degrading areas of the Mediterranean, Baltic, and Black Seas, large parts of Asian coastal areas from the Bay of Bengal to the Yellow and South China Seas, and estuaries in Africa, and South and North America.

the natural process of cooling forces warmer air to release much of its water as rain or snow. This is the freshwater that society must make the best possible use of.

To effectively manage freshwater, it is extremely valuable to know in advance when water is going to come as rain or snow, or through the flooding of rivers. Such advanced knowledge will make it possible to arrange for storage, protection against flooding or temporary drought, and appropriate agriculture. Such advanced knowledge can now be obtained through long-range forecasting. Some major regular climate-related, basin-wide processes are receiving particular attention with respect to forecasting, namely the El Niño–Southern Oscillation (ENSO) and the monsoon phenomena.

El Niño

El Niño is a reversal of the upper layer circulation pattern in the equatorial Pacific Ocean. Under normal conditions, trade winds blow fairly consistently from east to west, in the subtropical zones driving the equatorial surface layer current system that carries the ocean water from east to west. The water absorbs much heat during the passage from east to west across the Pacific. A pool of very warm water up to 30°C builds up in the western equatorial Pacific. When the temperature reaches a certain critical level, normal circulation weakens and is gradually reversed, both in the ocean and the atmosphere. Warm water then returns to the east along the equator, mainly on the southern side.

The process reverses the surface layer circulation at the South American coast, along Ecuador, Peru, and parts of Chile. From having relatively cold surface water coming from the south and from the subsurface layers through coastal upwelling with high levels of nutrients for biological production, surface layer water becomes relatively warm and with low levels of nutrients. These waters come from the equatorial zone. Warm air coming with the reversed winds carries high amounts of water vapor. While ascending, the air cools off and releases large amounts of the precipitation as rain. Compared to normal dry years, this is very significant. Fisheries, agriculture, transport, tourism, and recreation conditions will be affected. Thus, there are very substantial socioeconomic consequences.

The impacts of El Niño are felt across the South American continent. But through long-distance connections in the atmosphere, they are noticeable on a global scale. These impacts are both good and bad. On the western side of the Pacific, cyclone activity is reduced during El Niño events. The opposite happens in the eastern and central Pacific. The eastern side of the Pacific enjoys more freshwater and climate that is milder than normal. In the Caribbean, Gulf of Mexico, and parts of the western Atlantic coast, the number of hurricanes and cyclones is notably reduced; so is rainfall on the Caribbean islands.

Negative effects of El Niño include: the much decreased biological production and fisheries in the waters off Chile and Peru; dryness in parts of Southeastern Africa and Northern Brazil; and droughts in parts of the Western Pacific, such as northern Australia, Indonesia, and the Philippines, coupled with large forest fires as a potential secondary consequence. The changed atmospheric circulation during El Niño manifests signals around the globe and modifies the weather patterns in many regions.

We now understand that the El Niño phenomenon is a component of the normal global climate system. It is a recurring process with an average return period of 4 years. Its occurrence, however, can be between 2 and 8 or sometimes 10 years apart. The El Niño is the ocean component of the coupled ocean-atmosphere process. The atmospheric component is manifested in the weakening of the trade wind system; increase of the surface atmospheric pressure over Indonesia and Australia, with related decrease of rainfall there; and a corresponding decrease of the atmospheric pressure over the southeastern Pacific, as well as an increase of rainfall there. Surface pressure variations between the southeastern Pacific and Indonesia and Australia are referred to as the Southern Oscillation. Together, the oceanic and atmospheric parts become the ENSO phenomenon. This is now recognized as one of the largest, if not the largest, contributor to the normal variability of the climate on global scales over periods of several years. The effects are noticeable in most parts of the Earth. The frequency of occurrence, strength, and persistence may well be influenced by the longer-term climate change.

El Niño has an opposite phenomenon called La Niña. This is not as well-known as El Niño; thus, even less understood. But like El Niño, La Niña has serious environmental impacts. It creates colder-than-average conditions at the western South American coasts. It brings about droughts in South America and flooding in parts of Africa where droughts are attributed to El Niño.

The Monsoons

A more regular phenomenon than El Niño is the monsoons occurring in the Indian Ocean in India and other parts of Asia. This is related to the oscillation in the Indian Ocean referred to as the Indian Ocean Dipole. The word monsoon comes from the Arabic word "mausam," which means "season." The monsoon is a seasonal wind pattern over large parts of the northern Indian Ocean, along shores particularly those in the Arabian Sea. During the summer months, that is, from May or June to September, the southwest monsoon brings rainfall to large parts of the subcontinent. The winds come from the sea towards the land. These are blocked by the Himalayan Mountains, resulting in rain. The cause for this process is the enormous heating of the landmass during summer, generating vertical rising motion of the air and low-pressure over land. The rising air masses are replaced by air masses drawn in from the Indian Ocean.

During winter, the reverse occurs. The landmasses of northern India, especially the mountains, are cooled together with the air above them. The air becomes heavy and a high-pressure zone is established. The ocean, however, keeps much of its heat content longer, with a relatively low pressure over the ocean as a consequence. The wind thus reverses and blows from land to sea. This implies very dry conditions over the land.

The southwest monsoon is the major source of water supply, agricultural support, and energy. A normal monsoon brings an even distribution of rain and other weather conditions over most of India. This is essential for the whole country. An abnormal monsoon, on the other hand, brings too much rain and flooding in some places. In other areas, it brings too little rain, a condition which leads to drought and famine. A monsoon is said to have failed when overall rainfall is insufficient and there are long gaps between individual rainfalls. A failure of the monsoon can lead to major drought.

Over the past hundred years, about 20 major droughts have occurred. This leaves little doubt that the forecasting of the monsoon and its characteristics is also of major importance. It will influence the management of agriculture, water supply, and preparedness for flooding or drought, among other things.

Forecasting Changes and Events

It is very difficult to follow temperature changes because these are subtle. Sometimes, a summer would seem only slightly colder than the last one. But aside from temperature change, there are other ways in which we experience climate change. At times, dramatic events, heralding just such a change, occur. These events could be in the form of flooding caused by abnormally heavy rains, changes in cyclone occurrences, possible changes in the El Niño phenomenon and monsoon occurrences, or changes in droughts. However, these events require very careful analysis of existing data, alongside the necessary models. One obstacle to efficient analysis is that the time series of data are limited. This makes it difficult to separate the human-induced signal from the signals generated by the natural variability.

The importance of weather forecasting was highly demonstrated during World War II. Since then, the ability to do weather forecasting has increased very significantly due to scientific and technological breakthroughs, especially in satellite observation technology. Consequently, applications have reached practically all parts of society.

It is not surprising that many are disappointed in the limitations to weather forecasting. As technology becomes more sophisticated, so do human expectations. We demand more accurate and timely forecasting of weather events, such as storms, cyclones, typhoons, flood-causing rains, and even seasonal variability. And, the more reliable weather advisories become, the more reliant we are of them.

Human dependence upon reliable weather forecasting is natural and is often motivated by safety and economic concerns. Weather forecasts help us reduce our vulnerability to the elements. If we know when a storm is coming, we can then be ready for it. This involves planning, which is also a characteristic of the second motivation. We rely on accurate weather forecasts to help us associate certain activities with the best time for doing them. In this case, we would know when to transport goods by air. We would know when the best time is to schedule large operations on land.

In order to ensure both delivery and reliability, weather service should be a public service based on science and technology. Governments and governance have to be involved. International cooperation is a must, to ensure that adequate data are available in a timely and reliable way, and to help cover related costs.

Forecast information must address a real and perceived need. Its benefits depend upon the forecast of relevant components of climate variability and having decision options sensitive to the forecast information provided [Hansen, 2002].

Benefits of forecast information include enhanced security, protection of life and property, increased returns on production, reduced management costs, adjusted uses of energy, freshwater, and food, as well as improved food production. Forecasts and observations also help in risk assessment and risk management. Risks may be estimated and possibly reduced, thereby making insurance feasible. This, in turn, may be utilized to help solve financing problems. An example of this is provided by the recent insurance agreement between the United Nations World Food Program and the French insurer AXA Re. The agreement may constitute a major breakthrough in solving finance problems related to environment and development. Another example is the use of forecasts of tropical cyclones organized through cooperation between research and insurance interests at the Bermuda Station for Research [Malmquist, 2002]. Perhaps someday, developments such as the two cited above could gradually lead to a global insurance system for our life-support system.

There is also a need for the control and management of the uses and users of the forecasts. This need points to a deep-seated necessity for governance. Forecasts can be used not only to limit the uses of natural ecosystems capital to sustainable levels but also to prevent overtaxing these assets.

The Need for Data

As early as the 1800s, attention was given to the role that the ocean plays in forecasting weather. It was understood that to know more about the weather, data was needed from the ocean. At the time, no scientific forecasting was done. People made predictions about the weather based on practical experiences.

Clearly, there is a need for organized and regular data collection. With just such a purpose in mind, the International Meteorological

Organization was established in 1873 (now the WMO). The information collected through ships' log-books formed a substantial foundation for the International Meteorological Organization's data and generated increased understanding for weather and ocean surface current patterns.

Towards the end of the 1700s and early in the 1800s, British scientist James Rennell collected data from ships' logbooks and used them to prepare charts on the circulation in the Atlantic. He noticed that surface currents were closely related to the directions of prevailing winds [Deacon, 1996]. At about the same time Matthew Fontaine Maury of the U.S. Navy collected data from logbooks and prepared charts of seasonal surface currents and wind patterns. These were becoming more and more valuable for navigation and trade across the ocean because they helped decrease the crossing time of ships.

M.F. Maury realized that international cooperation in gathering data from ships would much improve the charts, for the benefit of all. Data would be gathered in accordance with agreed procedures, technology, and schedule. Accordingly, an international conference was organized in Brussels in 1853. Governments adopted and gradually implemented a standardized procedure for observation and reporting. This conference was a milestone. It gave birth to scientific cooperation among governments. This proved to be very important in the development of oceanography and meteorology and the practical application of research results.

As early as the 1930s and 1940s, the scientific community already understood that the atmospheric situation commonly referred to as weather is not the atmospheric condition that was present several days before: the "memory" of the atmosphere is relatively short. But because water is about a thousand times denser than air, the heating or cooling events of ocean water will be traceable for much longer periods in the ocean than in the atmosphere. Weather forecasting can, therefore, be improved by using observations from the ocean. These observations are then utilized to follow the transport of heat over large distances and periods. When exchanged with the atmosphere, heat can influence the weather. Satellites can be used to obtain necessary information from the surface of the ocean. With more detailed information from the subsurface layers of the ocean, we can now forecast the expected development of weather patterns over longer times. These patterns include seasons, shifts between seasons, rain, temperature, and wind "expectancies."

The ability to make such forecasts is particularly useful in managing, storing, and using freshwater, in the form of rain; heating of accommodations; river dams and flood management; transportation; agricultural planning; fisheries; tourism; and even recreation. However, conflicts can also arise from the use of this ability. Forecasting results can be used inappropriately; it could be utilized to gain advantages or to mismanage resources.

Sometimes, management refuses to use forecasting; this frequently leads to disasters at sea or on land.

When ocean data obtained recently, that is real- or near-real-time data, are used with running mathematical models, it becomes possible to forecast more accurately than before the occurrence and movement of hurricanes, typhoons, cyclones, and other exceptional storms, as well as increase the length of the forecast. Recent events in many parts of the world demonstrate the immense significance of reliable forecasting. Without question, the ocean gives us the means to better understand weather and forecast weather as well as climate variability. But have we made wise use of this gift? Have we treated the gift-giver in the manner it deserves?

Although developments in weather forecasting are mainly attributed to scientific and technological advancements, international cooperation, and socioeconomic motivations, Mother Nature has the overall control. She is subtle. She does not give away all her secrets and she always asks for something in return.

There is a need to increase the cooperation between nations, for establishing and operating an ocean-observing system. This system should also set guidelines for protecting the ocean from harm. Harm to the ocean comes not only in the form of pollution, but also as imposed changes in temperature and salinity, or salt content, and destructions of ecosystems and habitats. In some regions of the ocean, these impacts may be more noticeable than in others, depending upon the characteristics of the region. These regions may be utilized as early warning systems, provided regional cooperation and ocean governance permit adequate observations and data exchange.

Natural catastrophes arising from oceans can cause damages equal to, or even more devastating than, strong earthquakes. For example, cyclones generate strong flooding which not only damage property, but also take a high death toll, as has been the case, for instance, in the low-lying and poor regions of the Bay of Bengal, where the frequency of occurrence is much higher than in the other part of the Indian Ocean — the Arabian Sea.

Clearly, it is of great importance for us to forecast the generation and path of cyclones. We can presently provide rather accurate predictions of a cyclone's landfall about a day or two in advance. This is sufficient time for preparation or evacuation, provided there is a response system in place and that this is being used. In many developed countries, this is frequently the case. But in most less-developed countries which are usually more vulnerable, neither a response nor a warning system is in place. In the Bay of Bengal, hundreds and sometimes, thousands, of lives are lost every year due to cyclones. In November 1970, at least 300,000 lives were lost in Bangladesh [Qasim, 1998]. After the tragedy, the government introduced and constructed cyclone safety houses. But even so, tens of thousands of lives were lost and billions worth of property damages were incurred in November 1977 and April 1991. In Central America, hurricane *Mitch* caused just as great a death toll and economic losses.

Most cyclones occur in the last quarter of the year, but they can also strike in April, May, and June. The reality that cyclones cause massive destruction and death reinforces the call for a global system that can generate warnings and support responses. The United Nations has designated the years between 1990 and 2000 as the International Decade of Natural Disaster Reduction. To some extent, this program helped raise awareness of the issue and managed to demonstrate the importance of proper response systems and cooperation.

Climate Change and Variability

Our lives are dictated by the climate. Climatic conditions decide our agricultural production, housing conditions, and among many others, our mode of transportation. Drought and failed crops lead to famine and human catastrophes; so do El Niños and floodings. Climate variability and change impacts not only agricultural production but also fishery yields and distribution. Many of these phenomena are natural and our growing understanding of them helps us prepare for their occurrence.

There are several large-scale phenomena of variability, most of them strongly related to the ocean and the coupling between the ocean and the atmosphere. Over all time scales, the ocean responds to exchanges with the atmosphere. Changes in the ocean are smaller than those evident in the atmosphere. But they can be observed over longer time scales because the ocean has a longer memory, or larger thermal inertia, compared to the atmosphere. Therefore, long-time series of observations of the ocean are very important. For instance, the ocean responds strongly to continuous atmospheric forces, on interannual and decadal time scales [Figure 5].

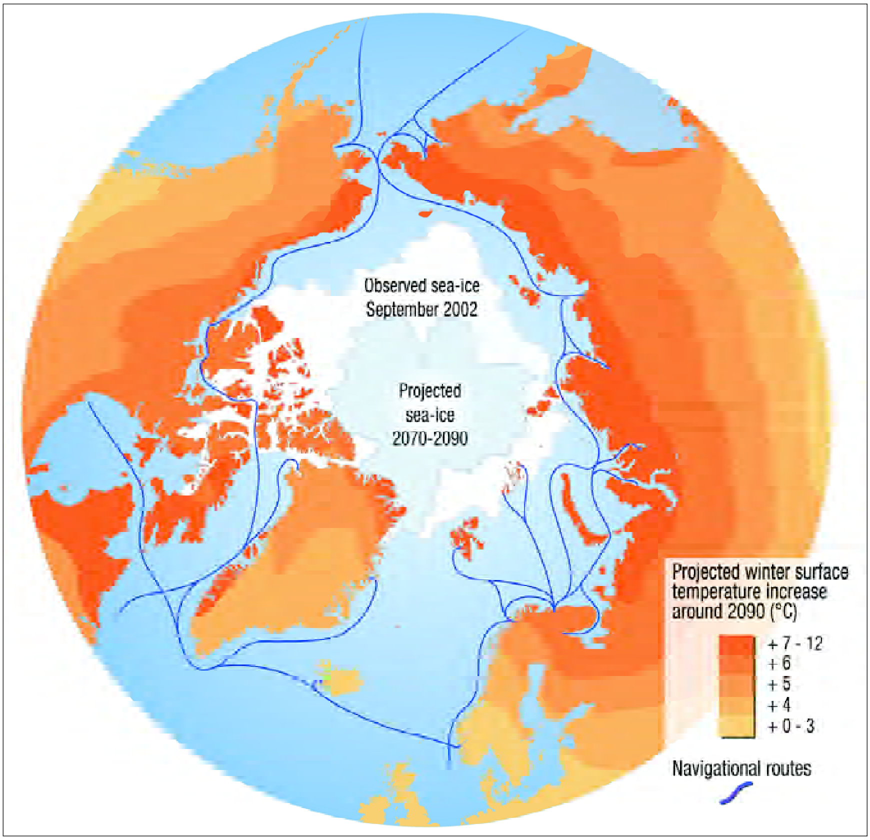
Records of changes over very long-time scales can be obtained through ocean sediment cores. Such examinations have revealed that during the last ice age, the northern part of North Atlantic was considerably cooler. Additionally, the flow of water from the central Atlantic towards the north is much reduced compared to the present situation. The Conveyor Belt was partially shut down. But its North Atlantic component started once more towards the end of the glaciation period, about 12,000 years back. However, sediment studies have also revealed that there was at least one serious interruption of this reactivation. This disruption occurred between 8,000 to 11,000 years ago and generated a dramatic cooling of the North

Atlantic region, thereby increasing glaciation once more. The cooling period appears to have lasted no more than 400 years. However, it developed comparatively quickly over a few decades only. There are several hypotheses about this phenomenon. But no explanation for the change in ocean circulation has been satisfactorily established.

Studies of ice cores from the Greenland Ice Shield have corroborated sediment findings. Ice core examinations showed that the major part of

Figure 5: Projected Changes in the Arctic Climate, 2090 — With Shipping Routes

"The averages of the scenarios in the Arctic Climate Impact Assessment (ACIA) are presented in this figure, for the year 2090, with the surface temperatures over land, the size of the polar ice cap, and the outer limits of permafrost. This map features shipping routes in addition — as the sea ice is decreasing, the potential for developing shipping in the Arctic increases."



Available at http://maps.grida.no/graphic/projected-changes-in-the-arctic-climate-2090-with-shipping-routes. [Accessed 12 January 2008]. *(Diagram: Hugo Ahlenius, UNEP/GRID-Arendal)* the warming transition from the ice age also occurred rapidly over approximately 40 years. Deglaciation, however, took much longer.

Ice cores from Greenland have revealed temperature changes of 5–10°C, as well as the doubling of precipitation over a period of about 20 years. But why do these changes occur? What triggers them? Are we now triggering such a change through our carbon-driven society? The answer to the latter question is a qualified yes. The answers to the previous questions are not yet very clear.

Antarctic ice cores have confirmed the connection between temperature and the CO_2 content of the atmosphere. These ice cores also shed light on the development of levels of CO_2, methane, and local air temperature over the last 160,000 years. The total range of temperature variation is about 12°C. The total CO_2 variation range is between about 180 and 280 units. Considering that we are now observing about 350 units, without a doubt there is cause for concern.

The abovementioned observations confirm that climate can change due to many natural and anthropogenic factors. There may not be any need for very large changes to trigger much more significant changes. Recent research results indicate that freshwater balance and heat balance both matter. A small change in freshwater balance can trigger a large change in thermohaline circulation.

A change in freshwater balance could be generated by an increased inflow of freshwater to the Arctic Basin and to the northern North Atlantic, triggered by a limited warming of the atmosphere. This would lower the salt content of the surface waters there. This occurrence would, in turn, decrease or prevent the sinking of surface water because cooling and evaporation may not be sufficient to generate sufficiently heavy surface water. This is because the water starts with a lower salt content than usual.

Where freshwater content and salt content are concerned, increased inflow of freshwater to the northern North Atlantic would decrease the differences between this part of the ocean and the Pacific. Thus, the compensation flow, which is part of the Conveyor Belt, does not need to be as strong as before; it could even weaken considerably. This has tremendous implication for the North Atlantic. It means that circulation would weaken and shrink. There would not be so much heat transferred to the European part so the climate there would change. Studies of circulation models from sedimentary records show that the scenario described here has occurred, to the extent that circulation has been different. It may have even been possible that deep-water formation was pushed as far south as the South Atlantic.

Our utmost concern now is climate change [Box 4]. There is a potential increase in average temperature of up to about 4°C over a century. This potential climate change is due to the increase of greenhouse gases in the atmosphere which absorb or trap radiation from the sun.

Box 4: Impacts of Climate Change

The occurrences of *heat waves* are likely to increase along with the temperature. This is proven by model studies that use observed heat waves. *Precipitation* is also likely to increase, including cases of heavy rain. This is due to the fact that warmer air can absorb more water vapor than cooler air. For every temperature increase of 1°C, there is a corresponding rise of 8 percent in precipitation. Climate models corroborate this, predicting a general increase of rain and rain extremes with increasing temperature, particularly in mid and high latitudes.

But what about the antithesis to excessive rainfall? A *drought* is not a sudden event; rather, it is a persistent condition with a long duration. There are numerous examples that show the devastating impacts of droughts in all continents. Several even occurred during the 20th century. However, it is not possible on the basis of present understanding to say that an increase in temperature has led to the intensification of droughts in endangered regions. Global studies indicate an increase of drought in the dry zones of Southern Africa and the Sahel of eastern Asia, in the last 2–3 decades. An increase of the global temperature by 2–3°C has been predicted. This will lead to a potential increase of evaporation by about 40 percent. But since the ocean, from where most of the water vapor comes, will warm up less efficiently, the real increase of evaporation will also be less. Nevertheless, there is a heightened risk of droughts.

Much work has been dedicated to analyzing the *frequency of storms* that occur outside the tropics, in the North Atlantic and Western Europe, for example. But so far, scientific results do not suggest an increase in the number of storms. In the North Atlantic and in Western Europe, storm frequency is coupled to the North Atlantic Oscillation (NAO). This is the variation of the difference of air pressure between the low pressure over Iceland and the high pressure over the Azores. It can be measured as the air pressure difference between Iceland and Lisbon. This index decreased from the beginning of 1900 to 1960 and has since then showed an increasing trend. It cannot be clarified yet if this increasing trend is due to natural variability or is an anthropogenic greenhouse effect. It is, however, clear that the low pressure systems over Western Europe have increased, as a consequence of the strengthening of the NAO.

As mentioned in an earlier section, *tropical cyclones* are extreme weather events which, when they hit targets, generate enormous damage and loss of lives. This is why it is of paramount importance to study how global warming affects their frequency and intensity, or if there will be any effect at all.

Box 4: (continued)

The relationship between global warming and the frequency and intensity of cyclones is not at all easy to explain. The origin, internal dynamics, and the interaction of tropical cyclones with ambient climate conditions are not well understood. Observations are not sufficient. This makes it difficult, if not impossible, to simulate in climate models the processes which occur in cyclones. A confident indication of how tropical cyclones develop and behave in a warmer climate is not yet available. Analysis of existing data show that in the North Atlantic, the number of hurricanes decreased from the 1940s until the early 1990s. But, there is a shift towards greater activity beginning 1995. In the Northwest Pacific, the number of typhoons and total tropical storms have increased since 1980. In the Southwest Pacific, there is a decrease in the frequency of tropical cyclones and this decrease was most evident in the middle of the 1980s.

Another factor that adds uncertainty to our understanding of the relationship is the influence of the ENSO on tropical cyclones. During El Niño events, tropical cyclone activity appears reduced in some parts of the Pacific. In other parts, these activities appear to strengthen. In the western Atlantic, however, tropical cyclone activity decreases. During La Niña events, opposite processes occur. This is not surprising because La Niña is the exact opposite of El Niño. However, much needs to be clarified before precise answers can be given to the question of how warmer climate affects tropical cyclone activity.

There is another effect of global warming that is of great concern for many oceanic islands and low-lying countries. This is the potential *increase in sea level* and its related extremes. These can have very serious impacts at regional levels. The 2001 IPCC report confirms that the average sea level has risen between 10 and 20 cm during the 20th century. The IPCC also pointed out that the heat content of the ocean has increased since the late 1950s, the period when adequate observations of subsurface ocean temperatures first became available. The model runs of IPCC also made projections on sea level changes. For the fossil fuel-intensive scenario, the projected average increase in sea level is about 45 cm. On the other hand, the two other major scenarios project a sea level increase of 35–40 cm. The IPCC concludes that global mean sea level is projected to rise between 9–88 cm sometime between 1990 and 2100. This primarily results from the expansion of the seawater due to warming, as well as the melting of ice from glaciers and ice caps. These two are the major factors which will cause the sea level to rise. There are other factors influencing the sea level, such as land rise or subduction, erosion of land, ocean currents, and atmospheric pressure.

Box 4: (continued)

Two significant changes have occurred in the Arctic Basin and attributed to climate change. These two are the thinning of the sea ice and a decrease in the area covered by ice. Observations substantiate the projected weakening of the thermohaline circulation in the northern North Atlantic. Similarly, observations over long periods suggest significant changes of ice conditions in the Antarctic region.

The regional climate of areas surrounding enclosed or semi-enclosed seas is very much influenced by the sea, due to the *heat content* of the water. This heat is obtained during the warm part of the year, and is largely retained because of the high heat capacity of the water. The heat remains there for at least a season and is used during the cold part of the year to increase air temperature. It reaches surrounding land areas. This explains why these areas have a warmer winter season compared to what they would have experienced had they not been close to the sea. This effect of the sea is evident in areas around the Baltic Sea, the Black Sea, the Caspian Sea, and the Mediterranean. In the case of the Mediterranean, there is also a noticeable opposite effect for coastal areas during the warm season, or at least parts of it. The sea does not warm up in the same way that air and land do. Heat is spread much deeper into the sea, mainly by the wind and waves that generate a stirring of the surface layers. This stirring gradually warms up the subsurface layers. At the same time, near-surface water does not warm up as much as the land and the air over land. A cooling effect on the coastal areas becomes obvious.

Knowing all these, it is completely logical for us to wonder if people living in the areas specified above are able to feel the effects of ongoing climate change. But it is probably not possible to identify specific signals. In fact, it is also possible that the warmer-than-usual recent winters in areas around the Caspian Sea may not be indicative of climate change. It could be the result of a larger-than-before heat storage in the sea. However, it is not possible to draw firm conclusions from the data presently available.

Forecasting Climate Variability and Change

Climate variability is potentially predictable. International research efforts demonstrate that climate variability can be reasonably modeled and forecasted [Goddard et al., 2001]. The ability to do so is a major scientific advancement. The long memory of the ocean makes it possible to obtain such long-range forecasting. Science and technological developments have made it possible to obtain the required ocean observations, transmit them as closely to real time as possible, and together with data assimilation schemes, use them in running models. These also make use of other observations from the land and the atmosphere.

Forecasts of climate variability are, however, not yet effectively used. This is due both to lack of data and observations to improve the forecasts and lack of communication between potential users and the producers of the forecasts. Efforts are underway to have user communities specify their needs and be more involved in the development of products and uses of forecasts.

Possible changes in weather extremes, such as higher wind speeds in storms, are of great concern since they can directly or indirectly lead to disasters that cause extensive loss of lives and damage. Changes in these extremes will have regional influences of a different nature. They are of considerable economic concern, especially to governments and the insurance companies. Recent regional case studies using data and models show an increased frequency of extreme weather events in some regions. These studies also indicate an increased probability that the anthropogenic greenhouse effect, that is global warming, is the cause of changes in weather extremes.

Several recent studies show the relationship between El Niño occurrences and the changes in freshwater resources. Such studies are carried out in Australia, Japan, Southeast Asia, and Central and North America.

Accurately forecasting El Niño ensures not just great economic gains but also the avoidance of too much suffering or social disruptions. Governments and other concerned parties can make the necessary adjustments or preparations. Fortunately, it is now possible to make accurate forecasts, thanks to the scientific and technical advances referred to earlier.

Advances in using forecasting have been strongest in South America. The considerable usefulness of forecasting to freshwater management has been well demonstrated in Argentina and Brazil. In Peru, forecasting has been used for preparedness, in respect to flooding preparations, the management of fisheries, and the appropriate selection of crops for agricultural cultivation.

Coupled mathematical models of the tropical ocean and atmosphere can now reasonably simulate an ENSO period. Clearly, forecasting is feasible. But in order to achieve forecasts, the models must receive information on real conditions of the ocean and the atmosphere. These pieces of information are obtained through observation. The required observing systems are in place in the Pacific. More systems are being established in the Atlantic and Indian Oceans. The related costs are small in comparison to potential gains. However, international cooperation is necessary to ensure the smooth running of the operation. Furthermore, education and information about forecasting as a tool must be provided.

National policies addressing the control and use of these tools are also necessary. All of these should be part of ocean governance.

Forecasting of the monsoon is, however, very complicated because many factors influence the monsoon and these vary between years. There have been progresses made in the understanding of these processes [Yamagata, 2003]. At present, statistical approaches to forecasting are used [Shetye, 2003] and will continue to be used until dynamic modeling can be utilized. In both statistical approach and dynamic modeling, observations from the ocean are crucial for success.

Climate Change Models and Simulation

Model simulations of the climate change presented by the Intergovermental Panel on Climate Change (IPCC) in its 2001 report showed that when the model simulations only included known natural forcing processes, they fail rather markedly to model the observed temperature change. On the other hand, model simulations, which included only human-induced or anthropogenic forcings, such as greenhouse gas changes and aerosols, simulate the observed temperature curve better. The best and quite good simulation was obtained when all forcings were included in the model.

Clearly, an anthropogenic effect exists. But can we trust the models to make predictions? The models have been tested over a wide range of scales and recent models can produce satisfactory simulations of current climate. The IPCC 2001 report concluded that the large consistency between models and observations can be used to provide an independent check on projected warming rates over the coming decades, given certain emission scenarios.

On the basis of model runs, the IPCC also presented a series of possible climate change scenarios for this century. These scenarios varied depending upon the diversity of development. The basic scenario describes a world with rapid economic growth, a global population that peaks mid-century, and a rapid introduction of new and more efficient technologies that utilize energy sources, be these fossil-intensive, nonfossil-intensive, or a balance between the two. The fossil-intensive, business-as-usual scenario gives a strongly increased CO_2 concentration and a temperature increase of about 4°C at the end of the century. The balanced approach of using a combination of fossil-intensive and nonfossil-intensive sources gives a temperature increase of about 3°C. Finally, the nonfossil-intensive scenario gives a temperature increase of approximately 2°C, a decrease of CO_2 emissions beginning 2030, and an almost stabilized CO_2 concentration level at the end of the century. Using the 1961 to 1990 average as the zero line, the average observed global temperature increase for 2000 is about 0.3°C. However, the increase of the global mean temperature since 1900 is 0.6°C. IPCC predicts that the globally averaged surface temperature will increase by 1.4–5.8°C in this century. There is no mistaking the urgency of the problem. Science has spoken; governments should act on this advice.

Efforts from Governments and International Organizations

The climate we have enjoyed on Earth since the end of the last deglaciation period around 11,000 years ago serves as our basis for defining basic climate conditions. Naturally, there have been a few deviations but these have been restricted to changes of 1–2°C.

The scientific community and the related international organizations took action towards the end of the 1980s. IPCC was established by the World Meteorological Organization and the United Nations Environment Programme in 1988. This panel involved the scientific community and different governments. These governments showed commitment because they had ownership of the IPCC reports.

The IPCC delivered its first assessment at the Second World Climate Conference in 1990. Besides using its conclusions on the facts mentioned above, it also presented model results that projected temperature increases of about 3°C until around 2100.

On the basis of this report, the Second World Climate Conference confirmed the need for an international treaty. The United Nations Framework Convention on Climate Change (UNFCCC) was signed at the Rio Conference, the United Nations Conference on Environment and Development in 1992. It entered into force in March 1994. The central goal of the Convention is stabilization of greenhouse gas concentrations. This means that gradual increases should be stopped so that gas concentrations become stabilized at an acceptable level. Since then, several conferences of concerned parties have been held. The best known so far is probably the third one in Kyoto, held in 1997. During that conference, the Kyoto Protocol was agreed to and accepted by all 159 parties present. The Kyoto Protocol urges developed and industrialized countries to reverse the trend of growing emissions and return to the levels present in 1990 and 1992. However, the implementation of the agreement has turned out to be very difficult and there are big questions about reaching the goal.

Despite this obstacle, the IPCC continues its scientific evaluation. In its second report in 1996, which laid the foundation for the Kyoto Conference, the panel concluded that "the balance of evidence suggests a discernable human influence on global climate." This means that observed temperature changes could only be simulated in models if the increase of greenhouse gases and other changes influenced or triggered by society were taken into account. This observation was further validated in the IPCC's third report, which was delivered in 2001.

The 2001 report states that most models show a weakening of the ocean thermohaline circulation, as a result of the expected global warming. This will lead to a reduction of heat transfer to high latitudes in the Northern Hemisphere. But even when this decrease of heat input is taken into account, the models still project a warming over Europe, due to increased greenhouse gases. So far, the models do not project a complete shutdown of ocean thermohaline circulation by 2100. But it is possible that this would happen later.

Evidently, even a small temperature increase in the atmosphere could have dramatic impacts on ocean circulation. However, climate change in the Northern Hemisphere would be in the opposite direction of a potential warming from the increase of greenhouse gases in the atmosphere.

A Global Ocean Observing System

The challenge of establishing a system for ocean observations has been taken up following UNCED 1992 and UNFCCC. Between 1989 and 1990, the Intergo-vernmental Oceanographic Commission (IOC) of the United Nations Educational, Scientific, and Cultural Organization (UNESCO) accepted the need to establish a comprehensive global system for collection and delivery in near-real time of ocean data. The initiative to build the Global Ocean Observing System (GOOS) was taken. GOOS was presented by the concerned scientific community as a program that serves the need of most sectors of society by addressing key issues of climate, living marine resources, coastal zone management, state of the marine environment, and maritime services, including weather forecasting. Initially, governments were very reluctant to accept the need for and much later, take on responsibility. However, the GOOS concept was endorsed by UNCED 1992 and subsequently, by the resulting United Nations Commission on Sustainable Development. The GOOS is now being gradually built on the basis of partly existing, as well as new national, regional, and global systems to create a GOOS Initial Observing System. The development is currently focusing on two modules. One is a global ocean module for detecting and forecasting changes in the ocean-climate system; the other is a coastal module concerned with effects on coastal systems [UNEP, 2003].

It appears that the strategy of focusing on regional developments of observing networks and data products is most appealing. Thus, the need for partnerships with regional programs, such as the Regional Programme on Building Partnerships in Environmental Management for the Seas of East Asia (PEMSEA) and the United Nations Environment Programme's Regional Seas Programme, and related institutions is evident. The development of the regional Mediterranean Global Ocean Observing System (MedGOOS) has been linked to, and teamed with, the Mediterranean Action Plan and Barcelona Convention. It took about a decade for the GOOS to reach its present state of development, with the IOC in the lead. This is remarkable when we consider that IOC is not an independent ocean agency; rather, it is only a sectoral subsidiary of UNESCO. How would things have turned out if we had had an intergovernmental and intersectoral ocean agency, inside or outside the United Nations system, such as proposed by Arvid Pardo in 1967? Since 1992, the Global Climate Observing System (GCOS) has been serving climate observing and forecasting needs, under the leadership of the World Meteorological Organization.

The intersectoral nature of services, such as the ones an observing system provides, should be emphasized. This calls for partnerships with the system's "customers" so that they are involved in the development of the system's specifications and requirements. This is not a scientific experiment, but a system to be put in place for everyone's benefit. Thus, there is need for a broad association involving civil society, private industry and sector, and nongovernmental organizations in the preparatory work and the operations and uses of the information. Very little development has been made in ensuring the association of all interests of society with the ocean observing system. However, changes are underway [UNEP, 2003].

The Climate Change: A Reflection

The climate over the last 6,000 to 7,000 years has been quite stable. This is demonstrated by the relative stability of the sea level during this period. We know that large changes in sea level, especially those that reach 100 m or more, are associated with the ice ages.

Naturally, such large variations in sea level can only occur over relatively longer times. However, they can be initiated over shorter time periods by particularly significant changes. One such change involves the ocean and clearly illustrates the ocean's role in the climate system. Ocean currents transport heat between latitudes, from the equator to the poles. The amount of heat transported is about the same as the heat transported in the atmosphere. A change in the ocean circulation could, thus, trigger a climate change. Such a change in the ocean surface layer circulation could be triggered by a relatively limited change in temperature as discussed earlier.

The penetration of the anthropogenic source of CO_2 into the ocean has reached over 1 km in some areas [Brewer et al., 1999]. If we were to inject into the atmosphere CO_2 amounts at a sufficiently lower level than today, the ocean would possibly be able to absorb it. It would keep the CO_2 in balance so that there would be no noticeable increase of the concentration in the atmosphere. However, with the present rate of release, the system cannot cope; an increase is occurring in the atmosphere.

The rate of change is, to a large extent, decided by the ocean and so is the size of the potential climate change, which is due to the increase of CO_2 in the atmosphere. The time scale of ocean circulation is an important factor. However, there are too many uncertainties involved and we are in need of more information, in terms of observations and related modeling, to analyze different scenarios of development. With sufficient information, it is possible to influence this development. Thus, we have a very strong argument for establishing an adequate ocean observing system. This must include basic observations of temperature; salt content; sea level; gases in the water and in the air, particularly oxygen, CO_2, and other chemicals, such as important nutrients; and selected biological characteristics.

With the use of satellites, much can be learned about the ocean's surface. However, information from the depths and even the bottom, in some critical places, of the ocean are needed. This highlights the need for adequate ocean governance that will help ensure the reliable functioning and protection of the equipment used for the observations.

Is the climate change scenario really that serious? We are certain that it is. This certainty is not only based on present understanding of the climate system and the observations we have of the development over the last decades. It is also based on observations of temperature, CO_2, and sea levels recorded over geological time scales covering several glaciations, and even more. These records are directly or indirectly hidden in the ice of presently existing glaciers in Greenland and Antarctica, and in the sediments or subsurface layers of the seabed. The varying characteristics and contents of chemicals in the ice and sediment layers reveal how properties of the climate have changed and alternated between warm and cold.

There are also good reasons to follow the development of the temperature of the ocean's bottom water. Large reservoirs of methane, in the form of ice-like solids called methane hydrates, have been found in sediments deep in the ocean. An increase of bottom water temperature may melt some of these methane hydrates. This would release methane to the atmosphere, thereby increasing the greenhouse effect significantly because methane is about 20 times more efficient than CO_2.

There have been hypotheses suggesting that such releases of large amounts of methane from the deep ocean possibly generated large climate changes in geological times. One possibility is the Paleocene-Eocene Thermal Maximum event about 55 million years ago, when temperatures were about 5°C and 7–8°C higher than at present, in the tropics and the polar areas, respectively.

There are uncertainties about this hypothesis. However, the precautionary principle would advice us to at least follow the development of bottom water temperature, knowing that the temperature in the interior of the ocean does increase in some areas.

Nature is complex and understanding its complexity cannot be done by one person or group singly. Concerted scientific efforts have the best chances of uncovering everything there is to know in the relationship between climate and the ocean. Additionally, response to observed changes of potentially large significance must involve both governments and governance.

Scientific studies show that over relatively long time scales, our natural climate has varied significantly. The last ice age occurred between 23,000 to 19,000 years ago. An optimum warm period occurred about 6,000 years ago. The so-called little ice age in our historic time occurred between 1450 and 1850.

The difference of the average temperature between these two extremes, namely the ice age and the period of optimum warmth, was about 7°C. This figure may seem trivial. The significance of smaller changes is, however, also well documented in the development of various cultures. The Egyptian culture flourished at about the same time as the optimum warm period. A western European culture established several hundred years earlier in southern Greenland died as a consequence of the little ice age in the 1500s. At the time, average temperature was only 2–3°C lower than the temperature today. It is, thus, very much apparent that the temperature changes we are expecting from human-induced climate change will have dramatic effects on the world. Our only hope of averting future catastrophe is through remedial and adaptive actions.

The most important question with respect to how fast the changes in climate can occur is related to the rate of ventilation of the ocean. How long does it take to renew the bottom waters? How old are these bottom waters? Until very recently, we estimated that they were between 500 and 1,000 years old. The bottom waters of the ocean have not been in contact with the atmosphere for a long time. However, recent studies in an international cooperative research program called the World Ocean Circulation Experiment have shown that the deep waters in the Atlantic and Pacific basins are only about 250 and 500 years old, respectively. The reason for this disparity is that cooling patterns and the interaction between the air and the sea are more active in the Atlantic than in the Pacific. Studies also show that CO_2 released into the atmosphere from human activities has reached depths of over 1,000 m [Brewer et al., 1999].

Combined research using several techniques and sources of information also suggests that the bottom water temperatures in the Atlantic fluctuate by 3–4°C over a 300-year cycle. Additionally, it shows that incidents of glacial maximum vary in a 450-year rhythm. It also suggests that the flow of cold Arctic water into the North Atlantic varies with a 1,500-year rhythm [Gerdes and Wefer, 2000].

Thus, we have a picture of a varying climate that oscillates between some extremes and is driven by the combined forces of the climate system. What will happen to the climate in the next few decades? No one knows for certain. What appears certain, however, is that it will get warmer.

Now, more than ever, the need to act in global solidarity on this issue is crucial and immediate.

References

Brewer, P.G., G. Friedrich, E.T. Peltzer and F.M. Orr, Jr. 1999. "Direct experiments on ocean disposal of fossil fuel CO_2." *Science*, 284:943–945.

Charnock, H. 1996. "The atmosphere and the ocean," pp. 27–40. In: *Oceanography: An illustrated guide.* Edited by C. P. Summerhayes and S. A. Thorpe. Manson Publishing Ltd., London.

Deacon, M.B. 1996. "How the science of oceanography developed," pp. 9–26. In: *Oceanography: An illustrated guide.* Edited by C.P. Summerhayes and S. A. Thorpe. Manson Publishing Ltd., London.

Elder, D. and J. Pernetta. (eds). 1991. *Oceans.* Published in association with IUCN: The World Conservation Union. Mitchell Beazley Publishers, London. 199 pp.

Gerdes, A. and G. Wefer. 2000. "The climate, the ocean and the history of mankind." In: *Hanse-Wissenschaftskollegium Annual Report for 1999*. P.O. Box 1344, D-27733 Delmenhorst.

Goddard, L, S.J. Mason, S.E. Zebiak, C.F. Ropelewski, R. Basher and M.A. Cane. 2001. "Current approaches to seasonal-to-interannual climate predictions." *International Journal of Climatology*, 21:1111–1152.

Hansen, J.W. 2002. "Realizing the potential benefits of climate prediction to agriculture: Issues, approaches, challenges." *Agricultural Systems*, 74(33):309–330.

IPCC (Intergovernmental Panel on Climate Change). 2001. "The scientific basis." Available at http:www.wunderground.com/education/abruptclimate.asp

Lozan, J.L., H. Grassl and P. Hupfer. (eds). 2001. *Climate of the 21st century: Changes and risks*. Wiss. Auswertungen, Hamburg.

Malmquist, D.L. 2002. "The risk prediction initiative," pp. 29–40. In: *Report on the Risk Management Project First Phase*. International Ocean Institute Headquarters, Malta. 201 pp.

Qasim, S. Z. 1998. *Glimpses of the Indian Ocean*. Universities Press (India) Ltd., Hyderabad, India. 206 pp.

Shetye, S.R. 2003. "Southwest monsoon: Provider of water to South Asia," pp. 49–60. In: *Proceedings of dialogue between the ocean and freshwater communities: Forests, rivers, oceans and the skies*. World Water Council, 3rd Water Forum, Tokyo, Japan. 115 pp.

UNEP. 2003. *Global Marine Assessments: A survey of global and regional environmental assessments and related scientific activities*. UNEP-WCMC/UNEP/UNESCO-IOC. 132 pp.

Watson, A. 1992. "Conveying that sinking feeling." *Nature*, 336:561–562.

Yamagata, T. 2003. "The role of the Indian Ocean in climate forecasting with particular emphasis on summer conditions in East Asia," pp. 1–34. In: *Proceedings of dialogue between the ocean and freshwater communities: Forests, rivers, oceans and the skies*. World Water Council, 3rd Water Forum, Tokyo, Japan. 115 pp.

CHAPTER 8

The Coast and Beyond: Multiple Use, Conflicts and Management Challenges

Gunnar Kullenberg

About a hundred years ago, Lord Byron romantically, and perhaps wishfully, wrote: "Man marks the Earth with ruin — his control stops with the shore." The first part is still true, but not the second. Regrettably for most of us, the prevalent view of the ocean begins and ends at the shore. Thus, it falls on those who operate at sea and those who depend upon the sea for their livelihoods as well as concerned citizens and scientific communities to inform society how mankind marks the ocean.

The Coast

It is very important to know where the coastal zone ends and where the open ocean starts. We would not have a shoreline or a coastal zone without an ocean. The coastal zone is where the land, the ocean, the ocean floor, and the atmosphere all meet. The coast may thus be defined as that zone of linkage, or the zone that links land to sea. Many scientifically based definitions of the coastal zone have been provided or suggested. One is that "the coastal zone is the band of the dry land and adjacent ocean space in which ecology and use directly affect ocean space and vice versa" [Johnston et al., 1975]. Another defines it as "an area of variable width which extends seaward to the edge of the continental shelf, but which has no distinct landward demarcation. It is within this zone that man's activities can interrupt or destroy natural ecosystems and natural processes whether they are biological, chemical or physical" [Hail, 1980]. Other definitions have been used to define the coastal zone with reference to specific areas, like the areas of the Straits of Malacca [Chua et al., 1997] and the Seas of East Asia [Chua, 2006]. We should take note of the fact that the definition of the coast varies as our knowledge of the coasts and oceans increases. This chapter uses the term "coastal zone" interchangeably with "coastal area."

Our early understanding of the coast appears limited to the area of land to which the sea reaches directly and the area of the sea that becomes dry at some point in time. The size of the zone of land and sea is normally defined by the range between high and low water. This intertidal zone is an area of dynamic land-sea interface and is governed by geo-physical interactions known as the "forcing" of the coastal seas [Box 1]. New knowledge and technologies make us realize that these interactions have gone beyond the narrow strip of coastal band and have extended to the interactions between the land, the sea, and the people, going as far up to the watersheds of the hinterlands and to the open seas, thus implying a broader definition. The term "coastal area" is more frequently used now to mean that stretch of the coastal land and the adjacent seas which are physically, ecologically, and socioeconomically interconnected.

Coastal Resources, Multiple Uses and Competition

Undeniably, the coast is a resource in its own right. In fact, it is a resource that is home to many other resources, these include: building materials, such as sand and gravel; minerals; salt; freshwater (which is obtainable through desalination, and is being utilized more and more to meet freshwater demands); renewable energy harnessed from currents, tides, and waves; and fish and other marine products. About 70 percent of all marine food are taken from coastal waters.

According to a review of the Food and Agriculture Organization (FAO) which was cited by the Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection [GESAMP, 2001b], about 20–30 percent of the total animal protein intake in the poor countries of the Far

Box 1: Geo-physical Interactions at the Coast

The coastal seas are strongly influenced by the interactions of oceanic, atmospheric, and terrestrial factors. Scientists refer to this form of interactions as the "forcing" of the coastal seas. These factors generate many phenomena, including: waves, tides, fronts, vertical movements, horizontal currents, meanders, eddies, filaments, plumes, stratification, water masses and ice formations and transformations, turbulence, and mixing. These phenomena may or may not occur with varying strengths in different regions. Regions may be different or similar with respect to the mix of coastal phenomena that are present.

Some coastal phenomena, such as tides and storm surges, have long been recognized to be of immense importance and are quite well understood. Others, such as cross-shelf transport and water formation mechanisms, are now recognized as significant but require more study. An example is the so-called "rip currents" that are generated by rather strong wave action on beaches. The forcing gives rise to undercurrents going out in streaks perpendicular from the beach, at considerable strength. These currents are dangerous for swimmers. Should a swimmer be caught in such a current, he or she can get out of it by swimming parallel to the beach, perpendicular to the current itself.

Another common phenomenon is the change of water level at the coast caused by tidal motions known as tides. Tides are mostly very regular, with highs and lows once or twice a day. In addition to the tidal variation, the atmospheric pressure influences the sea level. High air pressure generates low water. It is normally a sign of good weather when the water level is low. Conversely, when the water level is normally higher than average during low air pressures, this normally signals bad weather. Usually, extreme events occur at most shorelines with higher-than-normal high water. Such events are usually meteorologically generated and are caused by storms or cyclones, which may have originated very far away. These high water levels can generate seawater intrusions that are much further inland than is normal.

The severity of flooding at low-lying areas depends on the persistence or duration of the storm, the distance over which the storm blows, or the strength of the tropical cyclone or hurricane and how and where it hits the coast. When such extreme events coincide with high water, the impacts on coastal areas are particularly strong.

Extremely high water can also be generated by a particular wave phenomenon, referred to as a tsunami. The word is of Japanese origin and translates as "harbor wave." Following the devastating tsunami event

Box 1: (continued)

in December 2004, the word became almost a household expression. These waves are caused by underwater earthquakes or other disturbances that are mostly of geological origin. These disturbances give rise to an ocean wave that reaches from the sea bottom to the surface known as the long wave. Such a wave can travel across the ocean at a high speed which is decided by gravitational acceleration and ocean depths. At a depth of 4,000 m, the speed is about 200 m per second. This means the wave will travel from the Central Pacific to the Japanese coast in about 6 hours. As long as the wave is over the deep ocean, the wave is hardly noticeable. But when it approaches shallow water, its energy can only be contained by an expansion of the water column. The water level rises. It rises dramatically at the coast and can exceptionally reach tens of meters.

The first sign of the incoming wave is a decrease of the water being sucked out; then, the surge follows. These waves are most common in the Pacific Ocean, hence the Japanese name. However, such waves also occur in other regions. It is believed that the Cretan-Mycenaean civilization in the Eastern Mediterranean was wiped out by a giant tsunami wave. This is believed to have been generated by the eruption of the volcano, Santorini, at approximately 1400 BC. The eruption was accompanied by a strong earthquake and a huge tsunami; both of which had severely destroyed the Cretan culture [Soloviev et al., 2000].

In the aftermath of Hurricane Katrina (Photo: DAVID HELVARG, Blue Frontier Campaign, Marine Photobank)

East, Asia, and Africa comes from fish. Other estimates point out that about 1–2 billion people in the developing and least developed nations depend upon fish as their only source of animal protein.

Food is not the only resource that the coast provides. Coastal ecosystems, particularly wetlands, provide very important services for society — they filter; clean and break down sewage; and absorb heavy metals, organic pesticides, and runoff during rainy periods. They also supply large amounts of organics and nutrients to adjacent coastal waters, thus supporting biological productivity.

Generally, coastal and estuarine ecosystems have unique biodiversity characteristics. These characteristics are related to the large variability in physical and chemical conditions experienced by the ecosystem. Each one is relatively resilient and could endure a large number of disturbances. Estuarine ecosystems, in particular, are subject to shocks due to strong physical "forcing." This is why these ecosystems are said to be mostly in the exploitation phase [Costanza et al., 1993]. They are low-biodiversity systems. Coral reefs, on the other hand, are considered stable, high-biodiversity systems.

Without question, the coastal area is one of the richest zones on the planet. The global value of the services of the coast was estimated at USD 12 trillion per year [Box 2]. However, it is also the most vulnerable zone. This vulnerability is amply demonstrated in monetary terms by the average total economic losses resulting from natural disasters hitting the coastal zone. In the 1990s, these losses amounted to USD 25–30 billion. In the 1980s, losses were no more than USD 10 billion. In the 1960s, damage was estimated to be less than USD 5 billion. Due to natural and manmade losses, the coastal zone is becoming increasingly pressured by human activities on land and sea [GESAMP, 2001a, 2001b].

Box 2: Can We Put a Value to the Coast?

The coastal area is a very large national resource. How can we estimate its value in monetary terms? Such an effort needs an understanding of the ecological, economic, and social importance of the coasts and the oceans as well as their interrelationships. This is so because we now realize that the ocean plays a critical role in the material cycles and energy balances in the marine system. For instance, the uptake and release of so-called greenhouse gases by the ocean, principally water vapor and carbon dioxide, are of enormous importance to the climate. The transport of heat by ocean currents from low to high latitudes makes these latitudes humanly habitable. Likewise, the ocean serves as a direct sink for most wastes generated by human

Box 2: (continued)

activities. It plays a huge role in absorbing much of the nutrients released by us by converting some into human food such as marine algae, fish, and other marine products. Therefore, the ocean is a great asset in our service-oriented economy.

Attempts have been made to estimate the values of the products and services that the ocean has long been providing mankind. The initial estimates by experts show that the numbers are indeed very large, and are comparable to the total global gross national product of USD 18 trillion per year. Such numbers are rather difficult to comprehend. What does it mean to an individual living at the coast? The global value of the services of the coast was estimated at USD 12 trillion per year. A perspective for these numbers may be obtained by noting that the world's coastline is about 440,000 km in total length [Goldberg, 1994; Inman and Nordstrom, 1971]. The global population is now about 6 billion; approximately half of this lives on a strip of about 100 km from the coast. If we simply divide USD 12 trillion equally among the coastal population, we get a figure of USD 4,000 for every person per year. For many, this would be a considerable or even impossible amount to pay. By coincidence, of course, the per capita income in countries eligible for support from the Global Environment Facility is the same, that is, USD 4,000 per year. The values given so far do not include resources which are found near the shore and in coastal waters. These resources include living, bottom-living organisms, and many others. Many of these living resources migrate in and out, between the coastline and the open sea and along the coast. No political or human-imposed national boundaries can stop them.

Harbor view, Table Mountain, Cape Town, South Africa (Photo: CHUA THIA-ENG)

Runaway Coastal Population and Multiple-use Conflicts

Over the last century, we have seen a steady drift of population towards the maritime frontiers. In a recent review, GESAMP [2001a] estimated that about 44 percent of the global population lives within 150 km of the coast. This is more than the number of people who inhabited the globe in 1950. The movements towards the maritime areas were not very obvious about 150 years ago. Then, populations moved more towards the interior of the continents as land transport developed more than the maritime ones. But this changed. Why? It is reasonable to relate this change to the following factors:

- increasing role of maritime transport and the development of ports and harbors at the coastal areas;
- technological development of the marine sector and the associated increasing specialization of production systems;
- gradual globalization of the economy; and
- interdependence and expansion of global markets.

The value of access to the ocean through coastal areas has also increased commensurably, and so, too, has the coast's attraction for the populace.

Recent assessments show that the capacity of some coastal waters to cope with waste inputs has been reached [GESAMP, 2001a, 2001b]. The coast is already overexploited in many parts of the world. Before long, existing coastal capacity to cope with growing population pressure will be surpassed. Over the last 50 years, the human population increased from 2 to over 6 billion. This increase is accompanied by tremendous global changes in the consumption and use patterns as well as changes in the physical, chemical, and biological features of the coasts. Some of these changes greatly impact sensitive habitats, such as mangroves, coral reefs, and seagrass beds in tropical and subtropical areas.

Just as major land-sea interactions are occurring at the coastal area, so are most activities of our society. These activities include: urban development, port and shipping, waste management, recreation and tourism, land reclamation, coastal aquaculture, desalination, artisanal and recreational fisheries, and extraction of building materials and other types of mining including prospecting for metals ranging from tin ore to diamonds.

The multiple uses of, and people's pressure on, the coastal area create severe conflicts. Original coastal populations are pushed away or prevented access to the coast by various industries, particularly the development of the tourism industry. The conflict can be quite dramatic for individuals who wish to use the beach for recreation and swimming. There may be lack of space because of the presence of a hotel or other tourism complexes. There may be danger in swimming or bathing due to pollution of the water. The beach may simply look too dirty to be useful or attractive. When swimming is possible, care may have to be taken because of water scooters or speed boats that are nearby, often driven by persons not really qualified to do so. Such social conflicts are becoming more and more common and are particularly noticeable in densely populated areas where mass tourism occurs. Such can be the case in many small islands that are popular for holiday visits.

Use conflicts can also emerge between land users and sea users. The potential for conflicts invariably results between income and employment- and product-generating activities. For instance, fish or other seafood farming, which is becoming very common in many coastal zones, requires reasonably clean water and protected areas for cages, nets, or rafts. On the other hand, the land users, whether generating runoff of nutrients from agriculture or insufficiently treated wastes from industries, cities, or tourism resorts will normally disturb marine farming, affect beach quality, or upset ecosystems. So will shipping, particularly in the transport of oil and harmful substances. Disturbances occurring through waste disposal and other activities at sea are also transboundary, spreading from the sources to other parts of the coasts and usually across jurisdictions.

A recent review by GESAMP [2001a, 2001b] concluded that:

- the impact of society on the ocean is most severely felt and seen in coastal areas, including coastal land strips and adjacent waters;
- the natural homes for biological activities or habitats have already been severely impacted and are threatened with further damage. These include seagrass beds, mangroves, wetlands, estuaries, and coral reefs;
- public health risk from exposure to contaminated seafood and coastal waters is more significant than so far realized; and
- existing quality standards for bathing waters and seafood do not provide adequate protection.

The review also concluded that the open ocean is much less affected than coastal areas, although the open ocean is contaminated with substances that are widely spread through the atmosphere from sources on land. These substances include some metals (such as mercury and lead), fertilizing substances (such as iron, nitrogen, and carbon dioxide), and some persistent synthetic materials (such as a pesticide, dichloro-diphenyltrichloroethane, known as DDT) which are potentially very harmful for marine ecosystems and marine life. The substantial uptake by the ocean of carbon dioxide released to the atmosphere through fossil fuel uses has led to an increase of the ocean water acidity. Acidification can have serious consequences for biological production and marine life and for the health of the ocean as a whole.

Without adequate coastal governance and effective management of human activities, rapid economic developments will continue to lay the foundation for environmental disasters as well as aggravate land- and sea-use conflicts.

This brings up the need to define more precisely than before the coastal zone and how to access and properly manage the resources falling within the national jurisdiction. In this context, the need for political and ecological definitions of the coastal zone becomes very obvious. The latter is related to the ecological functions of marine and terrestrial components of the coastal area. As stated earlier, the ecological definition implies that in the coastal zone, land ecology and its use directly impact ocean ecology, and vice versa. This means that the planning of the uses of the area, as well as the management of these uses and of the area itself, must take into account both the land and the marine components of the coastal area. The transboundary issues outside national jurisdictions may also require cooperation and if possible joint management with concerned neighboring countries.

Political definitions of the coastal zone are very significant as well. Over 80 percent of the world's independent states border the ocean or an adjacent sea, of which about 30 percent are islands. Most islands fall under the definition of coastal area. Others are maritime or archipelagic states like Indonesia and the Philippines, very large parts of which are coastal. In a political context, the need to intensify coastal planning, promote dialogues, and build partnerships among stakeholders is significant. This will ensure the rational uses of coastal resources so as to minimize conflicts. Combined and coordinated zoning schemes for land and sea use are needed. These should be set up in a rules-based management system.

There is also a need for deciding how much development pressures the coastal area can take without its ecosystems totally collapsing. If the natural defense provided by coral reefs, offshore sandbars or dunes, and mangroves are weakened then the waves and currents in the sea will freely erode the beaches and change the coastal landscape. This is evident in the Indian Ocean tsunami in 2004.

Coastal Urbanization

In this century, worldwide urbanization along the coast has grown dramatically due to population explosion and the overall migration of human population into the coastal areas. This has resulted in densely populated urban centers. Consequently, many megacities, with population above 8 million, have emerged. This continues to occur in all continents particularly in North and South America, North- and Southeast Asia, and increasingly in Africa. Desertification, climate variability, lack of habitable land, and the growth of tourism (which is the largest industry in the world and is still growing) also contribute to urbanization.

Two-thirds of all cities with over 2.5 million inhabitants are found on coasts [GESAMP, 2001a]. In 1950, only London and New York had over 8 million inhabitants. In 1975, there were 11 megacities. In 1995, there were 23 (17 of which were in developing countries). Forecasts indicate that by 2015, there will be 36 such places, with 30 of them in the developing world. Of this number, 22 will be found in Asia!

By themselves, growing cities directly attract domestic and international investments. These investments create opportunities for economic growth, employment, and livelihood. Urban areas generate about 55 percent of gross national product in low-income countries, 73 percent in middle-income countries, and 85 percent in wealthy industrial ones. Some cities have grown into regional or global commercial centers such as Shanghai, Hong Kong, and Singapore in Asia and New York and London in other parts of the world.

Socioeconomic Impacts of Coastal Urbanization

While coastal urbanization has certainly made significant contribution to national GDP, the process has resulted in some serious socioeconomic concerns relating to: availability of food; access to freshwater supply, sanitation and health services, employment, housing, and recreational

Coastal settlement in highly polluted urban area in Manila, Philippines (Photo: CHUA THIA-ENG) space; and changing quality of life. These factors are interactive and have direct or indirect impacts on the marine environment. Furthermore, large centers and megacities have attracted very large populations of poor people who live in slums and are unable to afford even the most basic necessities, such as clean water and sanitation. Problems related to these concerns are obviously very noticeable in the developing world. However, we can also find most of these problems in the developed world, in cities such as New York, London, Rotterdam, and even Tokyo.

The negative impacts of urbanization is the combination of the consequences of the continuous discharge of untreated domestic sewage, industrial wastes and dredged materials; urban runoff; indiscriminate disposal of solid wastes, excessive groundwater extraction, sand mining and land reclamation. This has posed considerable risks to human and ecosystem health such as seafood contamination, contaminated bathing beaches, and loss of habitats. Economic losses are also brought about by the closure of recreational beaches, land subsidence, erosion, saltwater intrusions, and the loss of fisheries and marine biodiversity. Improperly planned sea ports and congested shipping traffic sometimes might result in navigational hazards and threats to safety at sea.

Bangkok in Thailand is a good example of a low-lying metropolis exposed to the abovementioned threats. A large part of this megacity is now below sea level. The withdrawal of over a million cubic meters of groundwater per day from the water table and aquifers has resulted in severe land subsidence and saltwater intrusions that further contaminate its limited freshwater supply [APN Megadelta Project, 2004]. Another example is the sinking of Venice, which is also due mainly to the withdrawal of groundwater.

Competition for limited space in coastal areas is a growing problem not only for urban centers but also for the hinterlands they serve. An example is provided by the port developments in the West Coast of the U.S. and in Europe. These ports serve distant hinterland areas through rail and road to ship-borne container traffic. These ports' expansion is constrained with the possibility of horrendous land traffic. For example, the expansion of the Rotterdam Harbour was limited by objections from the local and regional authorities including the government because they did not want an increase of land traffic in the country. This limitation will lead to investment in more harbors and ports as the demand for container transportation increases. It must be noted, though, that thus far, transport by sea is cheaper than by land despite the fact that costs in constructing and maintaining harbors are considerable.

Pond embankment for shrimp farming at an estuary in Danang, Vietnam; a lift net operates beside the ponds (Photo: CHUA THIA-ENG)

Impacts of Coastal Urbanization on Ecosystems

Many coastal centers are located at river mouths, along the river, and in areas close to the coastline. These are also areas where important ecosystems are located such as estuaries, mangroves, seagrass beds, and coral reefs. These ecosystems, generally rich in biodiversity and productivity, are important food sources for local inhabitants. Increasing urbanization has led to the gradual degradation of these ecosystems primarily caused by human activities described below.

Coastal aquaculture

Coastal aquaculture are fish farming practices (which include shrimp, shellfish, and finfish farming) in the coastal areas. Most large-scale coastal aquaculture are located in estuaries, in intertidal areas, or adjacent coastal waters. They depend on good water quality, adequate water renewal, and proper shelter against strong currents, waves, or storm.

Compared to freshwater aquaculture which is an age-old practice in China dating back to the 5th century BC, coastal aquaculture, is a new venture. In many places, it started as a small-scale fish farming practice to augment income and food sources. However, in recent years coastal aquaculture has grown and expanded into large-scale commercial enterprises producing high-priced commodities such as shrimps, groupers, snappers, abalone, lobsters, and oysters for local consumption as well as for export.

These practices have led to large-scale conversion of valuable coastal wetlands and adjacent rice fields for shrimp farming. In addition, the fencing off of large areas of coastal waters for pen and cage culture and raft culture in or close to the intertidal zone has destroyed seagrass beds and, in some instances, blocked navigational passages. While intensive aquaculture requires large quantities of feeds and fertilizers — and sometimes the use of chemicals such as antibiotics to control diseases — to improve production, they have nonetheless caused pollution. The unconsumed feeds and the excreta from the farmed animals are another source of organic pollution. These also affect nearby ecosystems such as coral reefs. Such aquaculture practices are unsustainable. The resulting environmental degradation and loss of habitats will require costly remedial measures. The loss of wetlands, seagrass beds, and marshes is a very significant loss of our valuable natural assets.

Coastal mining

A common practice in recent years is the mining of sediments such as sands along the river mouth and nearby seabeds as building materials for the booming construction industry. For instance, marine aggregates supply about 15 percent of England's need for sand and gravel. The same is true in many other parts of the world. This has caused serious coastal erosion and loss of habitats. In a natural condition, the supply of sedimentary material to the coastal zone is through river runoff which brings sediments from land to the river mouth and then distributed by currents along the coasts. This is an absolutely essential natural process for keeping a sedimentary balance. However this natural process has been undermined. It has changed dramatically through the damming of rivers and the removal of sediments from coastal areas through mining.

Discharging harvested sand for coastal land reclamation from sand mining operation in Xiamen, China (Photo: CHUA THIA-ENG)

Land reclamation

An opposite activity is land reclamation. This is practiced globally especially in large urban areas through the infilling of shallow waters and coastal space with materials obtained from nearby seabeds or other filling materials from land. Hong Kong has the largest reclaimed coastal area in the world; Singapore and Tokyo are also examples of urban cities undertaking extensive land reclamation. In the process, the loss of habitats has become inevitable.

In many other low-lying countries, land reclamation is very important for their own survival. The Netherlands, for example, is mostly below sea-level. Thus, almost one-third of its land area is reclaimed. Land reclamation continues to take place as part of the coastal development over the last half-century. It is unfortunate, however, that in some cases land reclamation has contributed to conflicts between countries.

Management of the Coastal Area

The coastal area is perhaps one of the most complex natural systems that have been extensively utilized by human beings for their economic growth and prosperity. Coastal management needs to take into consideration the various dynamic processes that are taking place in the coastal zone. These include the dynamics of ocean, atmospheric, and land interactions; the dynamics of natural resource and ecosystems; and lastly the human dynamics in an era of globalization and human dominance of the seas. Added to these is the frequent occurrence of natural and manmade disasters and calamities such as typhoons, storm surges, tsunamis, floods, and the like. These are further aggravated by climate change resulting in an increase of sea temperature, sea level rise and increasing threats to lives and economy of the coastal population.

The problems in the coast cannot be addressed in a sectoral way. Resolution must come in the form of a combined approach that takes into account land resources, land use, population development, demography, and the coastal situation. Experience teaches us that we cannot satisfactorily deal with the land and water as separate entities; but as entities that continuously interact with each other. Therefore, there is a need for an integrated approach.

It must be emphasized that the coast is a resource system and we must treat the coast as a part of the whole ecosystem wherein humans are an important part. Managing the coast requires the participation of several levels of the society, especially the local communities.

A major challenge is the migration of the rural population to coastal urban centers. To minimize population pressure in the urban centers, efforts must be made to make it possible and attractive for rural populations to remain in the rural coastal areas. One way to do this is to promote sustainable livelihoods.

Poverty is another issue in most coastal areas. It is universally acknowledged that poverty increases risks and precludes sustainable development. The vast majority of victims of natural or anthropogenic disasters, epidemics, and environmental diseases are the poor. Poverty also contributes to the degradation of the environment. These degradations include deforestation, desertification, and pollution which, in turn, increase poverty. If a means to curbing poverty could be found, everyone in the world would be much better off. This is because apart from being an ethical imperative, the eradication of poverty has a risk-reducing effect. The abolition of poverty in the shantytowns of coastal megacities and marginalized coastal villages must be a priority for coastal managers. Lack of information on risks, lack of awareness and education, and the resulting lack of precaution and preparedness, increase vulnerability to natural and human-related impacts. The Regional Programme on Building Partnerships in Environmental Management for the Seas of East Asia (PEMSEA) has shown that problems can be constructively addressed and degradation can be reversed without hindering economic development through the application of sound integrated coastal management practices. PEMSEA also shows the necessity of involving the people especially the local communities to help them improve their livelihood conditions and quality of life [Chua, 2006]. These, along with equity, are vital in the attainment of sustainable development.

New coastal management approach should replace those used in the 1950s. Those approaches, which are basically sectoral in nature, have been proven to be ineffective and inefficient in addressing complex and complicated coastal issues. A basic scientific problem is the unpredictability of the relatively unstable condition in the coastal areas especially the estuarine systems. Such resource system is usually complicated by the dynamics of the ecosystem, active human interference, and scientific uncertainties. It is also difficult to address the issue of property rights. Current management institutions are generally not adapted to this situation because they were created for much more stable terrestrial systems [Costanza et al., 1993].

Since the 1960s, many national efforts have been made to improve the governance of coastal areas, regional seas, and the use of marine resources. These efforts, primarily undertaken in Europe and North America, have demonstrated that the deterioration of environmental conditions can be reversed if timely and effective management measures could be administered especially at the local levels.

One working model, developed over several decades in the Netherlands, clearly illustrates the usefulness of the abovementioned management approach. This includes horizontal and vertical integration with a delegated decisionmaking process; a high level of participation by all stakeholders; and the development of a transparent process in making management decisions. With these approaches sustainable coastal development can be achieved. Clearly it is through cooperation and partnerships, rather than competition that most multiple-use conflicts can be avoided or minimized.

Co-management is also another approach that is being used more frequently in urban and rural areas. Many relatively successful examples are available in the Netherlands, Canada, and Brazil. In order for co-management to function, there is a need to build up the social structures of communities and townships and stimulate the interactions between interest groups, communities, authorities, and governments. The legal system at the national level must also be appropriate to ensure protection of the local population against intruders.

Coastal Management Plans

In achieving sustainable development of a coastal area, the first aspect to consider is to ensure the balance between development and environment. Thus, it is very important that a zonation scheme be developed for the various uses of the coastal area. These uses must be based on the ecological functions and development priorities of the area — taking into account scientific information on oceanography, tidal and sea-level conditions, river runoff, beach and coastal morphology, habitats, and natural resources (both living and nonliving). In order to avoid future use conflicts, it is desirable to find the right balance between the developmental goals for a limited area and the environmental concerns for a larger one. This is because impacts of the development normally go beyond the developed area itself.[1]

The early specification of goals for the management of a given coastal area and the development of the resources therein is an essential step in coastal planning. A practical and social agreement on the plans must be implemented. Such an agreement should include specific management

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[1] Many development activities, such as heavy construction, filling, dredging, and land reclamation will bring about irreversible physical changes. Because the economic investments behind these actions are substantial, it is, therefore, important that space be allocated for the right uses. Development actions have great impacts on resources. In fact, the conditions on land change because of these actions. Two examples of such changes are the quicker generation of more surface runoff and reduced material transport to the coast.

recommendations and identified control mechanisms. Marine space, the waterfront, and the hinterland must be considered together, at all times taking into account social matters. The linkage between land and sea in the operation of ports, industries, construction, groundwater and building material extraction must be clearly recognized. Additionally, transportation to the waterfront, into and from the land, must be assessed.

There are references that can help us in coming up with goal specifications. Experiences from developed countries, mostly in Europe and North America, are available. In particular, redevelopment projects of large urban waterfront areas, such as San Francisco, Boston, Baltimore, Halifax, London, Tokyo, and Sydney, have been very successful. These were spurred on by changes to port functions. After redevelopment, old facilities were no longer used.

It must be emphasized, however, that although we use these redevelopment plans as points of reference, we should not simply borrow from one plan and implement it in totality. The plan must be tailored to meet specific needs. Thus, various approaches to control marine pollution and conserve critical parts of the marine environment must first be evaluated. Such an appraisal should include how wastes can best be treated and how the use of marine parks and protected areas can best be regulated.

Experiences from many large coastal urban areas show very clearly the need for, and benefits of, having developed a politically and socially accepted coastal management plan, based on natural and social sciences considerations.

There is also a need to create public awareness during the planning stage and opportunities for public participation especially during the development stage. This may be done through frequent dialogues with the public and partnerships in developing a common vision. This process has been demonstrated successfully by PEMSEA [Chua, 2006].

Need for Research and Knowledge Management

Because of the environmental, developmental, and management complexities in the coastal areas, there is a need to undertake systematic research or studies as well as to adequately manage the information and knowledge generated through the implementation of the coastal development and management plans.

A better understanding of the coast as a resource system and further knowledge of the ecosystems and their interactions with human activities shall provide decisionmakers a reliable information base for policy and management measures. Positive and negative impacts of the many uses of the coastal area must be studied. A benefit-cost analysis must be done to include the impacts of pollution, current aquaculture practices, and uncontrolled population pressure on food safety, quality of drinking water, availability of sanitary services, waste disposal, and resiliency towards natural and manmade hazards.

Reliable information on the use of land, income and population distribution, and economic diversities as well as ongoing efforts on environmental management such as protected areas/marine parks and no take zones are essential for understanding the multiple uses of the coastal areas and effectiveness of current management measures.[2]

The impacts of global climate change are also generating increasing risks and uncertainties that are of great concern for coastal areas, especially many small islands and low-lying countries.

Clearly, there is a pressing need for research in forecasting complex systems, risk assessment, and the management of uncertainties. This research must include evaluation of the likelihood for occurrences of extreme events. Research of this nature is linked to the economic concepts of insurance and re-insurance and their related social problems.

Risks and uncertainties from manmade and natural hazards

There are many uncertainties associated with any form of coastal management, due to both limited information and the lack of ability to forecast critical natural or manmade hazards. Forecasting hazards is growing in importance because of the rapid urbanization in the coasts. In most cases, the required long-term environmental information base does not exist. Thus, modeling and various types of indicators must be used to more accurately assess the human and ecosystem health risks of the coastal area.

It is imperative to undertake risk assessment so as to administer the proper mitigating measures in response to the impending risks. The so-called geo-indicators developed through rapid risk assessment of the natural hazard are using information — such as elevation, vegetation, offshore setting, erosion rate, beach width, slope, thickness, dune configuration, overflowing or flooding — to classify risks into several categories. On the basis of experiences, risks are categorized into high, moderate, and low. Models are also being used in order to identify and quantify extreme hazards. These models use historical and geological information for possible validation.

Risk assessment and risk management are effective approaches because management decisions have to be made even in conditions involving

[2] Fisheries are highly complex systems. In fisheries, there is an interplay of biological, ecological, meteorological, geophysical, and chemical processes, as well as socioeconomic and political factors. These systems are, therefore, nonlinear and in many cases, have turned out to be unpredictable. Risk assessment and risk management are essential tools in the arsenal of the fisheries manager, who, in turn, cannot act alone, but must be a stakeholder/member of integrated coastal management program.

uncertainty. For instance, we do not know which natural disaster may hit a zone at any given time. We do not know everything about the conditions of the waves, currents, living resources, and their sensitivity to external disturbances. We can predict the rate at which a coastal zone may disappear; but there is no way we can give the precise figures. Despite these uncertainties, decisions have to be made anyway. The decision-makers have to know the types and level of risks they are taking. PEMSEA has included risk assessment and risk management in its integrated coastal management programs [MPP-EAS, 1999; Chua, 2006].

Addressing the Complexities in the Coasts

A Sea of Troubles summarizes the complexities of the coastal management problems, their causes, and suggested specific courses of action [GESAMP, 2001a]. These management complexities need to be addressed so as to harmonize the multiple uses prevailing in the coastal areas in almost all coastal nations of the world.

There is a need for an internationally agreed framework, standards, and even legal measures. Over the last few decades, the integrated coastal management (ICM) approach has evolved, been tested, and universally accepted to provide the necessary framework and tools for addressing these management problems.

The principles of ICM have been adequately presented in Cicin-Sain and Knecht [1998]. Chua [2006] provides the practical application and advances the concept towards codification using ISO standards. GESAMP [2001a] noted three broad approaches to ICM practices, namely:

1. An integrated institutional mechanism where one organization is responsible for most, or all, aspects of coastal management. An example is the Great Barrier Reef Marine Park Authority in Australia.
2. An institutionally coordinated approach, where one institution directs the plans and works of others. An example is the Chesapeake Bay Programme in the United States.
3. Institutional coordination achieved through consultation within a legislative framework. An example is the lead taken by the Ministry of Lands and the Environment in Zanzibar to develop a holistic strategy for protecting the coasts. This is achieved by working closely with other sector ministries and in partnerships with local communities. A similar approach has been adopted in some Mediterranean countries, at national, provincial, or local level.

The framework and processes of ICM have been developed, refined, and tested through several regional programs, most notably in East and Southeast Asia [Chua, 1998, 2006]. Key components of an ICM program include those that contribute to the building up of a governance framework as well as several action programs. Activities include problem identification and program formulation, institutional arrangement, stakeholder participation, capacity development, environmental monitoring, and program sustainability. Adequate implementation of an ICM program would lead to changes in the attitudes and perceptions among stakeholders as well as the development of a critical mass of human resources, greater participation of major stakeholders, and political commitments.

In addition to the application of the ICM framework and processes described in Chua [2006], PEMSEA uses a combination of legislation, stakeholder consultations and partnerships in achieving policy and functional integration and implementation of action programs. In PEMSEA's case, motivation is based on a common vision for the development that involves all stakeholders.

PEMSEA also uses social indicators to measure the impacts of ICM. Information on how coastal management can lead to eradication of poverty, improvement of environmental services, and improvement in the quality of life are essential information that not only the local and national leaders but also the public should know [PEMSEA, 2006].

Most examples of ICM referred above were undertaken through local and provincial efforts. But increasingly national governments have taken stronger lead roles in promoting integrated management nationwide.

Beyond the Coasts

What headway has been made towards the implementation of ocean governance beyond the coastal waters? For one, international agreements and accepted standards related to the management of the seas and oceans are being adopted and implemented gradually. International cooperation, at the regional level in particular, has stimulated interesting and useful interactions between concerned countries. These interactions brought about the exchange of experiences, comparison of results, and data sharing. Increased public awareness about the state of the coasts, seas and oceans, and public participation in projects have helped spur governments to take more concrete actions.

Large international and regional cooperative programs are ongoing, as presented and discussed separately in this volume. Many of them are supported by the United Nations system. The Global Environment

Facility (GEF) which has been operating for more than a decade now, is currently the major driving force towards reversing the deterioration of the environment.

There are indicators that can be used to evaluate the implementation of these big and small programs and the environmental improvements they generate. These indicators include: *(a)* process indicators — indicating changes in policies at national or regional level, institutional developments, and regulation and legislation changes; *(b)* stress reduction indicators — showing reduction of pollutant inputs, restoration of habitats, and conservation of ecosystems, as well as change of resource utilization practices, such as destructive fishing methods; and *(c)* environmental status indicators — indicating achievements in improving conditions in the area under consideration [Duda, 2002]. The last indicator measures productivity, reduction in contamination levels or eutrophication, and improved socioeconomic conditions and livelihood, among many others.

The Exclusive Economic Zone

In the early days, national territorial water was generally considered as the stretch of coastal seas that was within the limit of national defense. Later, the 3-nautical-mile limit won international acceptance over the length of a good cannon shot. As nations became more and more aware of the large renewable living resources in the coastal seas, they wanted to extend their territorial limit. This led to the gradual extensions to 12 nautical miles with the introduction of the national fishing zones adjacent to the coast. The concept of extending national jurisdiction over the exploitation and management of the resources to the sea 200 nautical miles from the coast is an area we now call the exclusive economic zone (or EEZ).

In 1967, when Ambassador Arvid Pardo made his speech proposing that the ocean floor and the area below that lies outside the zone of national jurisdiction be declared as a Common Heritage of Mankind for the benefit of all, he was thinking of exactly that. However, negotiations during the Third United Nations Conference on the Law of the Sea (UNCLOS) led to the adoption of the EEZ concept. Through the EEZ concept of the Law of the Sea, coastal states are given full rights of resources within their jurisdiction. At the same time, they are also given full responsibility for management and development. When used properly, such a free reign over the EEZ can be used to create a focused and identified management regime which constitutes a very substantial national resource.

The potential benefits of the EEZ to individual states are thus very evident. Most coastal states established the EEZ. Almost 90 percent of world fisheries now fall under the national jurisdiction of coastal states. Land-locked states are excluded. In regions, such as the Baltic Sea and the Mediterranean Sea, where EEZ limits have not been introduced, coastal states continue to extend their national fisheries zones. In the Mediterranean, this extension reaches up to 25, and even 50, nautical miles offshore.

Through UNCLOS, basic international rules have been established. Through the 1992 United Nations Conference on Environment and Development, general agreements and common rules were established but issues related to specific subject areas were also agreed upon, in principle. These specifics include how to address problems and the interdependence of socioeconomic development and the environment. However, for the rules and agreements to be effective, they must be implemented. But implementation is the prerogative and duty of the states which have adopted them.

Nevertheless before implementation could be actualized, effective national capacities must be strengthened. There is a need to provide education, enhance public awareness, and equip governments and other stakeholders with the capacity for responsible management.

There are different levels of understanding regarding the various processes and interactions that occur in the coastal seas and ocean. There is also a wide difference in terms of knowledge, experience, and capacity in the regional seas. Techniques and knowledge from better-studied regions can contribute to the efficiency of research for less well-studied regions. The coastal seas present a set of more difficult scientific and technical challenges than those of the deep ocean. This is why the scientific and practical study of the coastal sea has become a priority. The efficient and effective management of both multiple-use EEZs and the regional seas require substantial scientific and technical base.

Regional ocean governance covers a wide range of issues related to marine and maritime operations, including: exploitation, preservation, and management of living and nonliving resources; regulation and management of aquaculture practices; regulation of recreation activities such as tourism development; and the effective implementation of pollution control. Coastal sea plays an important role in the global climate change especially in areas that concern biochemical and geochemical cycles and global ecosystems. A review of all this is presented by Robinson and Brink [1998]. The development of the coastal module of Global Ocean Observing System (or GOOS) has also stimulated a synthesis of many coastal social and ecosystem problems, as well as related needs for field observations and data collection and management [UNEP, 2003].

Unfortunately recent assessments of the state of the marine environment showed that most of the problems identified in the 1980s still exist; some are becoming more severe than before. While marine environmental research has intensified in recent years, maritime security is gaining more international attention especially in international straits and the EEZs. This is due to the increasing frequency of sea piracy and the recent threats of terrorism. This implies a need for more effective implementation of international instruments especially those under UNCLOS and other international maritime security agreements.

The full implementation of international instruments requires that we not only adopt and use the rights but adopt and implement the obligations and duties as well. The EEZ concept implies control by the coastal state. The means and will to carry out the control will also have to be found. In most states, they have not been found. What have been found, however, are the means to mark the coastal zone and the adjacent seas including the EEZ. Will Lord Byron's sad remark about the Earth be extended to include the ocean? The values and assets at stake are very high indeed.

References

APN Megadelta Project. 2004. Conference and workshop summary. First meeting of the Asia-Pacific Network Project on Megadeltas of Asia and IGCP-#475 Project on Deltas of Monsoon Asia-Pacific Region. Available at http://www.megadelta.ecnu.edu.cn/main/Item01.htm. [Accessed 4 May 2007].

Chua, T.-E. 1998. "Lessons learned from practicing integrated coastal management in Southeast Asia." *Ambio*, 27:599–610.

Chua, T.-E. 2006. *The dynamics of integrated coastal management: Practical applications in the sustainable coastal development in East Asia*. GEF/UNDP/IMO Regional Programme on Building Partnerships in Environmental Management for the Seas of East Asia (PEMSEA), Quezon City, Philippines. 468 pp.

Chua, T.-E., S.A. Ross and H. Yu. (eds). 1997. *Malacca Straits environmental profile*. MPP-EAS Technical Report 10. GEF/UNDP/IMO Regional Programme for the Prevention and Management of Marine Pollution in the East Asian Seas, Quezon City, Philippines. 259 pp.

Cicin-Sain, B. and R.W. Knecht. 1998. *Integrated coastal and ocean management. Concepts and practices*. Island Press, Washington, DC, USA. 517 pp.

Costanza, R., L. Wainger, C. Folke and K.G. Maler. 1993. "Modeling complex ecological economic systems: Toward an evolutionary, dynamic understanding of people and nature." *BioScience*, 43:545–555.

Duda, A. 2002. *Monitoring and evaluation indicators for GEF International Waters Projects*. Monitoring and Evaluation Working Paper 10. Global Environment Facility, Washington, DC, USA.

GESAMP (IMO/FAO/UNESCO-IOC/WMO/WHO/IAEA/UN/UNEP Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection). 2001a. *A sea of troubles*. Reports and Studies GESAMP No.70. 35 pp.

GESAMP (IMO/FAO/UNESCO-IOC/WMO/WHO/IAEA/UN/UNEP Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection). 2001b. *Protecting the oceans from land-based activities — Land-based sources and activities affecting the quality and uses of the marine, coastal and associated freshwater environment*. Reports and Studies GESAMP No. 71. 162 pp.

Goldberg, E.D. 1994. *Coastal zone space: Prelude to conflict?* United Nations Educational, Scientific, and Cultural Organization, Paris.

Hail, J.R. 1980. *Applied geomorphology*. Elsevier, Oxford.

Inman, D.L. and C.E. Nordstrom. 1971. "On the tectonic and morphological classification of coasts. " *Journal of Geology*, 79:1–21.

Johnston, D.M., A.P. Pross and I. McDougall. 1975. *Coastal zone: Framework for management in Atlantic Canada*. Institute of Public Affairs, Dalhousie University. Halifax, Nova Scotia.

MPP-EAS. 1999. *Environmental risk assessment: A practical guide for tropical ecosystems*. MPP-EAS Technical Report No. 21. GEF/UNDP/IMO Regional Programme for the Prevention and Management of Marine Pollution in the East Asian Seas, Quezon City, Philippines. 88 pp.

PEMSEA. 2006. *Xiamen: An ICM journey*. PEMSEA Technical Report No. 18. GEF/UNDP/IMO Regional Programme on Building Partnerships in Environmental Management for the Seas of East Asia (PEMSEA), Quezon City, Philippines. 93 pp.

Robinson, A.R. and K.H. Brink. 1998. *The sea: Ideas and observation on progress in the study of the seas. The global coastal ocean, regional studies and syntheses*. Volume 11. John Wiley and Sons, New York. 1062 pp.

Soloviev, S. L., O.N. Solovieva, C. N. Go, K. S. Kim, and N. A. Shchetnikov. 2000: *Tsunamis in the Mediterranean Sea 2000 BC–2000 AD*. Kluwer Academic Publishers. 237 pp.

UNEP. 2003. *Global Marine Assessments: A survey of global and regional environmental assessments and related scientific activities*. UNEP-WCMC/UNEP/UNESCO-IOC. 132 pp.

Part 3

Regional Ocean Governance

SECTION 1

Perspectives on Regional Ocean Governance

CHAPTER 9

International Trade and Ocean Governance

Elizabeth R. DeSombre and J. Samuel Barkin

The relationship among oceans, international trade, and sustainable development is enormously complicated. The oceans are a transportation conduit for international trade that affects sustainable development everywhere. International trade in turn affects the sustainable development of ocean-based resources. Regulatory attempts to improve the sustainability of development globally affect both trade and the oceans. This chapter will look primarily at the first of these two relationships, the effects of ocean-borne trade and ocean resource exploitation on sustainable development. It will also look at possible alternative approaches to achieving sustainability in these relationships, particularly at the options of localization and internationalization.

Trade and Ocean Trends

There are two kinds of trade-related activities that impact the oceans: the use of the oceans as a transportation network and the use of the oceans in production processes, either as a source of raw materials or as a pollution sink. The oceans have played both of these roles in human commerce for thousands of years. But the impact of both kinds of commerce on ocean ecosystems has increased exponentially in the past century. This chapter will discuss some historical background to this increase, and the reasons for its current exponential growth.

Historical Evolution of Ocean-based International Trade

There has been large-scale ocean-based international trade for millennia. Even in relatively rudimentary ships, water-borne transportation is much cheaper than land-borne transportation. This means that, until the invention of the railroad in the 19th century, any large-scale trade in bulk goods could only happen by ship. Examples of such trade include the trade between ancient Rome and Egypt, and between the Mediterranean and the Baltic from the late Middle Ages to the Renaissance. Both Rome and the Mediterranean states exported manufactured goods, while Egypt and the Baltic lands exported grains.

Ocean-based international trade has tended to expand slowly over time, with a pointed contraction beginning with the decline of the Roman Empire and lasting half a millennium. It began mostly in regional and protected waters, like the Mediterranean. Significant long-distance ocean-borne trading began in the 15th century, with the advent of ships capable of carrying large loads over long distances. Shipping technology and capacity improved steadily then. New technological or organizational innovations, such as the steamship or standardized container shipping, provided the occasional boost to this process.

This long-distance trade has often been of a large-enough scale to have significant environmental effects. The development of a Baltic economy based on grain exports, made possible by ocean-based international trade, led to the clearing and agricultural development of much of what are now Poland and the Baltic states, and parts of Baltic Russia. The need for tall trees to provide masts for British shipping in the 18th and 19th century led to the depletion of old-growth trees in much of Eastern North America. But it was not until the 20th century that the combination of the increased scale of trade and the new technologies of shipping and ocean resource extraction led to large-scale environmental effects on the oceans.

Current Trends in Ocean-based International Trade

Ocean-based international trade continues to expand. There are several current trends that are driving the continuing increase in scale. One is simply the growth in the global economy — as the amount of total economic activity increases, levels of trade should increase as well. Since a large majority of international trade goods continue to be sent by ship [Steinberg, 2001] — a trend that is likely to continue given the cost advantages of seaborne transport — increased levels of trade mean increased international shipping. But international trade has consistently grown faster than the global economy as a whole [WTO, 2004], and the ocean-based component of this growth has kept pace. The other trends beyond simple economic growth that help to account for this increase in ocean-based economic activity include: *(a)* the liberalization of international trade and commerce; *(b)* various technological developments in shipping; and *(c)* the increasing geographical distribution of trade.

Liberalization

One of the main forces driving the expansion of ocean-based international trade since World War II has been the gradual liberalization of international trade. Under the auspices of the World Trade Organization (WTO) since 1995, and its predecessor the General Agreement on Tariffs and Trade (GATT), general tariff levels on manufactured goods imported into industrialized countries have fallen by more than 80 percent since1948 [Panitchpakdi, 2005]. Along with these industrialized countries, an increasing number of developing countries are coming within the set of liberalized international trade rules governed by the WTO, such as China in 2001.[1] As tariffs and nontariff barriers (such as quotas and regulations designed to discourage imports) decrease, volumes of trade increase.

Liberalization of international finance has also had a major impact on international trade. The increasing tendency of governments since the 1970s to allow free capital flows across their borders has changed the way international production is organized. Instead of making a tradeable good in one place and exporting it to another, or setting up a subsidiary inside a closed national market to produce domestically for that market, many manufacturers now have globalized supply and production chains. For example, instead of making a car in Japan, a Japanese car company might make the engine and transmission in Japan, the body parts in Thailand, the electrical system in Taiwan, and then have the whole thing assembled in the United States. This pattern of globalized production means that parts of a good are often shipped all over the world before the final good

[1] The World Trade Organization had 128 members at its founding a decade ago. It now has 151 members, and a further 28 countries are in negotiations to join [WTO, n.d.a, n.d.b, n.d.c].

is assembled to be shipped somewhere. In other words, it means that for the same good being traded, more international shipping is needed than would earlier have been the case.

Technology

Two kinds of technological developments have encouraged the growth of ocean-based international trade: improvements in shipbuilding technology and improvements in the technology of handling the goods to be shipped. Both developments have had the effect of decreasing the cost of shipping goods, and therefore of making it economical to ship a greater variety of goods than was previously the case. As such, these developments have also reinforced the effects of the liberalization of international finance on global production patterns — as shipping becomes ever cheaper, it makes increasing sense to produce each part of a good wherever it can be done most cheaply, rather than producing the whole good in one place.

Shipbuilding has gone through several revolutionary changes over the years. The most recent began in the early 1970s. That decade saw a dramatic change in the scale of international shipping. A revolution in technology made possible sizes of ships that had previously been unimaginable. Where formerly the largest oil tankers had a capacity of about 28,000 Dead Weight Tons (DWT; a measurement of the amount of oil or other cargo the ship can carry), tankers of 250,000 DWT became common and those up to 330,000 DWT became possible. Likewise, cargo ships went from about 10,000 DWT to 200,000 DWT in a 2-decade period, and new container vessels were seven times larger than conventional break bulk liners [Couper, 1999]. This change can be seen by looking at British-registered shipping in the late 1960s and early 1970s: despite a decreasing number of ships (from 1968 to 1975 the number of ships over 100 GT registered in the UK decreased from 4,020 to 3,662) the overall tonnage registered to the British flag increased during that period from 21.9 million GT to 33.2 million GT.

At the same time, several technologies have developed over the past 4 decades that have significantly decreased the cost of shipping many categories of goods. One is the automation of port facilities — heavy machinery now does much of the work that stevedores and dockworkers used to [Kahveci, 2000]. Another is the development of containerization. This technology involves putting goods in standardized containers. The containers are loaded onto the decks of purpose-built ships, and can be transferred to trains or trucks without being unpacked. This makes it faster to load and unload ships, and easier to track goods in shipment and in port. Finally, recent developments in information and communication technologies have made it cheaper and easier both to track goods in shipment and to organize the shipping industry on a global scale.

Geographic distribution

Both liberalization and the decreasing costs of shipping have increased the geographic distribution of trade. Liberalization over the past 2 decades has had the effect of bringing countries into the international trade system, such as China, that were previously only marginally involved in it. And decreasing shipping costs mean that it makes more sense than it previously did to produce halfway around the globe and take advantage of lower production costs rather than produce in the intended market to avoid transportation costs.

Other factors have also affected the geographic distribution of international shipping. Uneven patterns of economic growth across countries have the effect of changing patterns of trade. In particular, the strong economic growth in the Asia-Pacific region is resulting in an increasing concentration of international trade there. And the development of the cruise-ship industry has radically increased large-ship traffic in many areas not previously known for high volume of large ships, such as many areas in the Caribbean Sea. The cruise industry creates different forms of environmental strain than other kinds of shipping, and often imposes this strain on particularly delicate ecosystems, as will be discussed below. The volumes of this particular form of shipping may well increase markedly in South Asian waters in the medium term.

Effects of Trade on Oceans

The use of the oceans as a source of raw materials and a pollution sink, while a standard practice throughout recorded human history, has increased exponentially in the past century. This is due in part to the increased demands of a growing global population for food, a growing global economy for resources, and growing global production for pollution sinks. It is also due in part to technological developments that have made it easier to exploit the oceans on an industrial scale. This section will first discuss pollution effects of international trade on oceans, and then the effects of resource exploitation. It will then look at the problem of invasive species, which does not fit neatly into either of the other two categories.

Pollution

Oil pollution

Pollution of the ocean by oil from ships can be generally divided into two categories: intentional and accidental. Intentional pollution refers to oil that is dumped into the oceans as part of the normal operations of ships. This includes oil flushed out of ships with bilge- and wastewater, and oil flushed out with water used as ballast or to clean the tanks of oil tankers. Tankers individually tend to cause significantly more intentional oil pollution than other ships individually, but nontanker ships can generate considerable volumes of intentional pollution through sheer numbers. Intentional pollution tends to create low-level but widespread pollution, which damages marine ecosystems slowly, through accretion. Intentional oil pollution by ships can be reduced by modifying both the equipment installed in the ships and the behavior of those operating the ships at sea, as discussed below. But both of these approaches to reducing oil pollution at sea add to the cost of shipping.

Accidental pollution often results in massive ship discharges that devastate local marine and littoral ecosystems. Such large-scale damage from accidents usually involves oil tankers sinking or running aground, but it can also result from accidents in other aspects of the oil industry, such as pipelines. While these accidents can result from substandard equipment or severe weather, they often result from poor decisionmaking. In two of the best-publicized tanker accidents of the past 2 decades, the *Prestige* and the *Exxon Valdez*, poor decisionmaking played a significant role in exacerbating environmental harm.

Air pollution

Two categories of air pollution that affect oceans are emissions of acidifying substances and of greenhouse gases. The overwhelming amounts of these pollutants are emitted by land-based sources, but affect the oceans nonetheless. Emissions of acidifying substances such as sulfur dioxide can fall back into the oceans in the form of acid rain, and have local effects on ecosystems such as increasing the acidity of water. These effects are far more severe in lakes than oceans, but can still have an ecological impact in small seas or shallow or coastal waters with little current. Increased acidity can kill both animal and plant life.

Potentially the greatest anthropogenic change to ocean ecosystems overall may turn out to be climate change, caused in part by emissions of greenhouse gases such as carbon dioxide and methane. These emissions affect the ocean chemistry directly (by increasing the amount of carbon dioxide sequestered in ocean water) and indirectly (by raising ocean temperature). Another indirect effect is increased ocean acidity, resulting from the chemical reactions with increased carbon dioxide. The effects of these changes are significant for the oceans as a whole, and potentially catastrophic for many local ocean ecosystems, particularly coral-based systems.[2] The worst of the possible impacts of climate change would come

[2] For a comprehensive review of these effects, see IPCC [2007].

from a complete disruption of the system of ocean circulation [IPCC, 2007] that would not only have impacts on the world's weather, but also on shipping [Kump et al., 2004].

Ship waste

Cruise ships present a special category of environmental threat to oceans for two reasons. One, they contain large concentrations of people. And two, they tend to sail in environmentally sensitive waters.

All ships discharge sewage and wastewater from showers, laundry and dishwashing facilities, and the like, and a certain amount of garbage from the day-to-day activities of those onboard. The difference between cruise ships and most other ships in this context is that while cargo and container vessels might have dozens of people onboard, cruise ships have thousands. This means that a single cruise ship can produce as much sewage, wastewater, and trash as 50 cargo ships. In areas with high concentrations of cruise ship activity, this can generate high concentration of nitrates and phosphates (from sewage), detergents (from wastewater), and plastics (from trash) [Oceana.org, n.d.].

Cruise ships often release these pollutants in particularly environmentally sensitive waters. The ships often target pristine shallow water or semi-enclosed environments, such as coral reefs or fjords, because these environments are what passengers want to see. The same features that make these ecosystems appealing to cruise passengers make them particularly sensitive to cruise ship discharges. As is the case in many other forms of economic use of the oceans, the waste treatment practices of many individual ships is improving, but this is being offset by growth in the industry, and hence a rapidly growing number of ships.

Land-based pollution

The major sources of pollution affecting the oceans not already previously addressed are industrial waste, agricultural runoff, and untreated sewage. These categories of pollution tend to have the greatest effect in enclosed seas, though they have implications throughout the oceans.

Industrial effluent, coming from a wide range of industrial sources and consistently of a wide range of specific pollutants, has significant effects in coastal areas and enclosed seas. These effects range from garbage washing up on beaches (as what happened repeatedly a few years ago with medical waste being washed up and down the New Jersey shores) to generally high levels of contaminants in enclosed seas, such as the Mediterranean and Caspian. Some concerted efforts to cleanup particularly polluted seas (including the Mediterranean [Haas, 1990]) have met with some success. One aspect of the problem of industrial effluent, the dumping of waste at sea, has been addressed by international negotiation, for example in the London Convention, discussed below.

Agricultural runoff is perhaps a greater threat to oceans than industrial effluent. The damage is caused by runoff to oceans from rivers that run through agricultural areas where large amounts of fertilizer are used, such as the Mississippi and the rivers that feed into it [Larsen, 2004]. The runoff causes nutrient enrichment, particularly from nitrates, which feed algal blooms. When blooms die they in turn feed microorganisms that remove most of the oxygen from the water. This cycle can create aquatic dead zones, encompassing as much as tens of thousands of square miles of ocean near the mouths of major rivers. The potential for this kind of damage is expected to worsen particularly in river systems where the levels of fertilizer use may increase markedly in the future, such as in the major river systems in China.

Untreated sewage is often disposed of in the ocean because it is the easiest and cheapest repository. Although such ocean disposal of land-based sewage is most common in developing countries, developed countries have been known to do so as well, especially when local sewage treatment is overwhelmed by flooding. The effects of sewage disposal in the oceans can be similar to agricultural runoff, providing nutrient enrichment and the resulting problems. In addition, pathogens can cause problems for human health. Some regional seas agreements have reduced such sewage disposal by member states [DeSombre, 2006a].

Hardware

Large-scale hardware, such as ships or various kinds of platforms built for the offshore oil industry, can be a significant source of pollution on the ocean floor. The negative effects of hardware are probably worse in shallow than in deeper water, because ecosystems are often more dense and delicate in shallow water (particularly coral-based ecosystems) and because the higher pressure in deeper water impedes the spread of pollutants.

Hardware can make its way to the ocean floor either through accident or through intentional disposal. The accumulation of hardware through centuries of ships lost at sea has already left a high concentration of wreckage on the ocean floor underneath active shipping lanes, particularly where the ocean floor is flat and sedimentation slow. Decreasing the rate of accumulation of wreckage can be accomplished either by making shipping safer, by decreasing shipping volumes, or both. Intentional disposal, particularly of large-scale structures like oil platforms, is more recent. The most famous incidence of an attempt to dispose a hardware this way involved an oil storage buoy called the *Brent Spar* in 1995. The international furor generated by this incident led to alternate disposal plans for the *Brent Spar*, and lent impetus to efforts under the auspices of OSPAR, the Commission for the Protection of the Marine Environment of the North-East Atlantic, to phase out this kind of equipment disposal. In other ocean areas, this kind of equipment disposal is governed by the London Convention, which allows for such disposal under fairly permissive circumstances [see London Convention, "Frequently Asked Questions"]. It should be noted, however, that there can be some benefits to ocean ecosystems from this kind of disposal. Shipwrecks often provide protection and thus can act as fish nurseries, and even the *Brent Spar*, when finally removed, was found to have an endangered freshwater coral growing on it [Connor, 1999].

Resource Extraction

Fishing

One of the major impacts that humans have had on the oceans recently is to significantly deplete fish stocks and to threaten species' biodiversity in the seas on a global scale, as a result of commercial fishing and the international trade that underpins much of it. Approximately 40 percent of all fish caught globally are traded internationally [Dommen, 1999]. The technological quantum leap that allowed people to have such an impact on fish stocks was the invention of the mechanical engine. This in turn allowed for the development of trawling, a practice in which ships pull weighted nets across the ocean floor. Trawling allows fishers to catch a greater proportion of bottom-dwelling fish in a given area than they previously could, but also does considerable damage to the ocean floor ecosystem. Large contemporary trawl nets can devastate acres of seabed in a single pass. By the 1980s, trawling technology had become so efficient that the cod fishery in the Grand Banks off Canada's Atlantic coast, a legendarily rich fishery, was completely fished out [Kurlansky, 1997]. The United Nations Food and Agriculture Organization estimates that fully one-quarter of the world's fish stocks are either overexploited or depleted, up from one-tenth in the mid-1970s [FAO, 2004].

Other technological developments are also increasing the extent to which fishers can outpace the ability of fish stocks to breed. Factory ships that process their catches at sea are increasing the scale at which fish stocks in distant and isolated waters can be exploited. Sonar and satellite technologies are making it easier for fishers to find fish, and thereby catch more per unit time at sea. And the decreasing costs and increasing speeds of global transportation mean that particular fisheries are finding global markets where only recently they might have found only local markets.

This increase in market size has the effect of making more capital available to heavily exploit fisheries that until recently might have been only lightly exploited. But the pressure on fish stocks globally does not result only from technological development and market forces. It is also driven by a tendency by governments in many countries to subsidize their fishing industries. The overall effect of this pattern of subsidy is to support a significantly larger global fishing fleet than would be the case if the market were allowed to operate freely, and a significantly greater fishing capacity than is reasonable given existing fish stocks. The issue of excessive subsidies to the fishing industry, and the distorting effects of these subsidies on international trade, is a topic for negotiation at the current round of WTO negotiations. Some progress has been made at getting countries to accept limits on subsidies, but more work is needed before new rules on this subject are accepted [ICTSD, 2005].

The tendency to overfish in international waters has been recognized for decades. One attempt by the international community to deal with this problem, as codified in the United Nations Convention on the Law of the Sea (UNCLOS) in 1982, was to expand national waters by the creation of exclusive economic zones, or EEZs. These are zones, extending up to 200 nautical miles out to sea, in which national governments have the right to regulate economic activity, including fishing. The idea behind this innovation was privatization — if you give one country the authority to regulate, and allow it the right to benefit from good regulation, it should then manage fisheries well. But in many cases, including the Grand Banks, EEZs backfired. Governments reacted to expanded fishing jurisdictions by increasing subsidies to the industry, exacerbating rather than ameliorating the problem of overfishing on continental shelves beyond the limit of traditional national jurisdiction.

Oil extraction and mining

Extraction of oil and minerals from under the ocean has a variety of environmental impacts; in the categories discussed above, it contributes to resource depletion (and unlike with fish, the resources sought are non-renewable) and creates pollution, from the platforms and equipment (discussed above) used for extraction. Because of its multifaceted effects, this kind of resource extraction is covered in its own section.

Oil extraction at sea is accomplished by means of huge metal platforms, with substructures that rest on the ocean floor and superstructures that rise as high as several hundred feet above the ocean surface. These structures can cause extreme but highly localized damage to marine environments. The technology of these platforms continues to improve steadily, allowing the platforms to be built in ever-deeper waters and in ever-colder parts of the world. Whereas in earlier decades, existing technologies were only advanced enough to allow drilling on continental shelves, they now allow for drilling much farther out to sea. The deep seas of Southeast Asia may, by some estimates, hold as much as 20 billion barrels of oil that can be extracted using these new technologies. Along with environmental effects, such extraction may be complicated by the fact that some of these deposits lie in disputed waters [Zhu, 2004].

Unlike oil extraction, most forms of mining at sea have not been proven to be economically viable yet. While there are major concentrations of minerals, known as polymetallic nodules, at known places on the ocean floor, no large-scale mining of these minerals is under way at present. The International Seabed Authority, however, granted its first 15-year contracts for exploration, beginning in 2001 [DeSombre, 2006a], so it is possible that over the medium-term some commercial mining operations will begin. The long-term potential of such mining was taken sufficiently seriously during the negotiation of UNCLOS when rules and institutional structures were created to ensure the benefits of any mining were shared by all countries, and not only by countries with the technology to access the nodules.[3] A disagreement with these rules was the primary reason why the United States did not sign UNCLOS. At the U.S. insistence, the rules have since been renegotiated along "free-market principles" [Turner, 2004].

Invasive Species

Invasive species have long been considered to be problematic on land and in freshwater ecosystems, but more recently their effect on ecosystems has been noted and efforts made to address this problem. This problem can be attributed fairly directly to international travel and trade. In oceans, the primary way species can be moved (unintentionally) from one location to another is in ballast water. Ships of all sizes take on water for stability when navigating the ocean; ships that drop off cargo in one location without reloading there are particularly in need of ballast water to balance the weight of the vessel. A small commercial vessel takes an average of 1 million gallons of ballast water at a time while large ships take about 20 million gallons per trip. Cargo ships are estimated to move between 10–20 billion tons of water as ballast around the world each year, carrying tens of thousands of specimens with them [McGrath, 2005]. A ship fills its ballast with water taken in one location and discharges them somewhere across the ocean, releasing species alien to a new ecosystem.

The concern with species brought to a new ecosystem is not that they will not survive (some do not) but rather that they will — spared whatever natural predators they are accustomed to, they thrive in the new location and disrupt the natural balance of that ecosystem. One of the major examples of oceanic aquatic species are comb jellies picked up from the Atlantic and deposited in the Black Sea (and now the Caspian Sea) where they eat plankton and eggs of various fish species, and are

[3] See in particular *United Nations Convention on the Law of the Sea of 10 December 1982*, Part XI and Annex IV.

causing a major problem in the ecosystem. Exotic fish and seaweed are also dumped from aquariums: the tropical seaweed *Caulerpa tadifolia* has taken over tens of thousands of acres in the Mediterranean and in the Pacific off the coasts of California. In one estuary in San Francisco Bay, alien species are estimated to account for 90 percent of the ecosystem. Ballast water is even blamed for bringing an alien strain of cholera to Peru, killing 10,000 people [McGrath, 2005].

Regulatory activity to prohibit this ocean-based transfer of species into alien ecosystems is slow, in part because preventing the problem would be both costly and difficult. Initial policies by states have focused on requiring ships to discharge ballast further out to sea — to decrease the chances that exotic species will reach coastal ecosystems — although some are starting to consider the idea of treating ballast water on ships, and the International Maritime Organization (IMO) has created guidelines for ballast water management. These measures are not widely or systematically used at this point, however.

A similar issue comes when farmed fish escape into the wild. Farmed fish stocks, even when they are of the same species as a local fish population, are often genetically different from local wild stocks. Escaped farm stock can either act as an invasive species, competing with wild stocks for resources, or can interbreed with wild stocks. Interbreeding often has the effect of weakening local stocks and decreasing their chances of survival in the wild, because stocks that have been farmed for several generations have been subject to different evolutionary pressures than wild stocks. With increased farming of species that inhabit the deep sea, such as salmon and cod, the genetic effects of aquaculture on wild stocks is beginning to have implications throughout the oceans.

The Impacts of Ocean Governance on International Trade

Different forms of ocean governance have either direct or indirect impacts on trade. These range from the use of direct trade restrictions as a mechanism of impacting the behavior of states in protecting ocean resources, to other regulatory processes, not designed directly as trade restrictions but nonetheless impact trade. Discussions of these trade impacts often take place in the context of international trade rules. Nevertheless, the ways in which ocean governance impacts trade are much broader than specific trade restrictions, and the effects of these ocean governance processes can be diffuse and indirect, but still significant.

Trade Restrictions

A variety of efforts to protect the marine environment have done so through direct and intentional restrictions on trade. These processes either involve restriction of trade as a part of the regulation itself or as a way to persuade specific states to take the desired action. These can happen in a unilateral or multilateral context, although when examining the effects of ocean governance on trade, the multilateral actions are most relevant.

The WTO/GATT context

The context in which these issues must be discussed is the rules under the World Trade Organization (WTO), and the General Agreement on Tariffs and Trade (GATT) (the governing agreement under which the WTO operates) about restricting trade. Under this system states are generally not allowed to impose discriminatory trade restrictions; they may not treat goods from one country differently than those from another within the regime; and they may not impose restrictions on imports of goods that are not restricted domestically. In addition, to the extent that states do impose restrictions on free trade, these should be in the form of tariffs rather than nontariff barriers such as quotas or prohibitions, and they should be applied in a nondiscriminatory manner.

There are some exceptions to these rules allowed for environmental considerations, primarily found in GATT (Article XX, Sections B and G). This article allows for rules that are "necessary to protect human, animal, or plant life or health" and those that are "related to the conservation of exhaustible natural resources if such measures are made effective in conjunction with restrictions on domestic production or consumption."

Unilateral and multilateral environmental measures restricting trade

In the context of the international trade regime, the issue of the acceptability of trade restrictions within, or in support of, multilateral environmental agreements has been a source of much discussion. Some of these issues have been addressed specifically in the context of ocean regulations. The most notorious of these are the findings against the United States in 1991 and 1994 for its unilateral restrictions of imports of tuna not caught in ways that protected dolphins [GATT, 1991,1994], and in 1998 and 2001 for its restrictions of imports of shrimp caught in ways that harmed sea turtles [WTO, 1998a, 1998b; WTO, 2001a, 2001b]. Much has been written about these disputes, but for the purposes of this chapter it is worth noting that the trend in the WTO has been towards increasing acceptance of environmental protection as a legitimate reason for restricting trade; that is, as long as restrictions on trade are applied in a nondiscriminatory way, are designed specifically for environmental protection, and are accompanied by multilateral attempts to address the environmental issue [DeSombre and Barkin, 2001].

As suggested above, some of the existing trade restrictions that impact ocean activity are a direct part of the regulatory process for some environmental issues. This is part of a broader trend in international environmental agreements to use trade as the specific way to protect an environmental resource. The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), for instance, attempts to protect endangered species — some of them aquatic — by limiting the extent to which they can be traded. Species listed in Appendix I, those considered to be the most endangered, cannot be traded except in extreme circumstances intended specifically to assist conservation (that is, breeding a stock for captive breeding programs). Species listed in Appendix II, those that might be in danger of extinction unless successfully managed, can only be traded when accompanied by an export permit that certifies a specimen was obtained legally and its export will not negatively impact species survival.

The CITES listing process has sometimes been used (or considered) strategically in the case of ocean-based species, when they have not been sufficiently well protected by other regulatory processes. For instance, some states have proposed the listing of Atlantic bluefin tuna — a managed stock (but not very successfully) under the International Convention for the Conservation of Atlantic Tunas (ICCAT) — in CITES Appendix I. If bluefin tuna were listed there, trade would essentially cease — unless all the states attempting to trade, lodged reservations to the listing, as allowed under the treaty — which would impact the management of the species. In this instance the proposal to list bluefin tuna in Appendix I was withdrawn after the major fishing states — in response to the threatened listing proposal — agreed to reduce the quota under ICCAT [Safina, 1993].

A number of whale species have been listed in Appendix I [CITES Secretariat, 2005], which would also impact trade in these species if the commercial whaling moratorium under the International Convention for the Regulation of Whaling is lifted. Japan, for instance, has advocated removing minke whales, among the most plentiful of whale species, from Appendix I so that trade would be allowed [Lies, 2004]. Norway and Iceland are catching these whales legally and Japan would like to have access to the whale meat, which is currently forbidden because of the CITES Appendix I listing.

Other environmental agreements whose main mechanism for protection is the restriction of trade, such as the Basel Convention on the Transboundary Movement of Hazardous Wastes and Their Disposal [1989] or the Rotterdam Convention for the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade [1998] could intersect with ocean protection. In both these cases the environmental problems themselves may impact environmental conditions on the oceans. In addition, ships are often the main transport mechanism for these substances, so an agreement that impacts the extent or location of trade will impact ocean transport.

As a participation mechanism

Trade restrictions are another way to entice states (and ships) into international ocean agreements. In these cases, the trade restriction is not the fundamental regulatory mechanism of the environmental agreement, but a way to support the agreement by increasing the number of states bound by it. Since states do not have to take on international legal obligations without their consent, some states choose to remain outside of international regulatory processes. In some cases this nonparticipation is simply because the state does not prioritize the issue in question. In other cases, avoidance of international obligations may be an intentional effort to increase the attractiveness of a ship registry to those ships opting not to be bound by international rules. An agreement, not limited to treaties pertaining to oceans, may specify that certain activities can only be conducted among member states, as discussed above.

Recently some international agreements — especially those pertaining to fisheries — have begun to take steps to restrict the trade with non-member states of relevant agreements. This action creates new incentives for states to join. The problem of "illegal, unreported, and unregulated fishing" (often referred to collectively as IUU fishing) is primarily about fishing outside of — rather than in contravention of — the regulations of regional fishery management organizations. Fisheries organizations have begun to restrict trade with nonmember states of the relevant regulatory organization. The International Commission for the Conservation of Atlantic Tunas (ICCAT) was the first to take this step by passing specific regulations to require member states to refuse to import specified fish species caught by nonmember states whose vessels were fishing in the convention area. In this case, a resolution is passed pertaining to each state and fish species in question. If a state takes appropriate action (either by joining the agreement or by ensuring that its vessels do not fish in the convention area) another resolution is passed removing the trade restrictions. As a result, some targeted states — Honduras and Panama — joined ICCAT; fishing vessels in these locations were thus bound by ICCAT rules, and the trade restrictions were removed. Other states, such as Belize and St. Vincent and the Grenadines, took steps to remove fishing vessels from their registries or to ensure their ships were not fishing in the ICCAT regulatory area [DeSombre, 2005].

The Commission for the Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR) took this process one step further by creating a Catch Documentation Scheme for Patagonian toothfish. Under this process, CCAMLR members must ensure all imported or transshipped toothfish have been caught by vessels following CCAMLR regulations. This process requires those who intend to sell toothfish to CCAMLR members be part of the agreement themselves (and be willing and able to demonstrate that the fish were caught in accordance with treaty rules). There are, however, provisions allowing nonmember states to demonstrate that the fish have been caught within CCAMLR rules (or outside the CCAMLR regulatory area), in deference to WTO concerns. Since these provisions have been put into place in 1999, the price for Patagonian toothfish with catch documentation has been consistently higher than that without documentation [Stokke and Vidas, 2004]. This indicates that CCAMLR states are indeed refusing to buy unregulated fish and decreasing the advantages to those who fish outside the regulatory process. More importantly, there has been a decrease in toothfish catch in the 5 years the program has been in place. Moreover, two states whose fish exports were affected — Namibia and Vanuatu — have joined CCAMLR since the process began. Other states — Belize, China, Mauritius, Singapore, and the Seychelles — have also agreed to cooperate with the Commission on catch documentation issues [CCAMLR, n.d.a].

Other fisheries commissions, such as the Indian Ocean Tuna Commission, the Northwest Atlantic Fisheries Organization, and the North-East Atlantic Fisheries Commission, have adopted similar schemes that regulate trade with nonmember states as a way to increase participation with the regulatory process. These efforts seem to be having an effect, precisely because of their interference with trade. States whose vessels fish in international waters do not want to be cut off from the major markets for their fish products, and therefore have been willing to take on obligations they had not previously chosen to adopt, in order to have access to these markets. The WTO, moreover, has indicated that these types of trade restrictions are acceptable under WTO rules [DeSombre, 2005].

Port State Control

Port state control is the power of actors from a state to "board, inspect, and where appropriate detain a merchant ship" flying a foreign flag that enters its port [Hare, 1997]. The legal authority to do so can be found in a number of international agreements from the past 3 decades, many of them under the auspices of the IMO, and the process of cooperation among those states conducting the inspections has been formalized through a set of regional Memoranda of Understanding (MOUs).

Although port state control is not practiced for the purposes of restricting trade, it has the effect of doing so. Ships detained by or after inspections are impacted in their ability to engage in trade, and ships that do not meet international standards are likely to be in that situation because owners have chosen to operate low-standard ships in order to gain advantages in international trade.

The primary locus of authority for the broad jurisdiction of port state control comes from UNCLOS [1982], building on broader principles of international law. UNCLOS lays out the ability of states to "establish particular requirements for the prevention, reduction and control of pollution of the marine environment as a condition for the entry of foreign vessels into their ports." Its Article 211 requires flag states to hold their ships responsible for providing information to port states that require it for these purposes. In addition, Articles 216, 218, 219, 220 stipulate that port states have an obligation to prevent a ship — inspected and found violating an applicable rule which "threatens damage to the marine environment" — from leaving port until the problem has been resolved.

The system of port state control as it is currently practiced is explicitly governed by MOUs in an attempt to create a system with a greater effect than simply reporting problem ships to flag states. The first of these, the Paris MOU, was completed in 1982, initially involving 14 European states. This and other similar agreements make no new laws pertaining to ships; instead, they refer to existing international agreements on labor, safety, and environmental protection that ships must uphold. In addition to UNCLOS, these main agreements are:

- The International Convention for the Prevention of Pollution from Ships (MARPOL), 73/78
- The International Convention for the Safety of Life at Sea (SOLAS), 1974
- The International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW)
- The International Convention on Load Lines, 1966
- The International Convention on Tonnage Measurements of Ships, 1969
- The Convention on the International Regulations for Preventing Collisions at Sea (COLREG),1973
- ILO Convention No. 147, Merchant Shipping (Minimum Standards), 1976

The MOUs covering most regions of the world include: the Viña del Mar, or Latin America (1992); Tokyo (1993); the Caribbean (1996); the Mediterranean (1997); the Indian Ocean (1998); West and Central Africa (1999); the Black Sea (2000); and Persian Gulf (2004).

These MOUs create a systematized process of enforcing existing international rules, which thus brings into being new obligations specifically for the port states that participate. In existing MOUs, the port state authorities agree to inspect some percentage (for the Latin American agreement it is 15 percent and for Tokyo and Paris {until recently} it has been at least 25 percent)[4] of ships that enter their ports during the course of a year, and to use a standard inspection process that, while it allows discretion on exactly how the inspection is done, holds ships to a set list of international obligations. MOUs also set up a process for sharing information with the other members. Member states are required to provide information of a particular metric and in a standard format. There is evidence that the MOU process has dramatically improved the implementation of international ocean agreements [DeSombre, 2006b].

Port state control is not explicitly a process for restricting trade but the context in which it operates is precisely about trade. The whole reason that inspection — and particularly detention — is a potent threat is because shipping operates on increasingly thin profit margins and the time spent detained can make the difference between financial success and failure. Because MOU inspections explicitly discriminate based on flag state (states focus on inspecting ships registered in states with poor inspection records), ship owners may choose where to register based on the likelihood that their ships may be singled out for inspection, and states, hoping to improve their inspection records, may choose to adopt higher standards in order to decrease their detention rates.

Conversely, it is precisely these thin profit margins that lead some states to choose to avoid high standards and many ship owners to register in low-standard states. Ship owners fear the only way to effectively compete for cargo in international trade is going low cost, and that strong international and domestic standards increase the cost of operating ships. There is thus a constant tension between the need for lower costs and the hope of increasing standards. Port state control impacts this process and thereby impacts the way international trade on the oceans is conducted.

Behavior Standards

Most ocean governance agreements operate through requiring that states change their behavior, which for the most part means that flag states must require ships they register to change behavior. Although it is states that take on international obligations, it is predominantly substate actors whose behavior changes are required for implementation of these standards.

[4] In 2004 the Paris MOU Committee decided at its annual meeting to remove the requirement that 25 percent of ships be inspected [Reyes, 2004].

An overview of the types of behavior changes required by ocean governance agreements must be broad, since there are large numbers of international agreements pertaining to the governance of the ocean. A few categories can be identified, however.

First are treaties pertaining to the conservation of fisheries. These are among the earliest ocean governance treaties, with the clearest incentive structure for behavior change: those who fish agree to observe limits to their fishing, in order to ensure that sufficient fish remain in the ocean to reproduce and allow fishing to continue indefinitely. Fishery treaties generally regulate by species, by region, or both. They put limits on the amount or size of fish that can be caught, determine seasons or areas in which catching is allowed or prohibited, and regulate methods that can be used for catching fish. Sometimes (as with the International Whaling Commission) there is only one collective quota for all who participate. More frequently (and more recently) total allowable catches within the fishery are divided by states so that each has its own quota; it is then up to the state to ensure that its fishers collectively do not exceed that quota [DeSombre, 2006a].

Other agreements protect species that are considered to be endangered or are vulnerable to extinction. In these cases, the concern is generally to prevent any use, rather than pursuing sustainable use as fisheries agreements do. CITES (discussed above in the consideration of trade sanctions) lists some ocean species, as does the Convention on Migratory Species, which also creates individual affiliated agreements to protect species, some of them in oceans. Other agreements, such as the Inter-American Convention for the Protection and Conservation of Sea Turtles [1996] focus on protecting a specific type of endangered species, both in fishing activities and ensuring that the young are able to hatch. Also important are agreements (including some of the above) that protect species harmed incidentally by other activities — for instance as bycatch in fishing (a problem for some seabirds, marine mammals, sea turtles, or even for fish species other than those being sought). Since the economic activity implicated in harming endangered species — be it fishing or direct use of endangered species — almost inevitably involves trade, regulations to protect these species thus impacts trade.

A number of agreements regulate the disposal of pollution in the ocean, from the Convention for the Prevention of Marine Pollution by Dumping and Other Matter [1972] (currently referred to as the London Convention) to various protocols to the regional seas conventions. Most of these treaties are regulatory — they create lists of substances that cannot be disposed into the ocean, as well as those that can be dumped with special permits or a determination that disposal will not be unduly harmful to ecosystems. Dumping, in this case, constitutes both of taking waste produced on land out to the ocean to dispose of it, and of putting into the ocean waste generated during the operations of ships. These regulations thus both impact the activity of ships (that would have been disposing of waste in the oceans but now cannot) and, presumably, require a change in how waste that would have been disposed of in the ocean is addressed on land.

More recently, those concerned with preventing ocean pollution have realized that land-based sources are responsible for much of the relevant pollution and must also be regulated. Some have estimated, for example, that land-based sources account for 44 percent of marine pollution [International Chamber of Shipping and International Shipping Federation, n.d.]. Examples of international agreements to deal with this issue are the Paris Convention for the Prevention of Pollution from Land-based Sources [1974] (now part of the 1992 Convention for the Protection of the Environment of the North-East Atlantic) and the Protocol for the Prevention of Pollution from Land-based Sources [1980] to the Convention for the Protection of the Mediterranean Sea Against Pollution [1976] (commonly referred to as the Barcelona Convention), which has been renegotiated as the 1995 Convention for the Protection of the Marine Environment and the Coast Region of the Mediterranean. Both these agreements require that states make plans to reduce the introduction from land activities of various substances deemed harmful, with the elimination of those deemed most harmful. If fully implemented, these types of rules would require serious behavior changes that would have strong and diffuse economic impacts. They are quite difficult to implement, however. A joint meeting between the World Health Organization and the United Nations Environment Programme pointed to the difficulties of creating such behavior change, including the difficulty of oversight and monitoring and the costs of domestic enforcement [WHO/UNEP, 1999].

Behavior standards can be particularly difficult to implement successfully with respect to ocean governance, both because they require changes from a lot of actors (for example, ships or those who work on them) and because the ocean is so vast the detection of noncompliance can be difficult. Although in some cases this noncompliance can come as intentional state-level action — as Soviet whaling did, with a state-directed program of violating IWC standards but reporting information to the organization suggesting compliance with regulations [Brown, 1994] — it is much more likely to involve illegal behavior on the part of substate actors whose states do not successfully prevent, or even know about, their improper behavior. In the case of fisheries, for instance, those who fish will gain in the long run if the fishery is successfully managed, even if this requires sacrificing in the short-term. Yet it is difficult to get the requisite behavior change to address the problems. In the protection of endangered species or the avoidance of ocean pollution, costs are incurred both by those who will directly benefit when these strategies are implemented (for example, those who must change land-based practices to avoid ocean runoff must find alternate locations for disposing of pollution or change a variety of activities to avoid harming endangered species) and those who will not even benefit if management is successful. Given the low-level of success of fisheries regulations, which will benefit those regulated (in the aggregate), it should not be surprising that other types of behavior standards have been difficult to enforce.

All of these activities have costs, many of them to internationally competing industries, and thus have the potential to impact trade. Their effects on trade vary significantly, and in many cases would require extensive analysis to determine. But it is clear that international governance structures that impact the behavior of ships and influence what economic actors may do (in protecting the ocean environment) have the potential to impact international trade.

Equipment Standards

One of the most successful behavior changes impacted by international regulation on the oceans (and supported by the port state control system) is that of equipment standards on ships. The relevant equipment standards generally pertain either to safety or environmental protection. Many of the safety requirements — the necessity for life boats, fire suppression equipment, including fire barriers and other equipment to protect crew members in the case of disasters at sea, are regulated under the many iterations of the Convention for the Safety of Life at Sea (SOLAS). Port state control processes, discussed above, check for these types of safety equipment. At any given time, the necessity to have this kind of equipment makes operating a vessel more expensive (which accounts for those that choose to do without, whether legally — in states that are not SOLAS members — or otherwise).

The most frequently required equipment standards for environmental protection comes in the context of prevention of oil pollution (intentional or accidental) as addressed by the International Convention for the Prevention of Pollution from Ships (MARPOL 73/78). MARPOL built on earlier oil pollution agreements by requiring equipment standards rather than behavior standards for restricting oil emissions from ballast water used by oil tankers. Tankers that drop off oil they have been transporting need to take on ballast water for the return journey. Until MARPOL regulations, the standard way to do this was to take the ballast water into the tanks that had delivered the oil, and then discharge it — with some oil inevitably accompanying the water — before returning to port to pick up the next shipment. MARPOL provided several equipment-based alternatives, designed to avoid the oil pollution that resulted from hard-to-monitor discharge standards. Prime among these is the use of segregated ballast tanks (SBT) — in which separate tanks are provided for ballast water, apart from the oil tanks. This has now become the industry standard; most oil tankers currently in operation use SBT equipment. This kind of equipment standard was controversial because operating with this equipment is more costly for tankers: they have less room for carrying oil if they save empty space for carrying ballast water on the return trip. The estimated lost cargo room from the use of SBT is between about 12 and 15 percent of the tanker's carrying capacity [Mitchell, 1994]. Though for the reason discussed below, it is nearly impossible to do a straight comparison of the increased costs of using SBT. Initial studies suggested that the shipbuilding costs for SBT increase anywhere between 2 and 13 percent for creating an otherwise comparable SBT tanker [Cummins et al., 1975].

Interestingly, one of the major effects of SBT regulations has been to increase the size of the oil tankers used. Instead of using ships with lower capacity, those who operate oil tankers have moved to SBT-outfitted ships with the same oil-carrying capacities that are therefore much larger. This initially led to pressure from operators of larger SBT ships to change the practice of charging fees based on ship size to those based on cargo size, since their ships had to be larger to be able to transport the same amount of oil under the new equipment rules. For example, Intertanko, the organization of independent tanker owners, asked the Suez Canal Authority to change its practice of charging per ton of ship (rather than ton of oil carrying capacity), suggesting that this practice discriminated against ships with SBT [Platt's Oilgram News, 1992].

Nevertheless, in the port state control context (and the fact that equipment standards are much easier to monitor than behavior standards), almost all oil tankers now operate using SBT technology. In this case, the move from behavior standards to equipment standards is believed to have made the major difference in the protection of the oceans from intentional oil pollution [Mitchell, 1994].

The most recent equipment requirement for oil tanker is double hulls: an additional layer of metal between the ship and the oil that decreases the odds a ship running aground will cause an oil spill. The 1992 amendments to MARPOL require newly built tankers beginning in 1996 to have double hulls, and under a 2001 amendment, all ships must have them by 2015. Individual states have created their own requirements that exceed IMO rules: the United States Oil Pollution Act of 1990 preceded — and thus pushed — the 1992 MARPOL amendments. In a set of regulations dating from 2002 to 2004, the European Union required all tankers traveling in EU waters (or registered in EU states) — depending on date of construction and amount of oil carried — to have double hulls by dates ranging from 2003 to 2010.[5] The new EU rules obviously impact trade in oil, by dictating which ships can enter EU waters and by increasing the incentive for ships to be retrofitted or retired (or moved to other trade routes). The standards under MARPOL do the same, but on a slightly longer time frame.

It is reasonably easy to ascertain a direct link between equipment standards for ocean protection and international trade, though systematically determining the magnitude of the effect these standards have on trade would be a daunting task. As the SBT example suggests, it is not only that equipment standards changed the way tankers were built, but those who purchased tankers responded not simply by using the new equipment but by instead purchasing larger tankers with the new equipment. This change is likely to have other knock-on environmental impacts. Presumably the shipping costs increased as well, which has impacts on trade, but an ability to identify the specific impacts is beyond the scope of this chapter.

Monitoring

Many ocean governance treaties require some form of monitoring as a part of their operations. Labor standards are the least-monitored standards to which ships can be obligated, although the private certification process of the International Transport Workers' Federation, discussed below, plays a role in monitoring labor standards on ships. Safety standards, under agreements like SOLAS, allow for monitoring within the treaty, but have effectively been monitored through the process of port state control.

Most international environmental agreements call for self-reporting, rather than monitoring per se. States, for instance, need to report their compliance with MARPOL, the London Convention (1972), and the various regional seas agreements negotiated under UNEP. Self-reporting under international environmental agreements is lacking, however. Many states do not fulfill reporting obligations, although there is little evidence that nonreporting indicates noncompliance.

Fisheries agreements are the most likely of international ocean treaties to contain some form of monitoring, and this monitoring has become more substantial over time. In some fisheries agreements, observers from other states travel on fishing vessels to report or verify catch statistics. The International Whaling Commission (IWC) created such a system, but is

[5] Regulation (EC) No. 417/2002 of the European Parliament and of the Council of 18 February 2002; amended by Regulation (EC) No. 1726/2003 of the European Parliament and of the Council of 22 July 2003 and Commission Regulation (EC) No. 2172/2004 of 17 December 2004. See also Europa (n.d.).

currently not in use because commercial whaling is not being conducted through the organization. The Northwest Atlantic Fisheries Organization (NAFO) implemented an observer scheme after the Canada-Spain conflict over fishing quotas, when Spain was found to have illegally sized nets and banned fish on a fishing vessel [NAFO, n.d.]. The Inter-American Commission for the Conservation of Atlantic Tunas has such a program,[6] as does the Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean (2000).[7] Similarly, some states, such as Australia, place national observers on foreign vessels fishing within their exclusive economic zones [Australian Fisheries Management Authority, 2005].

Other forms of monitoring are also being tried. The various catch documentation schemes, described above in the discussion of participation mechanisms, require member states in a regional fishery management organization to monitor the catch conditions of all fish they allow to be imported into, or transshipped through, their territory.

An even more intrusive process would monitor where fish are actually being caught. CCAMLR, as of 2001, required all ships of member states fishing for Patagonian toothfish in the regulatory area be outfitted with a satellite tracking device that would allow their flag states to track their location. Such a system only allows the flag state (which, under the catch documentation scheme, also verifies that the fish were caught within convention regulations) to track the vessel's location. A more controversial proposal would have required CCAMLR itself to track the vessels: this proposal came in light of allegations that some vessels had falsified their location reports. Argentina vetoed such a measure at the 2003 CCAMLR meeting [The Mercury (Australia), 2003]. CCAMLR did, however, authorize a pilot program to test such a system [CCAMLR, n.d.b]. Other fisheries organizations are also including such systems; NAFO, for example, as of 2001, required contracting parties to be equipped with a Vessel Monitoring System which sends location reports to national reporting centers, which in turn are responsible for reporting positions to NAFO [NAFO, n.d.].

Presumably all of these monitoring programs are designed to increase the likelihood that ships will abide by the rules their flag states have agreed to (or that states whose waters they are fishing in have required). Doing so will better protect the resource in question, but at the same time increase costs of doing business, since fisheries observers or vessel monitoring systems are not free.

[6] This observer scheme, created in the 1980s in an effort to decrease dolphin mortality in tuna fishing, was one of the earlier ones.
[7] Annex 3, Article 3.

Labeling and Certification

Labeling and certification have occasionally been controversial elements in the intersection between environmental protection and free trade. The GATT/WTO system attempts to avoid all restrictions on non-tariff-based trade. Arguably, labeling requirements can be considered to be nontariff barriers to trade. As such, most of the issues about labeling are connected to actual trade restrictions — where the issues have been generally contemplated in light of the trade restriction itself — rather than discussing the impact of the labeling scheme.

To protect dolphins in tuna fishing, domestic U.S. tuna canneries created a "dolphin-safe" label for tuna. With heavy lobbying from environmental organizations, the U.S. Congress passed the Dolphin Protection Consumer Information Act: creating a standard that would have to be met for domestically produced or imported tuna and to be labeled as "dolphin-safe" [DeSombre, 2000].

Other types of certification relating to ocean governance can impact trade, however. One notable example is the process of certifying that ships have adopted certain labor standards. A robust process to do so has been undertaken by the International Transport Workers' Federation (ITF), a global labor union. This union offers collective agreements to ships that have agreed to uphold a set of International Labour Organization standards (regardless of whether they are required to do so by their flag state) and to contribute to the ITF welfare fund. Ships with these agreements also give permission to the ITF to conduct inspections to verify that these standards are being upheld. Ships without agreements are given the opportunity to acquire them (by following the necessary rules), but if they do not, the ITF may elect to call a dockworker boycott and refuse to service the ship in port [Northrup and Scrase, 1996]. In determining effects, what is more remarkable than the percentage of ships with collective agreements or analogous certification from the ITF — approximately 30 percent [ITF, n.d.] — is that those who engage ships for transport have begun to insist the ships they hire have blue certificates [Lloyd's Shipping Economist, 1996]. Concern about the possible interruption of trade when ships are subject to labor action has led those who use those ships to require a level of labor standards that otherwise would have not existed, thus changing both patterns of trade and of ocean regulation.

Labeling and certification are frequently intended as a way to interfere with trade. They can be direct, as in the catch documentation measure discussed elsewhere in this report that requires states to limit their imports to fish with proper documentation. Or they can be indirect, by giving either individuals or states — who want the ability to choose which products to buy or use based on the products' impacts on oceans — the opportunity to discriminate based on various standards and requirements.

While the idea of individual shippers being able to choose to send their goods on ships with ITF certificates has not been seen as problematic from the perspective of international trade rules (though it certainly has impacts on trade), decisions by states to support, or make trade decisions based on certification, is at least theoretically more complicated for international trade rules.

Exogenous Impacts on Ocean-borne Trade

Security

Security has always been a concern for ocean-borne trade. The nature of the high seas makes it difficult to ensure the security of ships where the rule of law is poorly enforced. Jurisdictional issues complicate the matter — it is unclear if security should be provided by the state in which a ship is flagged, the state of beneficial ownership, the state of origin or destination of particular shipments, or by those states that are geographically nearest. Furthermore, areas used as havens by those who would threaten the security of ocean-borne trade are often within the sovereign territories of states that are unable to root out the threat, but at the same time are unwilling to compromise their sovereignty by letting others secure their territory for them.

There are two general categories of security threats to ocean-borne trade at the moment: terrorism and piracy. Terrorism threatens shipping mostly in an oblique way — it increases the cost of shipping by making states adopt costly port security measures. Piracy threatens shipping more directly, by creating a direct threat to the security of ships and sailors at sea. Both have the effect of increasing the cost of insurance for shipping, thus potentially generating a marginal decrease in volumes shipped.

Terrorism

Sea-borne trade has long been recognized as vulnerable to terrorist activity. This is particularly true of containerized shipping, because port workers rarely see inside the containers, making them ideal hiding places for bombs (as well as smuggled goods and people). Concern about this vulnerability grew following the terrorist attacks on the United States in 2001. Although customs officials have the right to inspect containers, they rarely do — by some estimates, only 2 percent of containers are physically inspected in ports [The Economist, 2002]. Inspecting a significantly higher ratio of these containers could prove prohibitively expensive, and could in turn create a major barrier to the growth of international trade.

The United States has taken the lead in dealing with this issue, and is approaching it from two angles. One angle involves the use of improved inspection technology, and the other involves improving tracking of containers at ports of embarkation. Improved technologies include radiation detectors designed to identify nuclear materials in containers efficiently enough that all containers can be cost-effectively scanned, and improved radar- and x-ray-based equipment eliminating the need to open them. At this point, these technologies have mostly been installed only at larger ports, and many are turning out to be of questionable usefulness [Lipton, 2005]. But the trend to increased high-technology port security measures will likely continue. These measures add somewhat to the cost of shipping, but not prohibitively.

The major policy to accomplish these ends is the International Ship and Port Facility Security (ISPS) Code, which was adopted in December 2002 as amendments to the 1974 Convention for the Safety of Life at Sea (SOLAS), and entered into force in July 2004. The ISPS Code includes a mandatory section that requires that ports and shipping companies in member states take on a set of security measures [IMO, 2002]. States are required to undertake a Port Facility Security Assessment for each port in their territory, identifying the port infrastructure that is essential to port operation; identify its vulnerabilities; and ascertain which components could, if damaged, become a threat to human life, to the environment, or to the operation of the port. They are also required to approve the security plans of vessels flying their flags and verify that these ships are complying with the ISPS obligations.[8] Each ship must create a Ship Security Plan as well, and carry an International Ship Security Certificate indicating compliance with relevant ISPS rules. The creation of the ISPS accelerated the existing IMO plans to require most large commercial ships be fitted with an Automatic Identification System. In addition, ships must carry with them a Continuous Synopsis Record that contains basic information about the ship, its flag, its registration, and owner information, including name and address.[9] Undertaking these measures will be extremely costly for ports and for ship operators.

Piracy

Lawlessness on the oceans has been an issue for centuries. In the 18th century, for example, much of the shipping in the Mediterranean was dominated by the Barbary pirates. Braithwaite and Drahos [2000] argue that historically, states tolerated piracy and related practices on the oceans because they benefited from the system, either directly (by employing the pirates themselves) or indirectly (by the general lack of regulation on

[8] International Ship and Port Facility Security (ISPS) Code (2002), Articles 4-5, 16-17, 19.
[9] International Ship and Port Facility Security (ISPS) Code (2002), Articles 6-12.

the high seas). When Britain, the naval power at the time, concluded that ocean lawlessness was interfering with its economic needs, it took action to signal that piracy would no longer be tolerated [Braithwaite and Drahos, 2000].

Piracy is again becoming a fairly major threat to shipping in some areas, particularly in Asia. Though large numbers of attacks likely go unreported, in 2006 there were 239 reported incidents of piracy on commercial vessels [IMB, 2007], and in Southeast Asia an average of two commercial ships a month are hijacked [Burnett, 2002]. Though there are no clear solutions to the problem, the International Maritime Bureau of the International Chamber of Commerce tracks these attacks and issues daily situation reports to ships warning of potential piracy risks. Some of the practices undertaken in the ISPS Code may help with piracy as well.

Climate Change

Climate change can affect ocean-borne trade through the effects of actual changes in the climate, and the effects of efforts to regulate greenhouse gas emissions.

Climate effects

Because the potential effects of climate change are so unclear, it is difficult to predict the effects of climate change on ocean-borne trade. But it could potentially have both direct and indirect effects. Direct effects are effects on the process of shipping itself. Most forecasts suggest that climate change will have the effect of exacerbating extreme weather events. This would likely add to the cost of shipping, both through increased insurance costs to compensate for a higher frequency of damage to and loss of ships from weather events, and through a need to build stronger, and therefore more expensive, ships. These costs may be partially offset by improvements in storm forecasting capabilities.

Indirect effects refer to the effects of climate change on global production patterns, and thereby on demands for ocean shipping. Any speculation on these effects at this point would be pure guesswork.

Kyoto effects

The Kyoto Protocol to the United Nations Framework Convention on Climate Change may have direct consequences for patterns of ocean-borne trade. The Protocol does not actually affect the process of shipping directly, because the stipulated reductions in greenhouse gas emissions do not apply to international shipping.[10] In other words, the fuel burned by international shipping is not counted against any country's quota. The

[10] Article 2, paragraph 2.

Protocol calls for the International Maritime Organization to preside over the negotiation of regulatory mechanisms for the reduction of greenhouse gas emissions from international shipping, but at this point no significant progress has been made toward this goal.[11]

The Protocol may well affect patterns of ocean-borne trade indirectly, by affecting patterns of international trade. It may, paradoxically, have the effect of increasing such trade, because sea-borne transportation is far more energy-efficient than land-based transportation [Barkin, 2003]. It may also reduce the demand for oil tankers, and the sea-borne transportation of oil. This would in turn reduce the risk of one of the most damaging effects of international shipping — large-scale oil spills.

The Costs of Implementing Environmental Agreements

The costs of implementing international environmental agreements and various national environmental standards can be broken down into three categories: industry-wide costs, relative costs, and port costs. Industry-wide costs are those costs that equally affect all participants in a particular part of the industry. For example, the requirement to double-hull all oil tankers by 2015 imposes equivalent costs on all tanker operators. This in turn has two effects. One, it is often less difficult for larger, more highly capitalized operators, and those operators who are already operating at the more environmentally friendly end of the industry. This is because these operators are likely to get access to the capital necessary to implement capital improvements at lower rates, and because they often have to change their operations less to meet higher standards. Two, many environmental agreements impose costs on operators, thus increasing the costs of ocean-borne trade over what they would otherwise be. This has not had the effect (nor is it likely to) of increasing costs overall. Technological and organizational improvements in the industry continue to drive costs downwards. The costs of implementing environmental agreements act as a relatively minor break on this trend. As such, these costs marginally slow the rate of expansion of ocean-borne international trade.

The second category of costs is relative costs: the costs that apply to some shippers but not to others. To the extent that some ship operators

[11] As of late 2004, the IMO's Marine Environment Protection Committee had begun working on draft guidelines for a voluntary carbon dioxide indexing scheme, and "recognized that IMO guidelines on greenhouse gas emissions have to address all six greenhouse gases covered by the Kyoto Protocol." In other words, they have not progressed beyond the Protocol [IMO News, 2004].

flag their ships in low-regulation states, or avoid ports that actively enforce international regulations, their ships can avoid the costs associated with implementing those regulations. This means these ships can operate at a cost advantage compared to ships that comply more fully. But this cost advantage is offset by the resulting limits on where the ships can operate. This may result in the medium term in a bifurcation of the industry into a higher-cost segment that operates in high-regulation areas, and a lower-cost segment that operates in lower-cost areas and presents a much greater threat to the environment in those areas.

The third category of costs is port costs: the costs of building ports that can service ships built to new environmental standards. This includes the cost of large-scale hardware like ballast reception facilities. For most industrialized and large countries the costs of these facilities is not problematic. But for the poorest countries, those that already have the poorest access to international trade, the cost can be prohibitive. Port costs may therefore have the effect of making it more difficult for the poorest countries and regions to become active participants in international trade.

Conclusions

International trade is inextricably intertwined with the oceans, both as a medium of transportation and as a source of resources. But the relationship between the trade-and-oceans nexus and sustainable development is not necessarily clear. The nexus enables production at greater scales than would otherwise be possible, threatening sustainability. At the same time, it allows productive resources to be distributed more efficiently, potentially aiding sustainability.

Ocean Trade and Sustainable Development

Efficient ocean-borne trade allows for greater levels of production than would otherwise be the case, other things being equal. The cheaper ship-borne transportation becomes, the more it allows for global increases in production. In this sense, the expansion of ocean-borne trade presents a threat to sustainability. But there is an offsetting gain, in a sustainability sense, from the ability to make things where they can be produced most efficiently, or extract resources where they are most abundant, and then move them around at little cost. For example, the availability of cheap ocean-borne transportation allows for the exploitation of resources in a local area for a global market. As such, ocean trade can exacerbate the unsustainable exploitation of a particular resource. At the same time, the ability to draw resources from where they are abundant often means that more environmentally vulnerable areas can be protected from exploitation.

In short, it is not clear what the overall sustainability effects of ocean trade are, and there is probably no straightforward metric by which the variety of different sustainability effects can usefully be measured against each other. It may well be the case, however, that ocean trade has a positive impact on sustainable development in the rich world, at the expense of sustainability in the poor world. Because ever-cheaper ocean-borne transportation allows many economic activities to be carried out on a global scale anywhere in the world, it can have the effect of moving environmentally damaging activity from highly regulated, usually richer areas to less-regulated, usually poorer areas.

Sustainable Exploitation of the Oceans

International trade affects the sustainable management of the oceans in two ways: through damage caused to ocean environments in the process of transportation, and the damage done through the extraction and exploitation of ocean-based resources. Ship-borne transportation, as noted above, generates pollution through general operation and through major accidents at sea. The damage done to the environment by shipping by volume shipped has consistently fallen in the past few decades, as both technology and regulation have improved. This improvement, however, has been offset by increasing volume of ocean transport. In some forms of pollution, volume effects have overwhelmed improvements, leading to an overall decrease in sustainability. With other forms of pollution, the opposite is true. While it is not clear which effect predominates overall, the sustainability effects of international shipping can be significantly impacted by future regulatory efforts, and by future technological developments.

The sustainability effects of current levels of ocean resource exploitation are much clearer — ocean resources, particularly with respect to fishery resources and oil extraction, are being used unsustainably. That oil extraction is unsustainable is true almost by definition, being a non-renewable resource. But the rate of extraction in many of the major offshore oilfields, such as those in the North Sea or the Gulf of Mexico, is unsustainable even in the short term. And the effects of extraction on local ecosystems can be severe. Meanwhile, ocean fish stocks are being exploited at a clearly unsustainable level. While international cooperation is moving exploitation towards more sustainable levels with respect to some fish stocks, other stocks continue to be added to the list of those that are being overfished. The sustainability effects of ocean overfishing have already proved to be severe, and without major improvements in management, large swaths of ocean may suffer considerable environmental degradation.

Other Options

Beyond business-as-usual, two ways often discussed on improving the sustainability of development are localization and internalization. Localization is the opposite of the globalization of production. It refers to the promotion of production for local consumption only. Internalization means the creation of regulatory mechanisms that force people undertaking economic activity to absorb all of the costs, the externalities, of their activity. Both localization and internalization are relevant strategies for dealing with the sustainability implications of the trade-and-oceans nexus. Each strategy has both potential and limitations. In the context of sustainable development and the trade-and-oceans nexus, though, internalization has the greater potential.

Localization

Localization would have a major impact on ocean-borne trade. It would decrease the use of the oceans for transportation, and thus decrease all of the environmental damage associated with ocean-borne transportation. It would decrease exploitation of some ocean resources, particularly deep-sea resources, but may also have the effect of increasing pressure on resources, particularly fish stocks, near large population centers. The overall effect of localization on sustainability would be similarly unclear, because of the scale-versus-efficiency tradeoff discussed above. Localization would also, however, have a major impact on the "development" part of sustainable development, particularly in a region as export-focused as Asia-Pacific.

Internalization

Internalization would hold those undertaking any economic activity responsible for the sustainability impacts of that activity. For example, it would tax bunker fuel enough to offset the climate change impacts of the fuel, would hold ship owners responsible for any environmental damage caused by their ships, and would charge enough for fishing permits to compensate for the negative impact of fishing (and enough to discourage unsustainable fishing). Internalization can be effective when applied well. Effective internalization, however, is both technically and politically more feasible in some situations than others. It is more politically feasible when it does not come up against vested economic interests with the political ability to avoid the imposition of the costs of internalization. This is a common problem with fisheries management — charging commercial fishers an environmentally sound amount for the right to fish often runs up against organized and effective political opposition. It is more technically feasible when it is enforceable. For example, monitoring the environmental impacts of ships at sea can be difficult, making it difficult to determine what needs to be internalized. But where feasible, internalization can have a major impact on the sustainability of ocean-based trade-related activity.

Both of these aspects are much more problematic on a large and inherently international space like the oceans. Even if it were politically possible in some jurisdictions to create policies increasing the internalization of environmental impacts, states do not have to take on international regulation. In the case of shipping, the well-developed system of flags of convenience, responsible for the majority of ships operating in a trans-oceanic capacity, suggests that some states are willing to remain outside a costly system of international regulation, and that ship owners will choose to register their ships there. Any serious system attempting to internalize the externalities discussed in the report will have to make use of a variety of the other mechanisms discussed here to increase the chances that states will join and that violations of rules can be detected.

References

Australian Fisheries Management Authority. 2005. "Observer Program," 28 April 2005. Available at http://www.afma.gov.au/services/observer/default.php. [Accessed 15 May 2005].

Barkin, J.S. 2003. "The counterintuitive relationship between globalization and climate change." *Global Environmental Politics*, 3(3):8–13.

Braithwaite, J. and P. Drahos. 2000. *Global business regulation*. Cambridge University Press.

Brown, P. 1994. "Soviet Union illegally killed great whales." *Guardian*, 12 February 1994:12.

Burnett, J.S. 2002. *Dangerous waters: Modern piracy and terror on the high seas*. Plume, New York.

CCAMLR. n.d.a. "List of parties implementing the CDS." Available at http://www.ccamlr.org/pu/E/cds/list-of-parties.htm. [Accessed 10 May 2005].

CCAMLR. n.d.b. "Conservation measures 10-06, 10-07, and resolution 19/XXI." Available at http://www.ccamlr.org. [Accessed 15 June 2004].

CITES Secretariat. 2005. Appendices I, II, and III, 17 February 2005. Available at http://www.cites.org/eng/app/appendices.shtml. [Accessed 9 May 2005].

Connor, S. 1999. "Rare coral discovered clinging to North Sea oil rigs." *The Independent*, 9 December 1999:11.

Couper, A.D. 1999. *Voyages of abuse: Seafarers, human rights, and international shipping*. Pluto Press, London.

Cummins, P.A., D.E. Logue, R.D. Tollison and T.D. Willett. 1975. "Oil tanker pollution control: Design criteria vs. effective liability assessment." *Journal of Maritime Law and Commerce*, 7(1):169–206.

DeSombre, E.R. 2000. *Domestic sources of international politics: Industry, environmentalists, and US power.* MIT Press, Cambridge.

DeSombre, E.R. 2005. "Fishing under flags of convenience: Using market power to increase participation in international regulation." *Global Environmental Politics*, 5(4):73–93.

DeSombre, E.R. 2006a. *Global environmental institutions*. Routledge, Oxford.

DeSombre, E.R. 2006b. *Flagging standards: Globalization and environmental safety, and labor standards at sea*. MIT Press, Cambridge.

DeSombre, E.R. and J.S. Barkin. 2001. "Turtles and trade: The WTO's acceptance of environmental trade restrictions." *Global Environmental Politics*, 2(1):12–18.

Dommen, C. 1999. *Fish for thought: Fisheries, international trade, and sustainable development — Initial issues for consideration by a multi-stakeholder policy dialogue, research, and information exchange process.* Natural Resource, International Trade and Sustainable Development Series No. 1. International Centre for Trade and Sustainable Development (ICTSD) and IUCN-The World Conservation Union.

Europa. n.d. "Maritime safety: Activities of the European Union: Accelerated phasing-in of double-hull tankers." Available at http://europa.eu.int/scadplus/leg/en/lvb/124231.htm. [Accessed 15 May 2005].

European Parliament. Regulation (EC) No. 417/2002 of the European Parliament and of the Council of 18 February 2002 and its amendments; Regulation (EC) No. 1726/2003 of the European Parliament and of the Council of 22 July 2003; and Commission Regulation (EC) No. 2172/2004 of 17 December 2004.

FAO. 2004. *The state of the world's fisheries and aquaculture 2004*, pp. 32–33. Food and Agriculture Organization Fisheries Department. FAO, Rome.

GATT (General Agreement on Tariffs and Trade). 1991. "Dispute settlement report on United States restriction on imports of tuna." *International Legal Materials*, 30:1594–1623.

GATT (General Agreement on Tariffs and Trade). 1994. "Dispute settlement panel report on United States restrictions on imports of tuna." *International Legal Materials*, 33:839–903.

Haas, P. 1990. *Saving the Mediterranean: The politics of international environmental cooperation*. Columbia University Press, New York. 303 pp.

Hare, J. 1997. "Port state control: Strong medicine to cure a sick industry." *Georgia Journal of International and Comparative Law*, 26(Summer 1997):571–594.

ICTSD (International Centre for Trade and Sustainable Development). 2005. "WTO members tackle development aspect of fisheries subsidies." *Bridges Trade BioRes*, 5(7):15 April 2005. Available at http://www.ictsd.org/biores/05-04-15/story1.htm. [Accessed 20 May 2005].

IMB (International Maritime Bureau). 2007. *Annual piracy report 2006*. International Chamber of Commerce, Paris.

IMO (International Maritime Organization). 2002. "IMO adopts comprehensive security measures." Press Briefing. Available at http://www.imo.org. [Accessed March 2004].

IMO News. 2004. "Revised MARPOL Annexes and IBC Code adopted at environment meeting." *IMO News: The Magazine of the International Maritime Organization*, Issue 4(2004):15.

IPCC (Intergovernmental Panel on Climate Change). 2007. *Climate change 2007*. Cambridge University Press, Cambridge.

International Chamber of Shipping and International Shipping Federation. n.d. "Shipping facts: Shipping and the environment." Analysis from the Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP). Available at http://www.marisec.org/shippingfacts/envirmntcontrib.htm. [Accessed 18 May 2005].

International Ship and Port Facility Security (ISPS) Code (2002), Articles 4–5, 6–12, 16–17, 19.

ITF (International Transport Workers' Federation). n.d. *Oslo to Delhi: A comprehensive review of the ITF FOC campaign*. ITF, London.

Kahveci, E. 2000. "Fast turnaround ships: Impact on seafarers' lives." *Seaways*, March 2000:8–12.

Kump, L.R., J.F. Kasting and R.G. Crane. 2004. *The Earth system*. Pearson, Upper Saddle River, New Jersey.

Kurlansky, M. 1997. *Cod: A biography of the fish that changed the world*. Walker and Company, New York.

Kyoto Protocol to the United Nations Framework Convention on Climate Change. 1992. Article 2, paragraph 2.

Larsen, J. 2004. "Dead zones increasing in planet's coastal waters." Earth Policy Institute. Available at http://www.earth-policy.org/Updates/Update41.htm. [Accessed 17 May 2005].
Lies, E. 2004. "Japan makes move to cut whale protection." *Planet Ark, Reuters Environmental News Service,* 1 October 2004. Available at http://www.planetark.com/dailynewsstory.cfm?newsid=27460&newsdate=01-Oct-2004. [Accessed 31 July 2007].
Lipton, E. 2005. "U.S. to spend billions more to alter security systems." *The New York Times,* 8 May 2005:1.
Lloyd's Shipping Economist. 1996. "Placing a value on crew experience." *Lloyd's Shipping Economist,* 18(3) March 1996:8–11
London Convention. 1972. "Frequently asked questions." Available at http://www.londonconvention.org/main.htm. [Accessed 31 July 2007].
MARPOL 73/78. 1992 Amendments and 2001 Amendments.
McGrath, S. 2005. "Attack of the alien invaders." *National Geographic,* March 2005:93–117.
Mitchell, R.B. 1994. *Intentional oil pollution at sea.* MIT Press, Cambridge.
NAFO (Northwest Atlantic Fisheries Organization). n.d. "NAFO fisheries management." Available at http://www.nafo.ca/activities/FRAMES/AcFrFish.html. [Accessed 15 May 2005].
Northrup, H.R. and P.B. Scrase. 1996. "The International Transport Workers' Federation flag of convenience shipping campaign 1983–1995." *Transportation Law Journal,* 23:3.
Oceana.org. n.d. "Cruise ship waste — Laws and regulations." Available at http://www.stopcruisepollution.com/index.cfm?fuseaction=factsheet_detail&factsheetID=992. [Accessed May 19, 2005].
Panitchpakdi, S. 2005. "Why trade matters for improving food security." WTO News: Speeches, DG, FAO, Rome, 13 April 2005. Available at http://www.wto.org/english/news_e/spsp_e/spsp37_e.htm. [Accessed 31 July 2007].
Platt's Oilgram News. 1992. "Egypt: News briefs." *Platt's Oilgram News,* 23 October 1992:6.
Reyes, B. 2004. "Paris MOU plans radical overhaul of inspections." *Lloyd's List,* 18 May 2004.
Safina, C. 1993. "Bluefin tuna in the West Atlantic: Negligent management and the making of an endangered species." *Conservation Biology,* 7(2):230–231.
Steinberg, P.E. 2001. *The social construction of the ocean.* Cambridge University Press, New York.
Stokke, O.S and D. Vidas. 2004. "Regulating IUU fishing or combating IUU operations?" OECD, Fisheries Committee, Directorate for Food, Agriculture and Fisheries, AGR/FI/IUU(2004)(8), 30 March 2004.
The Economist. 2002. "The perils of packet switching." *The Economist,* 6 April 2002. Lexis/Nexis.

The Mercury (Australia). 2003. "Snag in toothfish war." *The Mercury (Australia)*, 8 November 2003, Lexis/Nexis.

Turner, J.F. 2004. "Accession to the 1982 Law of the Sea Convention and ratification of the 1994 Agreement amending Part XI of the Law of the Sea Convention." Testimony before the Senate Environment and Public Works Committee, 23 March 2004. Available at http://www.state.gov/g/oes/rls/rm/2004/30723.htm. [Accessed 17 May 2005].

UNCLOS (United Nations Convention on the Law of the Sea). 1982. Article 211, 216, 218, 219, 220.

US Oil Pollution Act. 1990. U.S. Code, Title 33, Chapter 40.

WHO/UNEP. 1999. "Compliance and enforcement of legislation in the Mediterranean for control of pollution relating from land-based sources and activities." In: *Report on a Joint WHO/UNEP Meeting, 16-18 March 1999*. EUR/EHCO 05 01 01. WHO Regional Office for Europe, Copenhagen, Denmark.

WTO (World Trade Organization). 1998a. *United States — Import prohibition of certain shrimp and shrimp products: Report of the Appellate Body*. WT/DS58/AB/R, 12 October 1998.

WTO (World Trade Organization). 1998b. *United States — Import prohibition of certain shrimp and shrimp products: Report of the Panel*. WT/DS58/R, 15 May 1998.

WTO (World Trade Organization). 2001a. *United States — Import prohibition of certain shrimp and shrimp products: Recourse to article 21.5 by Malaysia: Report of the Panel*. WT/DS58/RW, 15 June 2001.

WTO (World Trade Organization). 2001b. *United States — Import prohibition of certain shrimp and shrimp products: Recourse to article 21.5 of the DSU by Malaysia*. WT/DS58/AB/RW, 22 October 2001.

WTO (World Trade Organization). 2004. "International trade statistics." WTO, Geneva.

WTO (World Trade Organization).n.d.a. "Accessions 2007." Available at http://www.wto.org/english/thewto_e/acc_e/acc_e.htm. [Accessed 31 July 2007].

WTO (World Trade Organization). n.d.b. "GATT signatories." Available at http://www.wto.org/english/thewto_e/gattmem_e.htm. [Accessed 31 July 2007].

WTO (World Trade Organization). n.d.c. "Members & observers." Available at http://www.wto.org/english/thewto_e/whatis_e/tif_e/org6_e.htm. [Accessed 31 July 2007].

Zhu, C. 2004. "Asia gunning for deep-sea oil and gas." *Planet Ark, Reuters Environmental News Service, 9 August 2004*. Available at http://www.planetark.com/dailynewsstory.cfm?newsid=26469&newsdate=09-Aug-2004. [Accessed 31 July 2007].

Xiamen port (Photo: CHUA THIA-ENG)

Fish trade in Hiroshima fish market, Japan (Photo: CHUA THIA-ENG)

CHAPTER 10

Overview of Regional Cooperation in Coastal and Ocean Governance

David L. VanderZwaag

Introduction

Providing an overview of regional cooperation in addressing human uses of ocean and coastal areas might be described as a "difficult voyage." Getting a firm fix on the state of regional cooperation around the globe is a challenge in light of at least four realities. First, is the large number and complex array of regional agreements and arrangements that exist. For example, some 38 regional fisheries bodies (RFBs) have been established [FAO Committee on Fisheries, 2007] with 20 having advisory roles and 18 having competence to establish fisheries conservation and management measures [Lodge et al., 2007]. Port state control agreements have been forged in many regions to cooperatively address inspection of substandard vessels [Kasoulides, 1997]. The regional harmonizing and strengthening of ship inspections while in ports began among European states under the Paris Memorandum of Understanding on Port State Control (1982) and similar cooperative agreements have been concluded in other regions including Latin America

(1992), Asia-Pacific (1993), the Caribbean (1996), the Mediterranean (1997), the Indian Ocean (1998), West and Central Africa (1999), the Black Sea (2000), and the Persian Gulf (2004) [IMO Sub-committee on Flag State Implementation, 2006]. A recent report just summarizing the complex patchwork of cooperative arrangements for the Gulf of Maine region between Canada and the U.S. took over 125 pages [ACZISC Secretariat and Marine and Environmental Law Institute, Dalhousie University, 2006].

A second difficulty is the malleable concept of region. Regions are human constructs subject to considerable overlaps and blurrings because of the many ways they can be defined [Johnston, 2006]. For example, regions can be delineated based upon management functions (for example, fisheries, shipping, or migratory species conservation), oceanographic parameters (such as convergence of cold and warm waters), and political and economic expediency (for example, security and trade facilitation) [VanderZwaag, 1999]. Some writers would not include bilateral cooperative arrangements under the term "regional" [Alexander, 1977].

A third reality is the ever-increasing number of decisions, recommendations, strategies, programs, and projects emanating from regional institutions. For example, the OSPAR Commission for the Protection of the Marine Environment of the North-East Atlantic lists on its website scores of recommendations, over 25 decisions, and 6 strategies (covering protection and conservation of marine biodiversity and ecosystems, eutrophication, hazardous substances, offshore oil and gas industry, radioactive substances, and monitoring and assessment).[1]

A fourth complicating reality is the often informal and hidden nature of transboundary cooperative relationships. For example, following the drawing of an ocean boundary in 1984 for Georges Bank and the Gulf of Maine by the Chamber of the World Court [McDorman et al., 1985], most transboundary cooperation between Canada and the U.S. has occurred through informal and nonlegally binding arrangements, with the main exceptions being joint contingency planning for environmental emergencies and fisheries enforcement. Transboundary fisheries management of groundfish stocks on Georges Bank — one of the most lucrative fishing banks of the world — has been carried out pursuant to exchanges of letters between fisheries officials and not by a formal treaty [Pudden and VanderZwaag, 2007].

Especially difficult to track are the changes happening within the regional fisheries management context. Existing regional fisheries management organizations (RFMOs) are in various stages of: *(a)* transformation in light of United Nations General Assembly urgings for performance reviews; and *(b)* modernization of mandates in light of key

[1] OSPAR decisions, recommendations, and strategies are available at http://www.ospar.org.

sustainability principles such as the precautionary approach and the ecosystem approach[2] [Rothwell and VanderZwaag, 2006; Lodge et al., 2007]. RFMOs established after the 1995 United Nations Agreement on Straddling Fish Stocks and Highly Migratory Fish Stocks — the South East Atlantic Fisheries Organization (SEAFO) and the Western and Central Pacific Fisheries Commission (WCPFC) — are "just leaving port" in their management efforts [Hendriksen et al., 2006; Aqorau, 2007; Hamukuaya, 2007]. The South Indian Ocean Fisheries Agreement (SIOFA) was concluded in July 2006 to establish a management framework for high-seas fishery resources other than tuna in a vast area of the South Indian Ocean [FAO, 2006]. A South Pacific Regional Fisheries Management Organization (SPRFMO) is still under negotiation [International Consultations on the Establishment of the SPRFMO, 2007], and discussions are underway to establish a new mechanism for managing high-seas bottom trawling in the North-Western Pacific Ocean.[3]

This chapter provides a four-part "cruise" through the churning waters of regional oceans cooperation. The *variable foundations* of regional cooperative arrangements are first described. Both "hard law," legally binding agreements and "soft law," nonlegally binding approaches, such as regional plans of action and ministerial declarations, have been followed.

Jurisdiction fragmentation is next discussed. Five main types of jurisdictional overlaps are highlighted: Regional Seas Programmes and regional fisheries bodies; Regional Seas Programmes and large marine ecosystems; regional fisheries bodies' overlaps within regions; regional wildlife and nature conservation agreements/initiatives overlapping with other regional arrangements; and trade-related and economic cooperation arrangements overlaying other regional cooperative arrangements.

The *multiple challenges* confronting regional coastal/ocean governance cooperation is a third dimension reviewed. Eleven practical problems are summarized: getting states within regions to ratify/accept global conventions promising regional benefits; securing ratification/acceptance of regional agreements and amendments by states within regions; resolving whether a legally binding agreement(s) should be pursued in regional sea areas presently not subject to such agreement(s); achieving effective implementation within regions of existing multilateral environmental agreements; addressing territorial and maritime boundary disputes that complicate

2 UNGA Resolution 61/105, Sustainable fisheries, including through the 1995 Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, and related instruments, paragraphs 73 and 70 [Sustainable Fisheries Resolution].

3 Record of the Second Intergovernmental Meeting on the Management of High Seas Bottom Fisheries in the North Western Pacific Ocean, 31 January – 2 February 2007, Busan, Republic of Korea. NWPBT/02/Rec Rev 1.

regional cooperation; filling in the "gaps" in regional cooperative arrangements; putting sustainability principles into practice; getting all regional issues on the "radar screen;" ensuring key elements for effective regional cooperation are in place; addressing the socioeconomic, political, and ethical dimensions fuelling marine environmental degradations and unsustainable development practices; and strengthening regional environmental standards to better protect ecosystem and human health.

A fourth aspect of regional cooperation explored is *extra-regional limitations*. Many environmental threats cannot be addressed at the regional level alone with climate change and long-range transport of toxic chemicals and heavy metals among the threats requiring more than regional responses.

Variable Foundations

Regional cooperative arrangements vary in being founded upon legally binding agreements ("hard law" foundations) and nonlegally binding approaches ("soft law" foundations). The 18 Regional Seas Programmes, linked to the United Nations Environment Programme (UNEP), demonstrate the variability [UNEP Site Map, n.d.].[4]

Fourteen of the Regional Seas Programmes are founded upon regional conventions with three main variations. Eleven regions follow a framework convention and subsequent protocol approach. A convention sets out the overall legal framework for cooperation including objectives, principles, and institutional structures, such as a secretariat, subsidiary bodies, and meetings of the parties; while, protocols set out rules and standards for specific issue areas. For example, the Convention for the Protection of the Marine Environment and Coastal Region of the Mediterranean has six protocols covering the areas of contingency planning and emergency response, ocean dumping, land-based marine pollution/activities, biodiversity and special area protection, seabed activities, and transboundary hazardous waste movements [UNEP Mediterranean Action Plan, 2005]. The 11 regions following the framework convention and protocol approach include: Black Sea, Caspian Sea, Eastern Africa, Regional Organization for the Protection

[4] Thirteen Regional Seas Programmes were forged under the auspices of UNEP with five additional independent programs (Arctic, Antarctic, Baltic Sea, Caspian Sea, North-East Atlantic) being listed as associated with the UNEP's Regional Seas Programme. See http://www.unep.org/regionalseas/Site_map/default.asp.

of the Marine Environment—Kuwait (ROPME), Mediterranean, North-East Pacific, Red Sea and Gulf of Aden, South-East Pacific, South Pacific, West and Central Africa, and Wider Caribbean.[5]

Two Regional Seas Programmes are based upon conventions with annexes addressing specific pollution and marine conservation concerns. This approach is followed for the Baltic Sea and the North-East Atlantic.

The Antarctic region has followed what might be called an "incremental treaty system" approach. While a general agreement on Antarctic cooperation was adopted in 1959, over the years, states having Antarctic interests have added agreements to address priority concerns including conservation of marine living resources, conservation of seals, minerals exploration/exploitation, and environmental protection [Verhoeven et al., 1992; Watts, 1992; Stokke and Vidas, 1996].

Four of the Regional Seas Programmes are grounded upon nonlegally binding documents. Regional plans of action have provided the cooperative frameworks for East Asian Seas, South Asian Seas, and the North-West Pacific [Gold, 2006]. The eight Arctic states have cooperated pursuant to a regional declaration adopted in September 1996 and through the Arctic Council and its working groups [Koivurova and VanderZwaag, 2007].

Jurisdictional Fragmentation

Five main types of jurisdictional overlaps are a common reality in regional coastal/ocean governance.

Regional Seas Programmes and Regional Fisheries Bodies

With some 38 regional fisheries bodies and 18 Regional Seas Programmes in place around the globe, a major coordination challenge continues. A "silo approach" has often prevailed where regional fisheries management organizations and Regional Seas Programmes have concentrated on their own mandates with little or no attention being paid to potential areas of common concern, such as the impacts of pollutants and coastal habitat degradations on fish stocks and the need to establish marine protected areas.

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[5] The governing instruments for the Regional Seas Programmes are available through UNEP's Regional Seas Programmes website: http://www.unep.org/regionalseas/Site_map/default.asp.

The United Nations General Assembly has urged greater coordination between regional fisheries and marine environmental protection arrangements. Resolution 61/105 on sustainable fisheries adopted in December 2006 urges regional fisheries management organizations and arrangements to "strengthen integration, coordination, and cooperation with … regional seas arrangements."[6]

A 2001 UNEP report — noting the reality that none of the regional seas conventions deals in a major way with the protection or management of fishery resources — set out some possible options to enhance cooperation between regional fisheries bodies and Regional Seas Programmes. Those options include encouraging observer participation between fisheries and environmental organizations, exchanging data and information of mutual interest, establishing joint advisory panels, organizing joint technical meetings, implementing joint programs, and creating formal agreements (for example, memoranda of understanding) detailing the scope and modalities of cooperation [UNEP, 2001].

A good example of the fragmentation challenge and some progress in meeting the difficulties is provided by the North-East Atlantic region. While the OSPAR Commission for the Protection of the Marine Environment of the North-East Atlantic has adopted a Biological Diversity and Ecosystems Strategy which pledges to develop a network of marine protected areas by 2010 [OSPAR, 2003], the Commission has no managerial competence over fisheries. In 2003, the OSPAR Commission together with the Baltic Marine Environmental Protection Commission (the Helsinki Commission) adopted a joint statement on the Ecosystem Approach to the Management of Human Activities. The Commissions agreed, among other things, to draw the attention of international fisheries management bodies on the need to protect deep-sea vulnerable habitats, such as sponge aggregations, cold-water coral reefs, seamounts, and carbonate mounds.[7] In 2005, the North-East Atlantic Fisheries Commission (NEAFC) closed five areas on the high seas to fishing activities in order to protect vulnerable deep-water habitats and, in November 2006, NEAFC agreed to prohibit bottom trawling and fishing with static gear in three other areas to protect vulnerable marine ecosystems [NEAFC, 2007]. The Secretariats of NEAFC and the OSPAR Commission have followed a practice of having observers at relevant meetings; and discussions between the Secretariats on future arrangements for the two organizations have been reported as ongoing [NEAFC, 2006].

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[6] Sustainable Fisheries Resolution, *supra* note 2 at paragraph 72.
[7] Joint meeting of the Helsinki and OSPAR Commissions, 25–26 June 2003, Bremen, Record of the Meeting, Annex 5, paragraph 13(b).

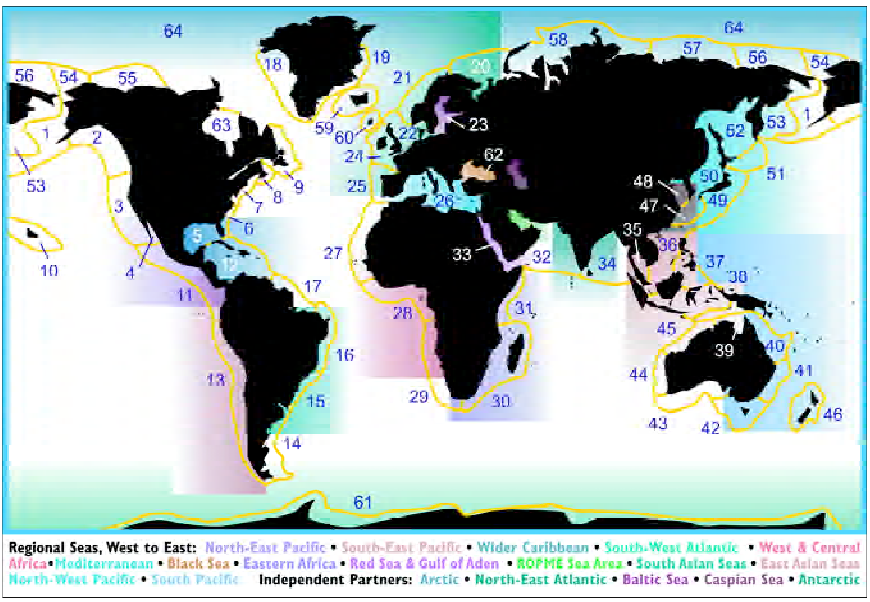
Regional Seas Programmes and Large Marine Ecosystems

The National Oceanographic and Atmospheric Administration (NOAA) in the U.S. and other organizations have identified 64 large marine ecosystems (LMEs) worldwide as possible ecosystem-based management units. The LMEs include coastal areas from river basins and estuaries to the seaward boundaries of continental shelves and outer margins of major ocean current systems. The LME regions — relatively large in the order of 200,000 km^2 or more — have been defined according to distinct bathymetry, hydrography, and biological productivity [NOAA, n.d.].

The Global Environment Facility (GEF) has funded various LME projects with common approaches [Freestone, 2007]. A five-module assessment has been followed with assessment reviews summarizing primary productivity, fish and fisheries, pollution and ecosystem health, socioeconomics, and governance arrangements. The GEF has also assisted some LME regions in developing Transboundary Diagnostic Analyses (TDAs) which identify and prioritize transboundary issues and in drafting Strategic Action Plans (SAPs) to address transboundary management issues [UNEP, n.d.].

While some of the LME projects match nicely with existing UNEP Regional Seas Programmes, such as those for the Red Sea and Gulf of Aden, the Mediterranean, the Black Sea, and the Baltic Sea [UNEP, n.d.],

Figure 1: Regional Seas and Large Marine Ecosystems*



**See Annex 1 for the list of the LMEs.*

Source: UNEP Site Map [n.d.]

the long-term relationship of LMEs and Regional Seas Programmes remains largely to be sorted out [Figure 1]. Various options include: possible broadening of the geographical scope of Regional Seas Programmes to cover LMEs; incorporating LMEs as sub-units within Regional Seas Programmes; developing specific governance arrangements for LMEs (such as the Benguela Current LME discussed in this volume); and not embracing LMEs as management areas.

Regional Fisheries Bodies' Overlaps within Regions

While a common sense ideal might suggest all fisheries in a region come under a single integrated fisheries management regime or even a broader regional biodiversity conservation framework, the practical reality is that considerable overlaps occur in many regions because of multiple agreements/arrangements put in place over time to address priority fisheries management issues. The various types of transboundary fish stock movements have contributed to the fragmented situation. Transboundary stocks include, among others, highly migratory species such as tunas, straddling fish stocks moving between national fisheries zones and the high seas, shared fish stocks crossing exclusive economic zone boundaries of states, and anadromous species such as salmon migrating from rivers of origin to marine waters of other countries.

The Northwest Atlantic region provides a good example of the phenomenon of overlaps among fisheries bodies. Three separate regional fisheries management bodies have been established for specific fish stocks: *(1)* the Northwest Atlantic Fisheries Organization (NAFO) is largely focused on managing groundfish stocks which straddle Canadian waters and the high seas [NAFO, n.d.]; *(2)* the International Commission for the Conservation of Atlantic Tunas (ICCAT) is dedicated to conserving tunas and tuna-like species traversing the Atlantic, including swordfish (ICCAT, n.d.); and *(3)* the North Atlantic Salmon Conservation Organization (NASCO) was established to promote cooperation in conserving wild salmon stocks which migrate from national rivers of origin into the high seas and marine waters of other countries [NASCO, 2004].

Another example is provided in the Southern Pacific. A South Pacific Regional Fisheries Management Organization (SPRFMO) is in the process of negotiation to address various non-highly migratory fish species in the high seas including bottom fishing [International Consultations on the Establishment of the SPRFMO, 2007]. The anticipated regulatory area of the SPRFMO would overlap in part with those of the Western and Central Pacific Fisheries Commission (WCPFC) and the Inter-American Tropical Tuna Commission (IATTC) [Molenaar, 2005]. Areas of overlap already occur between the IATTC and the WCPFC [Willock and Lach, 2006].

Regional Wildlife and Nature Conservation Agreements/Initiatives Overlapping with Other Regional Arrangements

A further integration challenge is figuring out the relationship of regional wildlife and nature conservation agreements/initiatives with Regional Seas Programmes and other regional arrangements with two main sources of regional wildlife and nature conservation developments. The Convention on the Conservation of Migratory Species of Wild Animals (CMS), a prime source, has spawned both binding regional agreements to conserve migratory species and Memoranda of Understanding. Regional agreements have been adopted for protecting albatrosses and petrels; cetaceans of the Black Sea, Mediterranean Sea, and contiguous Atlantic area; small cetaceans of the Baltic and North Seas; seals in the Wadden Sea; and African-Eurasian migratory waterbirds.[8] Memoranda of Understanding have been forged to address: conservation and management of marine turtles and their habitats in the Indian Ocean and Southeast Asia; conservation measures for marine turtles of the Atlantic Coast of Africa; and conservation of Pacific Island cetaceans.[9]

A second source of regional nature conservation commitments is through regional nature conservation agreements outside the CMS framework. Key regional agreements among others include: the Convention on the Conservation of European Wildlife and Natural Habitats; the African Convention on the Conservation of Nature and Natural Resources; the Association of Southeast Asian Nations (ASEAN) Agreement on the Conservation of Nature and Natural Resources; the Convention on the Conservation of Nature in the South Pacific; and the Convention on Nature Protection and Wildlife Preservation in the Western Hemisphere [Louka, 2006]. The European Community's 1992 Habitat Directive [Sands and Galizzi, 2006] is another example of a nature conservation "overlay" and the role of the European Union in regional sea cooperative arrangements is complex and multifaceted [Soveroski, 2004].

Trade-related and Economic Cooperation Arrangements Overlaying Other Regional Cooperative Arrangements

Further currents of fragmentation and complexity in regional coastal/ocean governance are trade and economic cooperation arrangements with obvious North American and Asia-Pacific examples. The North American Commission for Environmental Cooperation (CEC) — established pursuant to an environmental side-agreement (North American Agreement

[8] The Agreements are available through the CMS website http://www.cms.int/.

[9] The Memoranda are available on the CMS website http://www.cms.int/.

for Environmental Cooperation, 14 September 1993) to the North American Free Trade Agreement (NAFTA), 17 December 1992 — has supported various regional marine initiatives. The CEC funded pilot projects on regional implementation of the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities in two marine areas, the Gulf of Maine and the Bight of California [VanderZwaag, 2000]. The CEC has adopted a Strategic Plan for North American Cooperation in the Conservation of Biodiversity which aims to identify priority marine conservation areas and foster cooperation in conserving shared marine species of common concern. Three marine species, the humpback whale, Pacific leatherback turtle, and a seabird (the pink-footed shearwater), have been chosen for initial cooperation with North American Conservation Action Plans developed for each species [Pudden et al., 2006].

The forum for the Asia-Pacific Economic Cooperation (APEC), involving 21 Member Economies, provides another example of a trade-related cooperative initiative facilitating various activities relating to oceans. APEC has a number of working groups addressing ocean governance issues including the Marine Resource Conservation Working Group established in 1990 [APEC, n.d.a] and the Fisheries Working Group created in 1991 [APEC, n.d.b]. At the 2nd APEC Oceans-related Ministerial Meeting, held in Bali, Indonesia on 16–17 September 2005, Ministers adopted the Bali Plan of Action: "Towards Healthy Oceans and Coasts for the Sustainable Growth and Prosperity of the Asia-Pacific Community" [APEC, 2005].

Regional trade agreements (RTAs), which include bilateral free trade agreements between countries that are not in the same region, have become widespread. Some 197 RTAs in force have been notified to the World Trade Organization (WTO) and more than half of world trade is now estimated to be conducted under RTAs [WTO, 2006].

Multiple Challenges

Among the multiple challenges facing regional cooperation efforts in the coastal/ocean context, 11 challenges stand out.

Getting States within Regions to Ratify/Accept Global Conventions Promising Regional Benefits

A common regional problem is coaxing all states bordering shared marine waters to become a party to relevant multilateral environmental and maritime agreements which promise regional benefits such as marine pollution reduction and prevention. A good example is provided by the 1972 London Convention and its 1996 Protocol which are aimed at controlling ocean dumping. The London Convention, adopting quite a permissible approach to ocean dumping by establishing a limited "black list" of substances prohibited for disposal at sea and allowing considerable dumping so long as subject to national permits, has attracted limited ratifications/acceptances even though it was concluded in 1972. As of 31 May 2007, the Convention had 82 Parties with very limited adoption by East Asian states in particular.[10] Only four East Asian states, that is, China, Japan, the Philippines, and RO Korea, were listed as Parties.[11]

The Convention's 1996 Protocol, adopting a more modern precautionary approach through embracement of "reverse listing" where only wastes on a global "safe list" may be disposed of at sea, had only 31 Parties as of 31 May 2007. Only China had adopted the Protocol among East Asian states.

Various reasons may explain the lack of ratification/acceptance phenomenon. Countries may not become parties to agreements because of: lack of political priority towards multilateral agreements; limited financial and human resources; limited knowledge regarding international agreements; concerns over economic costs associated with meeting treaty responsibilities; and questions regarding the appropriateness of international standards and procedures set out in conventions [Anderson et al., 1999].

Securing Ratification/Acceptance of Regional Agreements and Amendments by States within Regions

The Mediterranean region demonstrates the often slow rate at which countries formally accept regional agreements and amendments [Chung, 2004]. Two regional protocols, one covering Pollution from Exploration and Exploitation of the Seabed (adopted in October 1994) and the other addressing Transboundary Movements of Hazardous Wastes (adopted in October 1996) have yet to enter into force. An amended Protocol on Ocean Dumping (adopted in June 1995) and an amended Protocol on Land-based Sources and Activities (adopted in March 1996) have also not yet entered into force [UNEP Mediterranean Action Plan, 2005].

The Wider Caribbean region also shows the challenge raised in getting countries to adopt regional instruments. While the Protocol concerning

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[10] A summary of IMO Conventions is available at: http://www.imo.org/Conventions/mainframe.asp?topic_id=247.

[11] The status of IMO Conventions by country is available at: http://www.imo.org/includes/blastDataOnly.asp/data_id=18856/status.xls.

Pollution from Land-based Sources and Activities to the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region was adopted on 6 October 1999, the Protocol has yet to enter into force. By the end of 2004, the Protocol had only been ratified by Panama and Trinidad and Tobago [Alm, in this volume].

Resolving Whether a Legally Binding Agreement(s) Should Be Pursued in Regional Seas Areas Presently Not Subject to Such Agreement(s)

Whether to move from "soft law" cooperative arrangements to cooperation based upon a binding agreement or agreements is an ongoing question facing a number of Regional Seas Programmes including the Arctic, East Asian Seas, South Asian Seas, and the North-West Pacific. Various arguments may be advanced in support of a legally binding approach [Koivurova and VanderZwaag, 2007]. Positive aspects include:

- encouraging greater political and bureaucratic commitments;
- establishing firmer institutional and financial foundations;
- transcending the vagaries of changing governmental viewpoints and shifting personnel;
- giving "legal teeth" to environmental principles and standards;
- raising the public profile of regional challenges and cooperation needs; and
- providing for dispute resolution.

Counter-arguments can also be raised in support of a "soft law" approach [Koivurova and VanderZwaag, 2007]. Possible drawbacks of pursuing a legally binding approach include:

- difficulty in getting political consensus on the need for an agreement or agreements;
- lengthy and costly preparatory and negotiation processes involved;
- risk of legalizing lowest common denominator standards;
- shifting political and bureaucratic flexibilities;
- contributing another layer of complexity to an already fragmented array of multilateral environmental agreements; and
- lack of assurance that all states will readily accept newly negotiated obligations.

Achieving Effective Implementation within Regions of Existing Multilateral Environmental Agreements (MEAs)

Scores of MEAs require transformation into national laws and policies. For example, the Convention on Biological Diversity calls upon states to: develop or strengthen national legislation to protect endangered/threatened species; establish a network of protected areas (including marine areas); create a regulatory framework for controlling bioprospecting of genetic resources; and forge national policies and controls over genetically modified organisms (including potential transgenic aquatic species).

The document *Regional Seas Strategic Directions for 2004–2007* — agreed to by representatives of regional seas conventions and action plans at their 5th global meeting in Nairobi in November 2003 — emphasized the need for integration of international agreements into domestic practice [UNEP, 2003]. The document set priorities on incorporating regional seas conventions and protocols into national legislation and using regional seas as a platform for coordinated implementation of relevant MEAs.

However, practical realisms continue to hinder national implementation of international obligations. Those realisms include limited financial and human resources and limited enforcement commitments and capabilities. Lack of political will is also common where MEAs are viewed suspiciously in terms of costs to the economy rather than benefits or as instruments usurping national sovereignty [Johnston and VanderZwaag, 2000].

Addressing Territorial and Maritime Boundary Disputes that Complicate Regional Cooperation

While transboundary cooperation can occur even where ocean boundaries and areas remain contested, regional cooperation may be “chilled” by territorial and maritime boundary disputes. According to one estimate, over 250 maritime boundaries remain to be resolved [Carleton, 2006]. Three particularly difficult regional disputes include continued national tensions over ownership and offshore jurisdiction surrounding the Spratly Islands and Paracel Islands in the South China Sea [Thao, 2003; Hearns and Tyedmers, 1995]; Eastern Caribbean State disagreements with Venezuela over the status of tiny Aves Island and its influence on maritime delimitations [Carleton, 2006]; and Aegean Island and maritime space disputes between Greece and Turkey [Acer, 2003; Chircop et al., 2000].

Filling in the "Gaps" in Regional Cooperative Arrangements

Regional cooperative arrangements have yet to be fully fleshed out around the globe with "gaps" remaining in both the fisheries and marine environmental protection arenas. Regional fisheries management organization coverage is still not complete in two priority areas: the completion of negotiations for a South Pacific RFMO and a new RFMO to regulate bottom trawling in the North-Western Pacific. Ensuring that fisheries bodies cover all key species (including bycatch species) and consider broader marine biodiversity issues (such as protection of vulnerable areas like seamounts and deep-water corals) are further needs [Gjerde, 2006].

Increasing the number of Regional Seas Programmes having key protocols or annexes may be viewed as another challenge. Not all regions have adopted land-based pollution/activities protocols or annexes. Only six regions have adopted land-based pollution/activities protocols, namely: the Black Sea, Mediterranean, ROPME, South-East Pacific, Wider Caribbean, and Red Sea and Gulf of Aden [UNEP, 2006a]. Three regions have annexes covering land-based pollution (specifically, Antarctic, Baltic, and North-East Atlantic). Three regions are reported to be developing land-based activity protocols (that is, Caspian, Eastern Africa, and West and Central Africa) [UNEP/GPA, 2006a].

Less than half of the Regional Seas Programmes have adopted detailed agreements relating to biodiversity and specially protected areas. Four regions have adopted in force protocols, namely: Mediterranean, Wider Caribbean, South-East Pacific, and Eastern Africa [UNEP Regional Seas Programme, n.d.]. Two regions have adopted annexes addressing protected areas, specifically, Antarctic and North-East Atlantic.

One region, the Mediterranean, is developing a protocol to facilitate integrated coastal zone management. The third meeting of the Working Group of legal and technical experts was held in Loutraki, Greece, from 12 to 15 February 2007, where a draft protocol text was further discussed with a view to its consideration and possible approval by the 15th Ordinary Meeting of Contracting Parties to the Barcelona Convention and its Protocols held in December 2007 [UNEP Mediterranean Action Plan, 2007].

Detailed provisions for regional cooperation in environmental impact assessment (EIA) are quite rare, but there are examples of "fleshed out" EIA requirements in the transboundary context [Koivurova, 2002; Sands and Werksman, 1995]. The Convention on EIA in a Transboundary Context [25 February 1991] and a subsequent Protocol in Strategic Environmental Assessment (SEA) [21 May 2003] have been adopted under the auspices of the United Nations Economic Commission for Europe. The 1991 Madrid Protocol on Environmental Protection to the Antarctic Treaty has also adopted detailed EIA requirements in Annex I.

Most existing regional seas agreements/protocols provide only "bare bones" EIA guidance. For example, the Convention for the Protection of the Marine Environment in the Coastal Region of the Mediterranean provides only general provisions on EIA. Contracting Parties are required to undertake EIA for proposed activities likely to cause a significant adverse impact on the marine environment and to promote notification, exchange of information, and consultation for activities likely to have a significant adverse effect on the marine environment of other states or areas beyond the limits of national jurisdiction.

Various potentials exist for adding "meat to the bones" of these existing limited legal frameworks addressing transboundary environmental impact assessment. Those potentials include: listing the type of project proposal subject to EIA; requiring application of SEA (for example, government plans, programs, and policies having the potential to significantly impact the marine environment or coastal communities); ensuring public participation in EIA processes; and providing for joint EIA options involving the state of origin and the potentially impacted state.

Putting Sustainability Principles into Practice

Moving key sustainability principles, such as the precautionary and ecosystem approaches, from paper into practice continues to be a regional challenge. Part of the challenge may be reaching agreement on what the practical implications of principles are in light of their general and evolving nature [VanderZwaag, 1995; de Sadeleer, 2002, 2007]. For example, strong versions of the precautionary principle might involve various measures such as: placing the onus of proof on proponents of development to demonstrate no "significant harm" or some other standard like no "serious or irreversible harm" to the marine environment; establishing prohibitions (for example, no import or production of transgenic fish); imposing zero discharge or virtual elimination standards (at least for toxic substances); and adopting "reverse listing" where only substances listed as safe can be manufactured or marketed [VanderZwaag et al., 2002–2003]. Weaker versions of precaution might involve mandating regulators to apply the precautionary approach, imposing partial prohibition (for example, allowing production of genetically modified fish but only in land-based facilities) and following an adaptive management (or learn-by-doing) approach [VanderZwaag et al., 2002–2003].

The ecosystem approach also remains to be fully sorted out [Corkeron, 2006]. Debate continues over even basic terminology such as whether ecosystem-based management is interchangeable with the term ecosystem approach [Garcia et al., 2003]. Multiple guidelines have been issued on how to implement the ecosystem approach including guidelines by the Food and Agriculture Organization [FAO Fisheries Department, 2003; FAO, 2005] and under the auspices of the Convention on Biological Diversity [CBD, 2004]. A "menu of measures" may be chosen to support implementation of the ecosystem approach. Those measures in the fisheries field include: prohibiting destructive fishery practices at least in some vulnerable areas; encouraging more selective fishery practices and development of environmentally friendly gears; reducing fleet size; setting precautionary reference points; restoring fish habitats; applying ecological impact assessment to fisheries; establishing marine protected areas; and promoting the use of eco-labeling [Rothwell and VanderZwaag, 2006].

Many difficult questions surround the ecosystem approach. Rothwell and VanderZwaag [2006] ask: How much of the oceans should be dedicated to "no take" areas in order to protect ecological integrity? What should be the indicators for measuring ecosystem health? How should ecosystem objectives and human use objectives be balanced?

Various constraints stand in the way of practical implementation. They include, among others, limited scientific data, limited scientific capacity, limited understanding of ecosystems, political and economic opposition, and dominance of a single-stock management paradigm [Arancibia and Muñoz, 2005].

A concrete example of the challenge faced in the regional context of moving principles from paper into practice is provided by the North Atlantic Salmon Conservation Organization (NASCO). While NASCO Parties have agreed to apply the precautionary approach to salmon fisheries [NASCO, 1998, 1999], implementation, in practice, has been difficult. Precautionary scientific advice recommended that no fishing should occur off West Greenland for the years 2007 to 2009 [NASCO, 2007a] in light of the poor state of wild salmon stocks. NASCO, however, has continued to allow a subsistence fishery by Greenland of about 20 tonnes in light of social and cultural pressures [NASCO, 2007b].

Fisheries off the French Islands of St. Pierre and Miquelon have also been problematic. Although salmon from populations listed as endangered in the U.S. and Canada may be caught in the fisheries, a substantial catch is still allowed, estimated at 3.6 tonnes in 2006 [NASCO, 2007a]. Complicating the management situation is the fact that France has not become a Party to NASCO on behalf of St. Pierre and Miquelon.

Getting All Regional Issues on the "Radar Screen"

While regional cooperative arrangements have traditionally focused on managing fisheries and reducing/preventing marine pollution, many issue areas have been minimally addressed on the regional "radar screen." Those issues include: aquaculture, invasive alien species, ocean energy development and coastal energy facility siting,[12] marine noise, bioprospecting, ocean acidification and carbon dioxide capture,[13] places of refuge for ships in distress carrying hazardous cargoes, pollution from pleasure craft, reception facilities for ship-generated wastes, marine litter, and the control of heavy metals.[14] Regional efforts to protect marine mammals remain variable [Culik, 2004] and the addressing of ship strikes has only occurred in a few regions [Ship Strikes Working Group, 2006].

The FAO Committee on Fisheries (COFI) at its 27th session in March 2007 emphasized the need to strengthen regional cooperation in the field of aquaculture. COFI called for improved aquaculture planning and policy development at regional levels and strongly supported the continuing work towards the development of regional aquaculture networks in Africa and the Americas similar to the Network of Aquaculture Centres in Asia-Pacific (NACA) [FAO, 2007].

The 2004 Ballast Water Convention, although not yet in force, urges countries to consider regional approaches to addressing ballast water and the associated threats of invasive alien species [Ballast Water Convention, 16 February 2004]. Considerable progress is occurring within some Regional Seas Programmes. Regional initiatives include among others: an action plan concerning species introductions and invasive species in the Mediterranean Sea adopted in 2003; a regional strategy on shipping-related introduced marine pests in the Pacific Islands; a 2006 Caribbean regional scoping meeting to explore the cooperative steps needed to prevent ballast water mediated marine bioinvasions; the establishment of the Baltic Sea Alien Species Database; and an action plan on invasive species in the Caspian Sea [Global Invasive Species Programme and UNEP, n.d.].

Ensuring Key Elements Are in Place for Effective Regional Cooperation

Various elements are critical to ensuring strong regional cooperation. They include, among others: clear objectives and principles; sufficient human capacity in the natural and social sciences; stable and adequate financing; broad representation of stakeholders such as NGOs representing environmental interests, relevant industries, and coastal community voices;

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12 The OSPAR Commission has developed a website for the exchange of information on environmental impacts of offshore renewable energy development. This is available at http://www.ospar.org.

13 The OSPAR Commission has issued two reports on ocean acidification and placement of CO_2 in subsea geological structures. The reports are available online at http://www.ospar.org/eng/html/press%20 release%20ocean%20acidification%20and%20CO2.htm.

14 For a summary of the relatively few regions paying attention to heavy metals, see UNEP/GPA [2006a].

and an evaluation mechanism for monitoring the success of regional cooperative efforts. Examples of evaluation techniques include national implementation reports, Conference of the Parties review of national reports, independent auditing of national implementation, or a compliance committee [Klabbers, 2007]. In the fisheries management context, regional cooperation in compliance and enforcement may be especially crucial as emphasized in the 1995 United Nations Fish Stocks Agreement.[15]

Addressing the Socioeconomic, Political, and Ethical Dimensions Fueling Marine Environmental Degradation and Unsustainable Development Practices

Addressing the serious environmental problems facing most marine regions will require much more than better science and technical solutions. Especially challenging dimensions include: poverty and inequitable distribution of wealth; population growth; consumerism and over-consumption; utilitarianism as a dominant philosophy with the notion that the environment can be traded off in the name of economic and social development; and globalization with the extra pressures on marine resources and coastal areas to nourish international trade [Benvenisti, 2002; Cox, 2007]. Whether such dimensions are "governable" at a regional level remains to be seen, but such dimensions suggest various directions. Addressing the policy sources of environmental degradations and giving priority to social justice and ecological sustainability issues [Sandler and Pezzullo, 2007] might be nurtured through development of regional policies and strategies which encourage more principled governance. Emphasis might also be given to enhancing regional educational efforts and building social science research networks.

"Empowerment" of coastal communities remains a key regional challenge in order to counter many of the unsustainability trends [Singh and Titi, 1995]. Avenues towards empowerment could include: granting local communities priority access to coastal/ocean resources; encouraging community-based management and co-management governance approaches; giving priority to maintaining local values and cultures; and committing to develop integrated coastal and ocean planning processes with "legal teeth."

[15] Article 21 of the Agreement for the Implementation of the Provisions of the UN Convention on the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, 4 December 1995.

Strengthening Regional Environmental Standards to Better Protect Ecosystem and Human Health

While environmental standards for controlling land-based marine pollution vary across regions [Hassan, 2006], many standards remain quite vague and represent political compromises. Common weakness include: limited lists of substances to be phased out or prohibited; adoption of the extremely malleable pollution control concepts of best available technologies and best environmental practices; and an over-emphasis on pollution control through permit authorizations from national authorities rather than pollution prevention [Hassan, 2006].

Setting standards for sewage treatment and wastewater effluents and funding sanitation infrastructure continue to be major shortcomings. Few regions have set wastewater emission targets and deadlines. Substantial populations within regional seas areas do not have access to adequate sanitation with estimates (as of the year 2000) being quite alarming. Out of a total regional seas population of 4.7 billion, 2.1 billion did not have access to adequate sanitation facilities. According to UNEP [2002], populations in regional seas areas not having access were estimated to be: 825 million persons in South Asia (63 percent of the population), 515 million in East Asia (46 percent of the population), 414 million in the North-West Pacific (58 percent of the population), and 107 million in West and Central Africa (44 percent of the population). In the Mediterranean region wastewater collection and treatment levels are very low in southern and eastern countries. With the large growth in urban populations expected in those countries (98 million between 2000 and 2025), an urgent need to develop simple and inexpensive technologies seems critical [Benoit and Comeau, 2005]. For Latin America and the Caribbean, some 86 percent of wastewater is discharged untreated [UNEP/GPA, 2006b].

The continuing threats raised by inadequate wastewater management and the need for adequate and sustainable funding to address the problem were highlighted at the Second Intergovernmental Review Meeting on the Implementation of the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities held in Beijing in October 2006 [UNEP, 2006b]. However, the Beijing Declaration, adopted by representatives of 104 governments and the European Commission, was quite general in addressing wastewater with a commitment to "devote additional effort, finance and support to address point and nonpoint nutrients, including municipal, industrial, and agricultural wastewater" [Beijing Declaration, 23 October 2006].

Extra-regional Limitations

Countries certainly cannot adequately protect the marine environment through national and regional actions alone. Three global pollution problems have yet to be effectively and comprehensively addressed: control of greenhouse gas emissions contributing to climate change, prevention of long-range transport of toxic chemicals, and curbing of long-range transport of heavy metals such as mercury [VanderZwaag et al., 2002].

Garnering further international agreement on how to curb greenhouse gas emissions is especially important in light of the threats of climate change to marine species [UNEP/CMS Secretariat, 2006] and polar marine areas in particular [ACIA, 2005]. Reaching a global consensus on greenhouse gas reductions beyond the year 2012 and initial reduction commitments by some industrialized countries under the Kyoto Protocol [10 December 1997] remains a major challenge. Getting developing countries to commit to reductions continues to be controversial [Doelle, 2005].

Mere "tinkerings" are still the story in relation to global responses to toxic chemicals and heavy metals [VanderZwaag et al., 2002]. A proactive and comprehensive chemical convention has not been adopted as advocated by some scholars [VanderZwaag, 1997]. While some countries have advocated negotiations for a legally binding instrument on heavy metals, particularly mercury [European Commission Directorate-General Environment, 2006], UNEP's Governing Council/Global Ministerial Forum in February 2007 chose to adopt a voluntary program to reduce threats from toxic mercury pollution. After 2 years of voluntary partnership initiatives to curb emissions, governments will gauge the success and further consider whether a new international legally binding treaty should be negotiated [UNEP, 2007].

Conclusion

Tracking regional cooperative efforts around the globe is no small task and this chapter has given a short four-part "cruise." The variable approaches to regional cooperation foundations, "soft law" and "hard law," have been described. Jurisdictional fragmentation and 11 key challenges to confronting regional cooperation have been summarized. Extra-regional limitations, particularly the addressing of climate change and long-range transport of toxic chemicals and heavy metals, have been noted.

Two maritime images help capture how ocean governance efforts are faring around the globe. The first is "troubled waters." A rather depressing picture has emerged regarding how national, regional, and global actions to date have not been able to counter the strong tides of marine degradations and overexploitations of marine resources. Scientists have documented the loss of some 90 percent of top predators from most of the world's oceans [Myers and Worm, 2003] and they have warned about a possibility of a worldwide commercial fisheries collapse by 2048 [Worm et al., 2006]. Some 200 marine "dead zones" have been created due to excessive nutrients being discharged to the marine environment [UNEP/GPA, 2006c].

The second image is a "difficult and unfinished voyage." Strengthening regional cooperative agreements/arrangements is a continuing journey with international principles and processes setting navigational coordinates but political and economic currents promising a "rough ride."

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References

Acer, Y. 2003. *The Aegean maritime disputes and international law*. Ashgate Publishing Limited, Burlington, VT. 291 pp.

ACIA. 2005. *Arctic climate impact assessment*. Cambridge University Press, Cambridge. 1042 pp.

ACZISC (Atlantic Coastal Zone Information Steering Committee) Secretariat and Marine and Environmental Law Institute, Dalhousie University. 2006. *Overview of current governance in the Bay of Fundy/Gulf of Maine: Transboundary collaborative arrangements and initiatives*. Oceans and Coastal Management Report 2006–05. Fisheries and Oceans Canada. 132 pp.

Alexander, L.M. 1977. "Regional arrangements in the oceans." *American Journal of International Law*, 71:84–109.

Anderson, W., E. Rankin and D.L. VanderZwaag. (eds). 1999. *Strengthening acceptance and implementation of maritime treaties and international environmental law obligations in OECS Member States: Treaty guide, case studies and workshop proceedings*. Oceans Institute of Canada, Halifax, Nova Scotia. 184 pp.

APEC (Asia-Pacific Economic Cooperation). n.d.a. *Marine Resource Conservation Working Group*. Available at http://www.apec.org/apec/apec_groups/working_groups/marine_ resource_conservation.html. [Accessed 18 June 2007].

APEC (Asia-Pacific Economic Cooperation). n.d.b. *Fisheries Working Group*. Available at http://www.apec.org/apec/apec_groups/working_groups/fisheries.html. [Accessed 18 June 2007].

APEC (Asia-Pacific Economic Cooperation). 2005. *Bali Plan of Action*. Available at http://www.apec.org/apec/ministerial_statements/sectoral_ministerial/ocean-related/bali_plan_of_action.html. [Accessed 27 August 2007].

Aqorau, T. 2007. "Illegal, unreported and unregulated fishing in the Western and Central Pacific Ocean (WCPO): Some legal and policy issues surrounding control of nationals and charter vessels under the new legal regime in the WCPO," pp. 177–201. In: *Ocean Yearbook* Volume 21. Edited by A. Chircop, S. Coffen-Smout and M. McConnell. Martinus Nijhoff Publishers, Leiden.

Arancibia, H. and H. Muñoz. 2005. *Ecosystem-based approach: A comparative assessment of the institutional response in fisheries management within APEC economies: The case of demersal fisheries (Phase 1)*. Final Report. Project APEC FWG 02/2005, Universidad de Concepcion, Chile. 68 pp.

Benoit, G. and A. Comeau. 2005. *A sustainable future for the Mediterranean: The Blue Plan's environment and development outlook*. Earthscan, London. 450 pp.

Benvenisti, E. 2002. *Sharing transboundary resources: International law and optimal resource use*. Cambridge University Press, Cambridge. 276 pp.

Carleton, C. 2006. "Maritime delimitation in complex island situations: A case study on the Caribbean Sea," pp. 153–188. In: *Maritime delimitation*. Edited by R. Lagoni and D. Vignes. Martinus Nijhoff, Leiden.

CBD (Convention on Biological Diversity). 2004. *Decision VII/11 Ecosystem approach*. Available at http://www.cbd.int/decisions/cop-07.shtml?m=COP-07. [Accessed 24 August 2007].

Chircop, A., A. Gerolymatos and J.O. Iatrides. (eds). 2000. *The Aegean Sea after the Cold War: Security and Law of the Sea issues*. St. Martin's Press Inc., New York. 247 pp.

Chung, S.-Y. 2004. "Is the convention-protocol approach appropriate for addressing regional pollution? The Barcelona Convention System revisited." *Penn State Environmental Law Review*, 13(1):85–103.

Corkeron, P.J. 2006. "Opposing views of the 'ecosystem approach' to fisheries management." *Conservation Biology*, 20(3):617–619.

Cox, T.R. 2007. "Golden tropes and democratic betrayals: Prospects for the environment and environmental justice in neo-liberal "free trade" agreements," pp. 225–250. In: *Environmental justice and environmentalism: The social justice challenge to the environment movement*. Edited by R. Sandler and P.C. Pezzullo. MIT Press, Cambridge, Massachusetts.

Culik, B.M. 2004. *Review of small cetaceans: Distribution, behavior, migration and threats*. Marine Mammal Action Plan/Regional Seas Reports and Studies No. 177. United Nations Environment Programme/Convention on Migratory Species, Bonn. 343 pp.

de Sadeleer, N. 2002. *Environmental principles: From political slogans to legal rules*. Oxford University Press, Oxford. 433 pp.

de Sadeleer, N. 2007. "The precautionary principle in European community health and environmental law: Sword or shield for the Nordic Countries?" pp. 10–58. In: *Implementing the precautionary principle: Approaches from the Nordic Countries, EU and USA*. Edited by N. de Sadeleer. Earthscan, London.

Doelle, M. 2005. *From hot air to action? Climate change, compliance and the future of international environmental law*. Thomson Carswell, Toronto. 415 pp.

European Commission, Directorate-General Environment. 2006. *Report on the International Mercury Conference – How to reduce mercury supply and demand, 26–27 October 2006, Brussels*. 20 pp.

FAO (Food and Agriculture Organization of the United Nations). 2005. *Putting into practice the ecosystem approach to fisheries*. FAO, Rome. 76 pp.

FAO (Food and Agriculture Organization of the United Nations). 2006. "New agreement governing high-seas fishing in Indian Ocean." Available at http://www.fao.org/newsroom/ en/news/2006/1000360/index.html. [Accessed 23 August 2007].

FAO (Food and Agriculture Organization of the United Nations). 2007. *Report of the Twenty-Seventh Session of the Committee on Fisheries, 5–9 March 2007, Rome*. FAO Fisheries Report No. 830. FAO, Rome. 74 pp.

FAO (Food and Agriculture Organization of the United Nations) Committee on Fisheries. 2007. *Strengthening regional fisheries management organizations and their performances including the outcome of the 2007 Tuna RFMOs Meeting*. COFI/2007/9 Rev. 1. 12 pp.

FAO (Food and Agriculture Organization of the United Nations) Fisheries Department. 2003. *The ecosystem approach to fisheries*. FAO Technical Guidelines for Responsible Fisheries No. 4, Suppl. 2. FAO, Rome. 112 pp.

Freestone, D. 2007. "Capacity building and the implementation of the Law of the Sea Convention: A view from the World Bank," pp. 313–343. In: *Law, Science & Ocean Management*. Edited by M.H. Nordquist, R. Long, T.H. Heidar and J.N. Moore. Martinus Nijhoff Publishers, Leiden.

Garcia, S.M., A. Zerbi, C. Aliaume, T. Do Chi and G. Lasserre. 2003. *The ecosystem approach to fisheries: Issues, terminology, principles, institutional foundations, implementation and outlook*. FAO Fisheries Technical Paper No. 443. FAO, Rome. 71 pp.

Gjerde, K.M. 2006. *Ecosystems and biodiversity in deep waters and high seas*. UNEP Regional Seas Report and Studies No. 178. UNEP/IUCN, Switzerland. 58 pp.

Global Invasive Species Programme and UNEP. n.d. *Invasive alien species — A growing threat to regional seas*. Available at http://www.unep.org/regionalseas/News/Regional_Seas_and_Invasive_Species/invasive_alien_brochure.pdf [Accessed 24 August 2007].

Gold, E. 2006. *Gard handbook on protection of the marine environment*. 3rd Edition. Gard AS, Arendal, Norway. 946 pp.

Hamukuaya, H. 2007. "South East Atlantic Fisheries Organization: A modern instrument to address typical fisheries management issues," pp. 203–236. In: *Ocean Yearbook* Volume 21. Edited by A. Chircop, S. Coffen-Smout and M. McConnell. Martinus Nijhoff Publishers, Leiden.

Hassan, D. 2006. *Protecting the marine environment from land-based sources of pollution: Towards effective international cooperation*. Ashgate Publishing Company, Burlington, VT. 233 pp.

Hearns, G. and P. Tyedmers. 1995. "Poseidon's trident: Biological diversity preservation, resource conservation and conflict avoidance in the South China Sea," pp. 289–300. In: *The peaceful management of transboundary resources*. Edited by G.H. Blake, W. Hilldesley, M. Pratt, R. Ridley and C. Schofield. Graham & Trotman/Martinus Nijhoff, London.

Hendriksen, T., C. Hønneland and A. Sydnes. 2006. *Law and politics in ocean governance: The United Nations Fish Stocks Agreement and regional fisheries management regimes*. Martinus Nijhoff Publishers, London. 220 pp.

ICCAT (International Commission for the Conservation of Atlantic Tunas). n.d. "About the International Commission for the Conservation of Atlantic Tunas." Available at http://www.iccat.es/introduction.htm. [Accessed 24 August 2007].

IMO (International Maritime Organization) Sub-committee on Flag State Implementation. 2006. "Harmonization of port state control activities: Progress report on regional PSC agreements." FSI 15/INF.4. IMO.

International Consultations on the Establishment of the SPRFMO. 2007. "Report of the Third Meeting, Reñaca, Chile, 30 April – 4 May 2007. Available at http://www.southpacificrfmo.org/event.third-meeting/. [Accessed 31 August 2007].

Johnston, D. 2006. "The challenge of international ocean governance: Institutional, ethical and conceptual dilemmas," pp. 341–399. In: *Towards principled oceans governance: Australian and Canadian approaches and challenges*. Edited by D.R. Rothwell and D.L. VanderZwaag. Routledge Press, London.

Johnston, D.M. and D.L. VanderZwaag. 2000. "The ocean and international environmental law: Swimming, sinking and treading water at the millennium." *Ocean and Coastal Management*, 43:141–161.

Kasoulides, G.C. 1997. "Global and regional port state regimes," pp. 121–139. In: *Competing norms in the law of marine environment protection*. Edited by H. Ringbom. Kluwer Law International, London.

Klabbers, J. 2007. "Compliance procedures," pp. 95–1009. In: *The Oxford handbook of international law*. Edited by D. Bodansky, J. Brunnée and E. Hey. Oxford University Press, Oxford.

Koivurova, T. 2002. *Environmental impact assessment in the Arctic: A study of international legal norms*. Ashgate Publishing Company, Burlington, VT. 448 pp.

Koivurova, T. and D.L. VanderZwaag. 2007. "The Arctic Council at 10 Years: Retrospect and prospects." *U.B.C. Law Review*, 40(1):121–194.

Lodge, M.W., D. Anderson, T Løbach, G. Munro, K. Sainsbury and A. Willock. 2007. *Recommended best practices for regional fisheries organizations: Report of an independent panel to develop a model for improved governance by regional fisheries management organizations*. The Royal Institute of International Affairs, Chatham House, London. 141 pp.

Louka, E. 2006. *International environmental law: Fairness, effectiveness, and world order.* Cambridge University Press, Cambridge. 518 pp.

McDorman, T.L., P.M. Saunders and D.L. VanderZwaag. 1985. "The Gulf of Maine boundary: Dropping anchor or setting a course?" *Marine Policy*, 9(1):90–107.

Molenaar, E.J. 2005. "Addressing regulatory gaps in high seas fisheries." *International Journal of Marine and Coastal Law*, 20:533–570.

Myers, R.A. and B. Worm. 2003. "Rapid worldwide depletion of predatory fish communities." *Nature*, 423:280–283.

NAFO (Northwest Atlantic Fisheries Organization). n.d. "About the Northwest Atlantic Fisheries Organization." Available at http://www.nafo.int/about/frames/about.html. [Accessed 24 August 2007].

NASCO (North Atlantic Salmon Conservation Organization). 1998. *Agreement on Adoption of the Precautionary Approach*. CNL(98)46. 4 pp.

NASCO (North Atlantic Salmon Conservation Organization). 1999. *Action Plan for Application of the Precautionary Approach*. CNL(99)48. 14 pp.

NASCO (North Atlantic Salmon Conservation Organization). 2004. *Twenty-year milestones and next steps — A vision for the future*. NASCO, Edinburgh. 16 pp.

NASCO (North Atlantic Salmon Conservation Organization). 2007a. *Report of the ICES Advisory Committee on Fishery Management*. CNL(07)7. 77 pp.

NASCO (North Atlantic Salmon Conservation Organization). 2007b. Press Release. Twenty-Fourth Annual Meeting Bar Harbor, 4–8 June 2007, Maine, USA: North Atlantic nations take crucial steps for conservation of wild Atlantic salmon. CNL(07)57. 2 pp.

NEAFC (North-East Atlantic Fisheries Commission). 2006. *Performance review panel report of the North-East Atlantic Fisheries Commission*. Available at http://www.neafc.ofg/news/docs/performance-review-final-edited.pdf. [Accessed 24 August 2007].

NEAFC (North-East Atlantic Fisheries Commission). 2007. *The North-East Atlantic Fisheries Commission performance review: Information update*. NEAFC, London.

NOAA (National Oceanic and Atmospheric Administration). n.d. *Large marine ecosystems: A breakthrough concept for ecosystems management*. Available at http://celebrating200 years.noaa.gov/breakthroughs/ ecosystems/welcome.html.

OSPAR (Commission for the Protection of the Marine Environment of the North-East Atlantic). 2003. *Biological diversity and ecosystems strategy*. Available at http://www.ospar.org/ eng/html/sap/welcome.html.

Pudden, E.J. and D.L. VanderZwaag. 2007. "Canada-USA bilateral fisheries management in the Gulf of Maine: Under the radar screen." *Review of European Community and International Environmental Law,* 16(1):36–44.

Pudden, E., D.L. VanderZwaag, T. Lowry and M. Kellam. 2006. "Marine environmental protection and conservation," pp. 5–48. In: *Overview of current governance in the Bay of Fundy/Gulf of Maine: Transboundary collaborative arrangements and initiatives*. Oceans and Coastal Management Report, 2006–05. Fisheries and Oceans Canada.

Rothwell, D. and D.L. VanderZwaag. 2006. "The sea change towards principled oceans governance," pp. 3–15. In: *Towards principled ocean governance: Australian and Canadian approaches and challenges*. Edited by D. Rothwell and D.L. VanderZwaag. Routledge Press, London.

Sandler, R. and P.C. Pezzullo. (eds). 2007. *Environmental justice and environmentalism: The social justice challenge to the environmental movement*. MIT Press, Cambridge, Massachusetts. 352 pp.

Sands, P. and P. Galizzi. (eds). 2006. *Documents in European Community environmental law.* 2nd Edition. Cambridge University Press, Cambridge. 969 pp.

Sands, P. and J. Werksman. 1995. "Procedural aspects of international law in the field of sustainable development: Citizens' rights," pp. 178–204. In: *Sustainable development and good governance.* Edited by K. Ginther, E. Denters and P.J.I.M. de Waart. Martinus Nijhoff, Dordrecht.

Ship Strikes Working Group. 2006. "First progress report to the Conservation Committee." Report presented during the 58th Annual Meeting of the International Whaling Commission. IWC/58/CC3, 22 pp.

Singh, N. and V. Titi. (eds). 1995. *Empowerment towards sustainable development*. Zed Books Ltd., London. 198 pp.

Soveroski, M. 2004. "The role of the EU in international environmental negotiations and the case of the Mediterranean," pp 121–141. In: *Contributions to international environmental negotiations in the Mediterranean context.* Edited by E. Raftopoulos and M.L. McConnell. Ant. N. Sakkoulas Publishers, Athens, Greece.

Stokke, O.S. and D. Vidas. (eds). 1996. *Governing the Antarctic: The effectiveness and legitimacy of the Antarctic Treaty System*. Cambridge University Press, Cambridge. 464 pp.

Thao, N.H. 2003. "The 2002 declaration on the conduct of parties in the South China Sea: A note." *Ocean Development and International Law,* 34:277–285.

UNEP (United Nations Environment Programme). n.d. "United Nations Environment Programme Regional Seas Programme linked with large marine ecosystems assessment and management." Available at http://www.unep.org/regionalseas/Publications/ RSP_Large_Marine_pdf. [Accessed 24 August 2007].

UNEP (United Nations Environment Programme). 2001. *Ecosystem-based management of fisheries: Opportunities and challenges for coordination between marine regional fishery bodies and regional seas conventions.* Regional Seas Reports and Studies No. 175. 52 pp.

UNEP (United Nations Environment Programme). 2002. *Water supply and sanitation coverage in UNEP Regional Seas, need for regional wastewater emission targets?* Section I: Regional presentation of data. UNEP/GPA, The Hague. 66 pp.

UNEP (United Nations Environment Programme). 2003. *Regional seas strategic directions for 2004–2007.* Available at http://www.unep.org/regionalseas/Publications/Strategy_180105 _English.doc. [Accessed 27 August 2007].

UNEP (United Nations Environment Programme). 2006a. *Guidance on the implementation of the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities for 2007-2011: Global Programme of Action contribution to the internationally agreed goals and targets for the sustainable development of oceans, coasts and islands.* UNEP/GPA/IGR.2/3. 21 July 2006. 30 pp.

UNEP (United Nations Environment Programme). 2006b. *Report of the Second Intergovernmental Review Meeting on the Implementation of the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities.* UNEP/GPA/IGR.2/7. 23 October 2006. 28 pp.

UNEP (United Nations Environment Programme). 2007. Press Release: "Environment Ministers rise to the challenge of globalization and United Nations reform." 9 February 2007.

UNEP/CMS (United Nations Environment Programme/Convention on Migratory Species) Secretariat. 2006. *Migratory species and climate change: Impacts of a changing environment on wild animals.* UNEP/CMS Secretariat, Bonn. 68 pp.

UNEP/GPA (United Nations Environment Programme/Global Programme of Action). 2006a. *Implementation of the GPA at regional level: The role of regional seas conventions and their protocols.* UNEP/GPA, The Hague. 31 pp.

UNEP/GPA (United Nations Environment Programme/Global Programme of Action). 2006b. *The state of the marine environment: Trends and processes*. UNEP/GPA, The Hague. 43 pp.

UNEP/GPA (United Nations Environment Programme/Global Programme of Action). 2006c. *Further rise in number of marine "dead zones."* Available at http://www.unep.org/Documents.Multilingual/Default.asp?DocumentID=486&ArticleID=5393&1=en. [Accessed 24 August 2007].

UNEP Mediterranean Action Plan. 2005. Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean and Its Protocols. UNEP Mediterranean Action Plan, Athens. 168 pp.

UNEP Mediterranean Action Plan. 2007. *Report of the 3rd Meeting of the Working Group of Experts designated by the Contracting Parties on the draft Protocol on Integrated Coastal Zone Management (ICZM) in the Mediterranean, 12–15 February 2007, Loutraki, Greece*. UNEP(DEPI) MED WG 305/4, 16 April 2007. 17 pp. plus Annexes.

UNEP Regional Seas Programme. n.d. "Ecosystems and biodiversity." Available at http://www.unep.org/ regionalseas/Issues/Ecosystems_and_Biodiversity/default.asp.

UNEP Site Map. n.d. "Regional Seas Programme." Available at http://www.unep.org/ regionalseas/Site_map/default.asp.

VanderZwaag, D.L. 1995. *Canada and marine environmental protection: Charting a legal course towards sustainable development*. Kluwer Law International, London. 561 pp.

VanderZwaag, D.L. 1997. "International law and Arctic marine conservation and protection: A slushy, shifting seascape." *Georgetown International Environmental Law Review*, 9(2):303–345.

VanderZwaag, D.L. 1999. "Regionalism and Arctic marine environmental protection: Drifting between blurry boundaries and hazy horizons," pp. 231–247. In: *Order for the oceans at the turn of the century*. Edited by D. Vidas and W. Østreng. Kluwer Law International, The Hague.

VanderZwaag, D.L. 2000. "Transboundary challenges and cooperation in the Gulf of Maine region: Riding a restless sea toward misty shores," pp. 265–285. In: *Law of the Sea: The common heritage and emerging challenges*. Edited by H.N. Scheiber. Kluwer Law International, The Hague.

VanderZwaag, D.L., R. Huebert and S. Ferrara. 2002. "The Arctic environmental protection strategy, Arctic Council and multilateral environmental initiatives: Tinkering while the Arctic marine environment totters." *Denver Journal of International Law and Policy*, 30(2):131–171.

VanderZwaag, D.L., S.P. Fuller and R.A. Myers. 2002–2003. "Canada and the precautionary principle/approach in ocean and coastal management: Wading and wandering in tricky currents." *Ottawa Law Review*, 34(1):117–158.

Verhoeven, J., P. Sands and M. Bruce. (eds). 1992. *The Antarctic environment and international law*. Graham & Trotman, London. 228 pp.

Watts, A. 1992. *International law and the Antarctic treaty system*. Grotius Publications Limited, Cambridge. 469 pp.

Willock, A. and M. Lach. 2006. *Follow the leader: Learning from experience and best practice in regional fisheries management organizations*. WWF International and TRAFFIC International, Gland, Switzerland. 57 pp.

Worm, B., E.B. Barbier, N. Beaumont, J.E. Duffy, C. Folke, B.S. Halpern, J.B.C. Jackson, H.K. Lotze, F. Micheli, S.R. Palumbi, E. Sala, K. Selkoe, J.J. Stachowicz and R. Watson. 2006. "Impacts of biodiversity loss on ocean ecosystem services." *Science*, 314:787–790.

WTO (World Trade Organization). 2006. "Lamy welcomes WTO agreement on regional trade agreements." Available at http://www.wto.org/english/news_e/news06_e/rta_july06_e.htm [Accessed 13 August 2007].

Agreements and Declarations

Agreement for the Implementation of the Provisions of the UN Convention on the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks. 4 December 1995. 34 I.L.M. 1542.

Ballast Water Convention (International Convention for the Control and Management of Ships' Ballast Water and Sediments) Adopted by the IMO Conference on Ballast Water Management for Ships. 16 February 2004. IMO Doc. BWM/CONF/36.

Beijing Declaration on furthering the implementation of the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities, Annex V, UNEP, Report of the Second Intergovernmental Review Meeting on the Implementation of the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities. 23 October 2006. UNEP/GPA/IGR 12/7, paragraph 11.

Convention on EIA in a Transboundary Context. 25 February 1991. 30 I.L.M. 800.

Kyoto Protocol to the United Nations Framework Convention on Climate Change. 10 December 1997. 37 I.L.M. 22.

London Convention. Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 29 December 1972. 11 I.L.M. 1291.

Madrid Protocol on Environmental Protection to the Antarctic Treaty. 4 October 1991. Annex I. 30 I.L.M. 1455.

North American Free Trade Agreement (NAFTA). 17 December 1992. 32 I.L.M. 289.

North American Agreement for Environmental Cooperation. 14 September 1993. 32 I.L.M. 1480.

Protocol on Strategic Environmental Assessment. United Nations Economic Commission for Europe. 21 May 2003. Available at http://www.unece.org/env/eia/sea_protocol.htm.

Protocol to the London Convention. 1 November 1996. 36 I.L.M. 1.

Annex 1

64 Large Marine Ecosystems (LMEs) of the World

1. East Bering Sea
2. Gulf of Alaska
3. California Current
4. Gulf of California
5. Gulf of Mexico
6. Southeast U.S. Continental Shelf
7. Northeast U.S. Continental Shelf
8. Scotian Shelf
9. Newfoundland-Labrador Shelf
10. Insular Pacific-Hawaiian
11. Pacific Central-American Coastal
12. Caribbean Sea
13. Humboldt Current
14. Patagonian Shelf
15. South Brazil Shelf
16. East Brazil Shelf
17. North Brazil Shelf
18. West Greenland Shelf
19. East Greenland Shelf
20. Barents Sea
21. Norwegian Shelf
22. North Sea
23. Baltic Sea
24. Celtic-Biscay Shelf
25. Iberian Coastal
26. Mediterranean Sea
27. Canary Current
28. Guinea Current
29. Benguela Current
30. Agulhas Current
31. Somali Coastal Current
32. Arabian Sea
33. Red Sea
34. Bay of Bengal
35. Gulf of Thailand
36. South China Sea
37. Sulu-Celebes Sea
38. Indonesian Sea
39. North Australian Shelf
40. Northeast Australian Shelf-Great Barrier Reef
41. East-Central Australian Shelf
42. Southeast Australian Shelf
43. Southwest Australian Shelf
44. West-Central Australian Shelf
45. Northwest Australian Shelf
46. New Zealand Shelf
47. East China Sea
48. Yellow Sea
49. Kuroshio Current
50. Sea of Japan
51. Oyashio Current
52. Okhotsk Sea
53. West Bering Sea
54. Chukchi Sea
55. Beaufort Sea
56. East Siberian Sea
57. Laptev Sea
58. Kara Sea
59. Iceland Shelf
60. Faroe Plateau
61. Antarctic
62. Black Sea
63. Hudson Bay
64. Arctic Ocean

CHAPTER 11

Perspectives and Experience of the UNEP Regional Seas Programme

Terttu Melvasalo

Introduction

Within the United Nations, a number of organizations are focusing on ocean-related issues. New commissions, programs, and cooperation bodies have been established at the intergovernmental and nongovernmental levels during the past decades. In spite of goodwill, the implementation of agreed programs has been a very slow process. The United Nations Environment Programme (UNEP) is the intergovernmental tool and executive body that takes care of fostering awareness, initiating agreements and declarations, and mapping out action plans that hinder the deterioration caused by human activities. UNEP cooperates with other UN organizations to fight against the degradation and misuse of the marine environment. The implementation of global ocean- and marine-related agreements and programs most often requires joint activities on regional, national, and local levels. These activities are best coordinated and regulated for success with high-level regional political agreements and action plans, to be implemented primarily by national institutions, in cooperation with relevant organizations.

Following the UN Conference on the Human Environment (Stockholm Conference) in 1972, the UNEP Regional Seas Programme was created as a global program to be implemented through regional components [UNEP, 1995]. This Conference outlined the basic and inseparable elements of environmental action plans and indicated the advantages of the regional approach in contributing to the solution of global problems.

This Conference was the basis for intergovernmental cooperation to protect the oceans, especially the regional sea areas, against pollution caused by humans. In addition to the decision to establish UNEP, it was decided in the conference to establish a separate intergovernmental cooperation body for the protection of the Baltic Sea, for which the Helsinki Convention was signed by all riparian states of the Baltic Sea in 1974 [HELCOM, 1994; Melvasalo, in this volume].

In the first years of UNEP, issues on marine pollution and the oceans ranked highly on its list of priorities. Consequently, funds were allocated to the Regional Seas Programme, which was initiated in 1974 and was developed step by step and region by region, starting with the Mediterranean [Keckes, 1994]. Scientific projects and monitoring programs were also implemented, often together with other UN organizations and programs. This provided the appropriate reliable information for decisionmakers both on regional and global levels. It was then understood that regional and subregional cooperation is crucial for the development and implementation of successful actions to protect and manage transboundary marine environmental issues.

From the beginning, it was clear that international cooperation allows for more accurate identification and assessment of problems and more appropriate determination of priorities for joint actions. In addition, it was understood that regional cooperation strengthens mechanisms for regional capacity building and offers an important avenue for harmonizing and adjusting measures according to national environmental, institutional, and socioeconomic circumstances.

However, these fundamentally scientific programs were limited or cut, due to drastic decrease of the funds in the 1990s. At the same time, new threats to the marine environment were identified. When the Convention of the Law of the Sea (UNCLOS) was implemented, ocean and marine environment protection was prioritized on the global level [Mann Borgese, 1999]. New intergovernmental agreements were approved to protect the coral reefs, marine mammals, and small island developing states and to reduce pollution caused by human activities. The natural way for the implementation of these new agreements was the UNEP Regional Seas Programme. Unfortunately, in many cases, funds remained the most limiting factor in the coordination of the implementation of the global agreements through the Regional Seas Programme.

The Regional Seas Programme

UNEP Regional Seas Programme, Region by Region

The number of regions included in the program increased during the years since the 1970s [Box 1]. By the 21st century, 14 regions[1] and over 140 nations, coastal states, and territories participated in the UNEP Regional Seas Programme. Not all regional seas are represented in the programme, because many regions, especially those surrounded by western countries, still continue to implement their own programs, conventions, and action plans on their own, bilaterally, or multilaterally. However, close cooperation exists in these areas. A few examples are the North Sea, Baltic Sea, and the Arctic regions.

The UNEP Regional Seas Programme was conceived as an action-oriented program encompassing a comprehensive, transsectoral approach to managing marine and coastal areas and their environmental problems concerning not only the consequences but also the causes of environmental degradation.

In beginning each regional program, UNEP acted as Interim Secretariat or an appropriate regional body was designated as Secretariat, pending the establishment of a Regional Coordination Unit. This was the case with Athens, Kingston, and Bangkok [Keckes, 1994]. In some cases, UNEP continued to provide secretariat functions from its headquarters. This created difficulties which became more marked when the UNEP Headquarters was transferred from Geneva to Nairobi in 1985. In a few instances, the functions of the secretariat have been moved from the region back to the headquarters. Most often, however, the secretariat is hosted by regional organizations, as is the case in Kuwait, Jeddah, Lima, Colombo, Apia, and Istanbul [Box 1].

Basic Features

The Stockholm Conference in 1972 created the basic outlines for action plans, which should cover three important categories: environmental assessment, environmental management, and supporting measures.

The intention has been to create an intergovernmental legal agreement for each region — in the form of a regional convention — and to agree

[1] *Editors' note*: The present listing appearing at UNEP's website consists of 13 regions forged under the auspices of UNEP and 5 independent partner programs [see VanderZwaag, in this volume].

Box 1: Brief History of the Establishment of UNEP's Regional Seas Programme

Mediterranean
- Action Plan 1975 (21 states)
- Barcelona Convention 1976
- Secretariat: Coordination Unit for the Mediterranean Action Plan, UNEP, Athens, Greece

Kuwait region
- Action Plan 1978 (8 states)
- Kuwait Convention 1978
- Secretariat: Regional Organization for the Protection of the Marine Environment (ROPME), Safat, State of Kuwait

West and Central Africa
- Action Plan 1981 (21 states)
- Abidjan Convention 1981
- Secretariat: UNEP, Nairobi, Kenya

Wider Caribbean region
- Action Plan 1981 (28 states)
- Cartagena Convention 1983
- Secretariat: Regional Coordinating Unit for the Caribbean Environment Programme, UNEP, Kingston, Jamaica

East Asian Seas region
- Action Plan 1981 (10 states)
- No convention
- Secretariat: Regional Coordinating Unit for the East Asian Seas Action Plan, UNEP, Bangkok, Thailand

South-East Pacific region
- Action Plan 1981 (9 states)
- Lima Convention 1981
- Secretariat: Permanent Commission of the South Pacific (CPPS), Lima, Peru

Red Sea and Gulf of Aden
- Action Plan 1982 (7 states)
- Jeddah Convention 1982
- Secretariat: Programme for the Environment of Red Sea and the Gulf of Aden (PERSGA), Jeddah, Saudi Arabia

South Pacific region
- Action Plan 1982 (19 states)
- Noumea Convention 1986
- Secretariat: South Pacific Region Environment Programme (SPREP), Apia, Western Samoa

Eastern African Sea area
- Action Plan 1985 (9 states)
- Nairobi Convention 1985
- Secretariat: Regional Coordinating Unit for Eastern African Action Plan UNEP, Nairobi, Kenya

South Asian Seas
- Action Plan 1995 (5 states)
- No Convention
- Secretariat: South Asian Cooperative Environmental Programme, SACEP, Colombo, Sri Lanka

North-West Pacific region
- Action Plan 1994 (5 states)
- No convention
- Secretariat: UNEP, Nairobi, Kenya

Southwest Atlantic
- UNEP supporting cooperation
- Secretariat: UNEP, Nairobi, Kenya

Black Sea region
- No action plan
- Bucharest Convention 1992 (9 states)
- Odessa Declaration 1993
- Secretariat: Black Sea Environmental Programme Coordinating Unit, Istanbul, Turkey

The North-East Pacific
- Secretariat: UNEP, Nairobi, Kenya

upon appropriate action plans, and later on, action programs and appropriate protocols. These activities, including environmental assessment, management, and legislation, as well as institutional and financial arrangements, are formally approved by meetings of the regional governments. These governments are parties to the convention or agreement. Later on, social and economic features of the regions were considered in planning priority activities in the protection of the marine environment. Thus, integrated coastal zone planning and management have become important in the program.

The overall strategy of the Regional Seas Programme was defined by UNEP's Governing Council in 1974. The strategy included the following topics:

- Promotion of international and regional conventions, guidelines, and actions for the control of marine pollution, and the protection and management of aquatic resources;
- Assessment of the state of marine pollution, of the sources and trends of this pollution, and of the impacts on human health, marine ecosystems, and amenities;
- Coordination of the efforts with regard to the environmental aspects of the protection, development, and management of marine and coastal resources; and
- Support for education and training efforts to facilitate the full participation of developing countries in the protection, development, and management of marine and coastal resources.

Since each regional program was aimed at benefiting the states of that region, governments were involved from the very beginning in the formulation of the action plan. Its implementation is carried out by national institutions nominated by governments. Specialized UN bodies, as well as relevant international and regional organizations, contributed to its formulation and have provided assistance to these national institutions.

The legally binding instrument, the agreement for the region, was intended to be formulated as a convention, to be signed by the governments and if possible, by all riparian states of the joint sea area. Sometimes, however, not all countries are ready to be involved or are not willing to ratify the joint agreement. The conventions were later amended, or, as in most cases, supplemented by specific protocols dealing with specific problems, such as those on the protection of marine areas and wild fauna and flora and combating marine pollution emergencies [Keckes, 1994]. The long-term goal has been to assist countries, through the Regional Seas Programme mechanism, to implement all relevant global environmental conventions and agreements, including UNCLOS, the London Convention, and regulations and other instruments of UN agencies and programmes, such as: the International Maritime Organization's (IMO) instruments and the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (GPA).

Financial support has been initially provided by UNEP and other international and regional organizations. In all regions, a number of other UN organizations, intergovernmental and nongovernmental organizations (NGOs), and in many cases, supporting governments from regions outside the region concerned, participate in the implementation and funding of the entire program or a part of it. However, the expectation has been that as the regional program develops, the governments of the region will assume increasing financial responsibility for its implementation, through specific regional trust funds or other suitable mechanisms. Other bodies then continue additional assistance in the form of providing expert advice, training, or technical support.

The regional action plan is the most important part of the program in each region. The action plan is based on the assessment of the marine environment and the causes of its deterioration, with response actions for management and development of the marine and coastal environment. The experience gained by UNEP has shown that linking the adoption of the regional convention with the adoption of an action plan is a good strategy [Akiwumi and Melvasalo, 1998]. The linkage strengthens both components and promotes continuous political commitment of the concerned governments.

In UNEP, it was believed that a formal legal agreement is fundamental to the long-term viability of any regional programme because it:

- provides a framework for harmonizing national legislation, and for creating new legislation as necessary, all of which are related to the marine and coastal environment;
- provides a forum for regular high-level consultation among participating governments in the implementation of the program;
- establishes guidelines for coordinating environmental programs and institutions at the regional and subregional levels;
- promotes the accession of more governments within and outside the region to existing global programs and regional conventions relevant to the environmental concerns of the region; and
- establishes a financial framework for continuous coordinated action for the protection of the coastal and marine environment of the region.

Based on the decision by UNEP in the beginning of the Regional Seas Programme, all action plans of the regions were structured in a similar way [UNEP, 1984]. Later, the specific needs of the regions were taken into account as priorities in the plans.

The main features of most of the action plans are the following:

- **Environmental assessment** — The causes of environmental problems, as well as their magnitude and impact on the region, are assessed, based on research and monitoring results.
- **Environmental management** — Training is given on environmental impact assessment; management of coastal lagoons, estuaries and mangrove ecosystems; control of industrial, agricultural, and domestic wastes; and formulation of contingency plans for dealing with pollution emergencies.
- **Environmental legislation** — Specific technical protocols that primarily provide the legal framework for joint regional and national actions are elaborated upon.
- **Institutional arrangements** — The permanent or an interim Secretariat for the action plan is set up.
- **Financial arrangements** — "Seed money" is provided by UNEP, together with appropriate UN groups and other organizations, in the early stages of the specific regional program. The idea is that the governments of the region gradually assume full financial responsibility for the program.

The regional action plans and the legal instruments are formally adopted by an intergovernmental meeting of a particular region before the program itself becomes operational. Consequently, the budget of the regional activities should be approved by the governments concerned. Funding of the activities is mainly through a regional trust fund contributed by governments of the region or by governments or organizations supporting the region.

Even if UNEP is coordinating the Regional Seas Programme, the prerequisite for the success of each regional program is that the governments of that region adopt the program, its action plan, and implementation on a political level. In many regions, the political, as well as socioeconomic situation needs proper preparation before the legal agreement can be signed and ratified. The action plan is implemented mainly by the institutions in the region, in close cooperation with relevant UN programs.

In the implementation of the regional action plan, it is crucial that the program strengthens capacity building through education, training and communication, and support the creation of frameworks for the implementation of the action plan and agreements.

Funding and Financial Concerns

As the duties and tasks of the Regional Seas Programme in all regional sea areas increased remarkably, there was a drastic decrease in the funds of UNEP which were allocated for the Programme. It became impossible to continue supporting many long-term activities, some of which were carried out in cooperation with other UN agencies. These activities included monitoring, intercalibration and intercomparison programs, scientific programs, and training. It was especially sad because a prerequisite for the decisions on the expensive pollution reduction actions is reliable scientific background data and long-lasting followup programs that would have helped reveal the consequences of polluting activities and natural changes in the marine environment [Kullenberg and Ayala-Castanares, 1994]. Some long-term activities and joint programs with other relevant UN organizations were stopped, including: the open sea monitoring program, GOOS, or the Global Ocean Observing Systems [Kullenberg and Ayala-Castanares, 1994], and intercomparison and intercalibration exercises and training provided to the regions in cooperation with the International Atomic Energy Agency (IAEA)/Monaco Laboratory.

Due to the crises in funding, even the "seed money" which was needed to assist regions and the secretariats was reduced to a negligible amount. Lack of funding diminished UNEP's assistance to the regions in the implementation of global environmental agreements. Subsequently, the support needed to establish new regional secretariats suffered the same fate. In the mid-1990s, most of the limited resources of the Regional Seas Programme were re-channelled to start UNEP's secretariat functions of the then newly established GPA undertaking.

Many obstacles have, however, appeared in funding, cooperation, and staffing. These obstacles were partly due to budgeting problems and organizational changes and bureaucracy of UNEP and its headquarters in Nairobi, Kenya. But despite differences between the regions, some examples of successful cooperation within the regional seas can be provided. Examples include the Mediterranean and the Wider Caribbean region, as well as the implementation of coastal zone management and the GPA in many regions.

Relations to Other Organizations and Global Instruments

The Regional Seas Programme has been working in close cooperation with a number of intergovernmental organizations, bodies, and relevant

NGOs working on ocean- and marine-related issues. One of the oldest bodies is the Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP), an interagency advisory group established in 1969 and sponsored by IMO, FAO, UNESCO/IOC, WMO, WHO, IAEA, and UNEP. The role of GESAMP has changed since 1969. Evaluations have been performed reviewing its functions and effectiveness to reveal its achievements, particularly when it comes to providing assistance to the regional seas.

There has been a continuously increasing need for scientific research activities, which could provide important new information on marine questions to the governments and decisionmaking bodies both on the global and regional levels. This means joint activities and regular exchange of information and reporting of results, not only between UN organizations, but also involving relevant NGOs, such as the International Ocean Institute (IOI).

There has been scientific cooperation on monitoring and assessments with UNESCO/IOC and training and intercalibration of methodology with IAEA/Monaco Laboratory. Due to financial constraints, the Regional Seas Programme has not regularly participated in these exercises. The IOC, however, has regional subcommissions; cooperation between IOC and UNEP on regional actions between these regional bodies has increased.

It has been stressed by governments in several occasions that organizations within the UN system should, in order to avoid duplication of efforts, develop mechanisms for interdisciplinary consideration of marine pollution problems. The UN Administrative Committee on Coordination (ACC) has established an advisory subcommittee tasked to address marine questions. This subcommittee, called the ACC Subcommittee on Oceans and Coastal Areas, has had an important role as interagency body that follows up and reports on priority actions. This is especially true in the implementation of the GPA, which is mainly implemented through regional seas. The clearinghouse mechanism, established to assist regional governments in the implementation of the GPA, requires continued support from the relevant UN agencies. This, however, has caused problems in some organizations, since the GPA clearinghouse was not in the regular work programs of the agencies. UNEP has invited the ACC Subcommittee on Oceans and Coastal Areas to perform the functions of an interagency steering committee on technical cooperation and assistance for the GPA, in collaboration with the ACC Subcommittee on Water Resources and with representation from relevant regional and international organizations.

In some regions of developing countries, the United Nations Development Programme (UNDP) has provided capacity building and training while the Global Environment Facility (GEF) has served as the major source of funding for coastal management projects. UNDP has been the implementing agency for many International Waters projects of the GEF; it has assisted the countries bordering the Black Sea, Red Sea, and South Pacific.

There have been problems in some regions when different organizations have provided expertise or funding for projects with little or no coordination between them, including the Regional Seas Programme. To ensure coordination and synergy, some global meetings have been convened by UNEP on the regional seas conventions and implementation of the GPA in the regions. A series of regional technical workshops have been convened as well under the auspices of the Regional Seas Programme.

Different attempts have been initiated to make the work of agencies and relevant NGOs more transparent in all regions. There have been some worries about duplication of work and these worries became evident when a huge UNEP-GEF project was established to prepare a Global International Waters Assessment (GIWA). GIWA included 64 subregions which do not necessarily match the existing monitoring and assessment of the regional seas [UNEP, 2006].

Cooperation with other UN organizations has been successful in most cases, such as preparing protocols to the regional conventions on specific tasks. A number of relevant organizations have cooperated with the Regional Seas Programme both on the global level, such as the IOI and the Advisory Committee on the Protection of the Seas (ACOPS), and on the regional level. This is a positive development because it increases public awareness and environmental education on marine-related issues.

Achievements

In 1997, UNEP's Executive Director Elizabeth Dowdeswell recognized the Regional Seas Programme as one of UNEP's success stories. UNEP was able to concretize several efforts to revitalize and complement the Regional Seas Programme, as requested by the governments.

GPA

November 1995 was a historic moment for the protection of the marine environment. At an intergovernmental conference organized by UNEP and hosted by the U.S. Government, more than 100 countries declared their commitment to protect and preserve the marine environment from harmful effects of land-based activities. The Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (GPA) was adopted in Washington, DC [UNEP, 1995].

UNEP was invited to act as the Secretariat for the GPA, cooperating closely with all partners including relevant UN agencies and bodies, as well as international, governmental and nongovernmental organizations, environmental institutions, national and local governments, the academic sector, scientists, funding agencies, and the private sector. The governments particularly emphasized that as an overriding goal, no new bodies should be established and that UNEP's Regional Seas Programme provide an important globally coordinated, region-wide mechanism to help governments in the implementation of the GPA. The task of UNEP as GPA Secretariat was to promote and facilitate the implementation of the GPA at national, subregional, regional, and global levels. The regions should be assisted in getting a realistic picture of the pollution loads from land-based activities and in identifying the need for priority actions to address the problems.

Due to differences between regions, no single model for implementation of the GPA was possible. It was evident that the best way to get real practical results in the implementation of the GPA was to use the existing Regional Seas Programme. The Regional Seas Programme provided a mechanism through which countries on the shores of a regional sea, such as the Mediterranean, Black Sea, or Red Sea, or those sharing a region, such as the Wider Caribbean, can combine forces to protect their common natural assets, the marine environment, and its living resources. It was assumed that due to the huge pollution problems in the regions and their drainage areas, it was extremely important that an intergovernmental mechanism provide a forum for negotiations. The goal of negotiations is to peacefully resolve conflicting demands for water use. Expanding the activities of the Regional Seas Programme to cover regional cooperation in implementing the GPA provided a forum for transboundary river basins to be linked to the regional seas.

The GPA was directed to develop and implement sustained actions to prevent, reduce, control, and eliminate marine degradation from land-based activities. In this program, freshwater and marine waters are linked together in terms of their environmental protection concerns. Thus, integrated management plans consider water resources within a single water management continuum: from freshwater sources to coastal waters and oceans. This comprehensive approach comprises integrated watershed and river basin management, together with relevant coastal zone management. In this new approach, a number of aspects were taken into account, such as: capacity building; environmental management; waste management; land use; and scientific, technical, institutional as well as legal, socioeconomic, and political factors.

The main purpose of the GPA was to identify the sources of land-based pollution; prepare regional, subregional, and national priority action programs on measures to reduce and alleviate them; and promote regional and subregional cooperation in the implementation of the said program.

The GPA concentrates not just on problems originating near the shores, such as discharges from megacities, other urban areas, harbors, or industrial enterprises in the coastal zone, but also on diffuse sources of pollution, such as agriculture, forestry, and tourism. Sometimes, even other pollution sources should be considered, for example, those which contribute to the contamination of the sea through rivers that cross the boundaries originating from landlocked countries. Reducing airborne pollution is a part of the GPA, because some harmful substances are carried by wind. Such substances include heavy metals, bioaccumulative persistent organic substances, and particles released through soil erosion and land use.

With a few exceptions, most of the countries of the UNEP's Regional Seas Programme have been developing countries. The countries outside the UNEP's Regional Seas Programme are implementing the GPA region by region, either together with neighboring countries or separately. In some cases, the same mechanism has been used as a model of sorts for the GPA. For instance, the countries in the Baltic Sea region, together with the other countries in the catchment area of the Baltic Sea, established a comprehensive action program in 1992 [HELCOM, 1998].

Due to differences in the problems of different regions, it was crucial for elements of the regional strategies to be identified by the governments concerned. The identification process makes special reference to recommended approaches by pollutant-source categories, such as: domestic wastewater, industrial pollution, agriculture, urban discharges, and atmospheric fallout. In the implementation of the GPA, both sector-wise and substance-wise approaches are needed.

In December 1996, the UN General Assembly requested states to take action through the governing bodies of relevant intergovernmental organizations and programs to ensure their active role in the implementation of the GPA. The relevant organizations should take the active leading role in coordinating the development of a clearinghouse mechanism, with respect to the following nine-source categories: sewage, persistent organic pollutants, heavy metals, radioactive substances, nutrients, sediment mobilization, oils (hydrocarbons), litter, and physical alterations (including habitat modification and destruction).

In January 1997, the UNEP Governing Council invited the ACC Subcommittee on Oceans and Coastal Areas to perform the function of a steering committee on technical cooperation and assistance for the GPA.

To facilitate or monitor the implementation of the GPA, a number of workshops, meetings, and global conferences were planned. In the first stage, regional workshops were convened, each of them focusing on regional overviews on land-based activities, including prioritization of sources of pollution both at the national and regional levels. The regional workshops also considered development of regional components of the clearinghouse.

Due to the fact that sewage was seen as a major land-based source of pollution, a global conference was planned [Melvasalo, 2000].

In the framework of the Regional Seas Programme or other regional mechanisms, joint strategies to implement the GPA have been agreed upon, based on the existing conventions, protocols, action plans, and special programs.

GPA Secretariat, clearinghouse, and partners

In order to facilitate the coordination of the secretariat functions of UNEP in assisting countries to implement the GPA, a secretariat was established in The Hague, supported by the Government of The Netherlands. During the first 10 years of the GPA, some progress was achieved. Results of the followup of the achievements have been reported to the UN Commission on Sustainable Development (CSD).

The tasks of the GPA Secretariat were identified as follows:

- promote and facilitate implementation of the GPA at the national level;
- promote and facilitate implementation at the regional level, in particular, through revitalization of the Regional Seas Programme; and
- play a catalytic role with other organizations and institutions in implementation at the international level.

The GPA called for development of a clearinghouse mechanism, which should provide a referral system through which decisionmakers at the national and regional level could be given access to current sources of information, practical experience, and scientific and technical expertise. The basic elements of the clearinghouse are data directory, information delivery mechanisms, and infrastructure.

The clearinghouse was planned to be a joint effort of several relevant organizations, such as UNEP, FAO, WHO, IAEA, UNESCO/IOC, IMO, UNDP, HELCOM, OSPARCOM, and many others. There were plans to establish links with the private sector, industry, international financing institutions, and relevant NGOs.

GPA recognizes that the important role of relevant NGOs is in the successful implementation of the program and provides support for their participation in clearinghouse activities. NGOs are encouraged to be involved in the implementation of the GPA, both at national and regional levels.

GPA in other regional seas not included in the Regional Seas Programme

The GPA was not limited to the regions belonging to the UNEP's Regional Seas Programme. In the North Sea region, the Oslo and Paris

Commission (OSPARCOM), is considering pollution problems in the area. In the Baltic Sea region, the Baltic Marine Environment Protection Commission — the Helsinki Commission (HELCOM), is considering the pollution problems of the Baltic Sea and its catchment area. For the Arctic region, there are specific intergovernmental cooperation bodies. Some countries, with long coastlines not linked to any regional sea, are implementing the GPA through their own mechanisms [Melvasalo, 2000].

HELCOM established the Baltic Sea Joint Comprehensive Programme in 1992 based on a decision by the Prime Ministers of the region in 1990. The goal was to restore the Baltic Sea to sound ecological balance. Five international financing institutions and a number of international organizations were invited to join the program [HELCOM, 1998]. The action-oriented program, established 3 years before the GPA, consists of similar elements through which the principles of GPA are implemented in the Baltic Sea region. The six major elements are:

- policies, laws, and regulations;
- institutional strengthening and human resources development;
- investment activities;
- management programs for coastal lagoons and wetlands;
- applied research; and
- public awareness and environmental education.

As to the investments, in the point and nonpoint source control, the program initially focused on 132 problem areas, called “hotspots,” two-thirds of which were located in countries in economic transition and accounted for 75 percent of the estimated total investment costs. The decision was that the program should be implemented in 20 years, from 1993–2012 [HELCOM, 1998].

Pan-African Conference in Sustainable Integrated Coastal Management (PACSICOM)

There are different approaches in dealing with the joint problems of a regional sea or shared coastal marine area. The most natural approach is that all countries surrounding an enclosed or semi-enclosed sea area, or even located in the drainage area of the sea, agree upon a joint strategy and an action plan which will be based on a convention and other legal instruments. This is the case in most of the sea areas belonging to the Regional Seas Programme, and other regions, such as those in the Baltic Sea and the North Sea.

In addition to this strategy, a new approach was proposed by the UNESCO/IOC in the 1990s. This strategy specifies that the countries of several regional bodies could better cooperate, exchange experiences, and agree upon a joint strategy in a more holistic way. This was proposed after it was found that ocean research was not coordinated properly. Such approach is applied in the European Union (EU) where a joint strategy has been developed to tackle the pollution problems of all regional and marine areas within the EU.

In Africa, the long open coastline is suffering from various pollution problems that are difficult to solve without: *(1)* a long-term strategy; *(2)* cooperation of almost all countries in the African continent; *(3)* the support of other countries, financing institutions and a number of organizations with expertise and funds; and *(4)* the drive to increase public awareness. UNESCO/IOC has a long history in ocean research activities in marine areas. Additionally, several regional conventions have been agreed upon by governments. Coordination units have been established by African governments within the UNEP Regional Seas Programme, such as West and Central Africa (WACAF), Eastern Africa (EAF), Red Sea and Gulf of Aden (PERSGA) and Mediterranean (MEDU) [Box 1].

One of the first attempts to endorse cooperation to streamline coastal management on a continental basis in Africa is the Pan-African Conference on Sustainable Integrated Coastal Management, held in Maputo, Mozambique, in 1998 [PACSICOM, 1998]. It serves as an example of plans to tackle marine pollution problems in a more holistic way, that is, "continent-by-continent." Its intentions were to strengthen current national and regional measures, raise public awareness, and endorse the implementation of relevant programs that give greater impetus to the management of seas and the coasts in Africa. PACSICOM demonstrated that there is a need for more scientific research on the ocean and the coastal areas, which means channelling more funds and expertise to these activities.

As a joint activity of the UNESCO/IOC and UNEP in preparation for the PACSICOM, an assessment of integrated coastal management in Africa was prepared. The Government of Finland, in cooperation with UNESCO/IOC and UNEP, financed the Conference and the assessment, which was used as a basis for discussion at the Conference. A sign of the need for, and interest in, this activity was the fact that 44 of the invited 53 African states were represented by Ministers of Environment or other high-level environmental decisionmakers. The recommendations were given to promote intra-African cooperation to protect the marine and coastal environment. The process focused on several years of implementation and on conventions, protocols, priority action plans and programs, as well as the development of cooperation partnership and funding of the major priority actions.

PACSICOM represented a major contribution of Africa to the observance of the International Year of the Ocean in 1998. It provided a unique opportunity for African countries to reinforce intergovernmental dialogue on increasing threats to the marine and coastal environment.

The Year of the Ocean

The year 1998 was designated as the Year of the Ocean by the UN to stimulate enhanced political and public awareness of the importance of marine and coastal environment to societal concerns. Within UNEP's global and regional water-related environmental work, this special year was dedicated to efforts to introduce activities facilitating the implementation of the GPA to all regions of the Regional Seas Programme and to work in close cooperation with other relevant UN organizations, governments, and NGOs. The intention was that in the long-term, activities on the regional and national level would be undertaken; the sources of land-based pollution would be identified; and priority action programs would be approved, to implement the GPA at regional, subregional, and national levels.

Cooperation within the Regional Seas Programme produced a number of different activities, such as: the publication of booklets, public awareness materials, greeting cards; and the production of an "ocean song" and other media campaigns like an IMAX trailer, in-flight video, meetings, children's art competitions, and many others. The last big exposition of the millennium with the theme "Ocean" was convened in Lisbon, Portugal in 1998. UNEP and its Regional Seas Programme, together with several UN organizations and bodies and NGOs, organized a number of different meetings and projects to increase public awareness on ocean issues in the exposition.

Problem Areas and Limiting Factors

In the beginning of the Regional Seas Programme, the focus was related to major concerns of the ocean, such as marine pollution, dumping, nature conservation, and scientific research. Initially, research on marine pollution was promoted and supported. Several experts from developing countries were trained. With the increase in public awareness of the pollution problems in coastal areas, especially in enclosed or semi-enclosed sea areas, a need to re-evaluate the priorities of the Regional Seas Programme was created. It was realized that the long-term monitoring and research of the open sea did not provide sufficient information for political decisionmakers. It also did not provide for immediate action to be taken in response to new problems, such as pollution of the coastal areas due to sewage, nutrients, litter, solid waste, and new toxic organic substances. UNEP redefined its policy and launched a strategy to catalyze the application of integrated coastal area management. In the strategy, special emphasis was placed on the mitigation of environmental degradation caused by land-based pollution and human activities, and actions based on sound environmental economics and practical natural resource accounting.

According to the strategy, the Regional Seas Programme should have prioritized capacity building and programs on:

- Integrated coastal area management;
- Formulation, adoption, and implementation of pollution control measures;
- Direct assistance to governments in defining and implementing policies and measures to moderate or eliminate pollution problems;
- Development and testing of procedures for environmental impact assessment;
- Training of policymakers, environmental managers, scientists, and technicians in subjects relevant to the protection of coastal and marine areas;
- Raising public awareness on environmental problems in coastal and marine areas; and
- Strengthening linkages between existing action plans through interregional activities, exchange of information, and transfer of experiences.

Even if the new strategy was formulated to serve regional governments, decisionmakers, and managers to solve problems in the coastal areas, there were still problems encountered in getting governments to commit themselves to regional legal agreements and action plans. Consequently, the national legislation of many countries concerned was not amended accordingly.

It gradually became apparent that the environmental problems in nearshore waters and coastal areas could not be solved in those areas alone. The fundamental question was how to handle the causes of the problems in downstream and coastal areas. These problems were caused by activities in the coastal region, including activities upstream. There was a need to reorient the strategy and make it take on a more holistic approach so that it would tackle not only the consequences but also all the root causes of the environmental problems in the regional seas.

There were huge problems when the headquarters of UNEP was transferred from Geneva to Nairobi in 1985. Problems related to coordination and development of the Regional Seas Programme increased. The changes in policy and strategy of UNEP and its financial and organizational problems were reflected in the staff and the implementation of the Regional Seas Programme not only in the headquarters but consequently, also in the regions. Many problems were of practical nature, such as communication, telephone functions, time-consuming travel, and difficulties in arranging meetings.

There also have been problems related to political decisionmaking. In many regions, there are huge problems concerning marine and coastal waters and especially the long-term plans in science and in measures needed to reduce pollution. These, however, need strategy and funding to guarantee that the projects can be carried out as planned for several years. Such decisions have been difficult to get from governments because the success of a project and the positive results achieved are seen only after several years, far beyond the political career of the decisionmakers concerned. A number of ministerial meeting declarations have failed in their implementation due to changes in the top level active decisionmakers of countries. One factor would be that the decisions are unclear for those who are expected to take action in the region.

Another problem is neglecting the use of scientific background information, both in the use of existing knowledge and in continuing comprehensive, long-lasting, large programs, which could provide a holistic view of the resources, demands, and the various direct and indirect relationships.

A great difficulty within the UN is that a number of organizations and bodies are responsible for ocean and coastal issues but none of them are dedicated to taking leadership [Kullenberg, 1999]. Due to limited resources for activities in each of the bodies, implementation of such huge projects as GPA is, unfortunately, very slow. One solution would be that an appropriate committee be established by UN. This committee's work is to advance sustainable development in the holistic ocean issues [Mann Borgese, 1999].

It has become evident that UNEP was the first international institution responsible for environmental protection. Nowadays, however, most international institutions have assumed some environmental responsibilities. Many criticisms have been raised about UNEP and the overall environmental governance system [Haas et al., 2004]. Critics suggest that UNEP is now too small, too poor, and too remote to coordinate and promote sustainable development effectively. The headquarters in Nairobi is too isolated and it is costly for delegates to attend meetings there or for UNEP officials to attend meetings elsewhere. Additionally, budget is inadequate to cover the ambitious array of programs assigned to UNEP by member governments [Haas et al., 2004]. All these problems are also reflected in the Regional Seas Programme. The program, however, should still be seen as a successful mechanism to get marine pollution problems tackled by governments and appropriate organizations of the regional seas. There is still a need for better coordination and support of the Regional Seas Programme to ensure the development and implementation of the relevant marine water protection programs in the regions and for actions to be taken at the regional and local levels.

Lessons Learned

Freshwater and seawater issues are linked together in terms of environmental protection, including both quality and quantity aspects. Thus, integrated management plans should consider the water resources within a single water management continuum: from freshwater sources to coastal waters and oceans. This approach is necessary to improve human life because it provides effective practical solutions to water problems. Therefore, in regions comprising both river basins and marine areas, an integrated approach would work to reduce pollution. Sometimes, however, this means a risk of conflict between neighboring countries. In this respect, there is a need for riparian countries of shared waters to reach agreement for the equitable sharing of water-related benefits and water protection issues.

In spite of global decisions, the implementation of actions that have been agreed upon is possible only at local and national levels. Most often, implementation of water-related issues is best carried out together, through jointly agreed action between countries sharing the same water area. Clearly, one of the best mechanisms for dealing with marine and coastal water issues so far has been the region-by-region approach. This approach has been applied in the UNEP's Regional Seas Programme, in some other regional programs of other UN organizations, such as UNESCO/IOC, and in regional commissions of the Baltic Sea, the North Sea, and the Arctic region. Attempts to increase cooperation between regional sea areas are promising, including better cooperation between different organizations, bodies, and partners of the region. One example is the increased cooperation in Africa to protect the marine areas around the continent.

There are big questions, not necessarily linked with regional marine-related environmental programs. There is a need for more scientific research and new results on ocean issues as whole, marine living resources, and their links to regional, subregional, and coastal areas. There are also some threats. Even if good regional action plans and action programs are based, or should be based, on assessments of the best available scientific information, relevant information may not be at hand due to cuts in long-term monitoring programs and the discontinuance of joint scientific projects with other organizations. Most often, this happens as a consequence of reduced funding from the nations, regions, or coordinating organization. If only applied science were supported, the information gathered may even be utilized beyond what is needed to make relevant decisions dealing with water and ocean issues of the regions.

There are different reasons why cooperation between different relevant UN agencies and programs is not as effective as is necessary, at least where sharing joint interests like water and ocean issues is concerned. Sometimes, the problems arise from gaps in the information flow between national delegates attending the meetings of the governing bodies of different organizations. The organizational and funding problems, not only within UN and its bodies, have sometimes been hindering effective implementation of the global decisions and agreements and effective cooperation in the regional seas level.

Very often, the flow of activities and their followup procedures are too slow and bureaucratic. The responsibility of the implementation of joint decisions is not properly coordinated at national or local levels. Very few persons involved are committed to the project long enough to know the history and to take relevant actions and contacts to endorse the implementation of decisions. Over the years, the resources for the coordination of the Regional Seas Programme have decreased. There seems to be a need not just for increased funding but also for increased cooperation among all partners, both in the regional and coordination level, and for avoiding overlaps in regional functions of different organizations. There are some success stories where the regional sea working model has reaped good results, both within the UNEP's Regional Seas Programme (particularly the Mediterranean), and outside (such as the Baltic Sea). There are also examples, as evident in the Wider Caribbean, for example, where — in spite of goodwill — political, personal, and financial problems have created big obstacles to regional cooperation.

References

Akiwumi, P. and T. Melvasalo. 1998. "UNEP's Regional Seas Programme: Approach, experience and future plans." *Marine Policy*, 22(3):229–234.

Haas, P.M., N. Kanie, and C.N. Murphy. 2004. "Conclusion: Institutional design and institutional reform for sustainable development," pp. 263–281. In: *Emerging forces in environmental governance*. Edited by N. Kanie and P.M. Haas. United Nations University Press, Tokyo, Japan.

HELCOM. 1994. *Intergovernmental activities in the Framework of the Helsinki Convention 1974–1994*. Baltic Sea Environment Proceedings No. 56. 241 pp.

HELCOM. 1998. *The Baltic Sea Joint Comprehensive Environmental Action Programme*. Annual Report. 92 pp.

Keckes, S. 1994. "The Regional Seas Programme. Integrating environment and development: The next phase." In: *Ocean governance: Sustainable development of the seas*. Edited by P. B. Payoyo. The United Nations University Press, Tokyo, Japan.

Kullenberg, G. 1999. "The ocean challenge." *Natural Resources Forum*, 23(2):99–104.

Kullenberg, G. and A. Ayala-Castanares. 1994. "Some experiences." In: *Ocean governance: Sustainable development of the seas*. Edited by P.B. Payoyo. The United Nations University Press, Tokyo, Japan.

Mann Borgese, E. 1999. "The Law of the Sea: Unfinished business." *Natural Resources Forum*, 23(2):105–114.

Melvasalo, T. 1998. "Cleaning the seas." *Our Planet*, 9(5):20–21.

Melvasalo, T. 2000. "Regional marine environmental management and the GPA-LBA: Perspectives and the need for scientific support." *Ocean and Coastal Management* 43:713–724.

PACSICOM. 1998. Summary Record of the Main Conclusions and Recommendations of the Pan-African Conference on Sustainable Integrated Coastal Management (PACSICOM), 18–24 July 1998, Maputo, Mozambique.

UNEP. 1984. *UNEP Regional Seas Programme: The Eastern African experience.* UNEP Regional Seas Reports and Studies No. 53.

UNEP. 1995. Global Programme of Action for the Protection of the Marine Environment from Land-based Activities, 23 October–3 November 1995, Washington, DC. UNEP (OCA)/LBA/IG.2/7. 60 pp

UNEP. 2006. *Challenges to International Waters: Regional assessments in a global perspective.* UNEP/GCSS.IX/INF/9. United Nations Environment Programme, Nairobi, Kenya. 120 pp.

A small-scale fisher dropping trap nets in a river near Hoi An, Vietnam (Photo: CHUA THIA-ENG)

SECTION 2

Basic Elements of Regional Ocean Governance

CHAPTER 12

Evaluating the Effectiveness of Marine Governance

Peter M. Haas

Introduction

Marine governance has become a major focus of policy and scholarly concern over the last 40 years. In the face of increasingly intense human uses of the coastal zones and open oceans, it is now widely accepted that sustainable use of the open oceans and coastal zones requires: *(a)* a significant international cooperation to coordinate policies and eliminate externalities; and *(b)* a comprehensive ecosystem management approach to minimize or eliminate the externalities arising from the interplay of multiple activities in these areas, and the differing needs and interests of multiple users [Sorensen and McCreary, 1990; Vallega, 1992; Boelaert-Suominen and Cullinan, 1994; Cicin-Sain and Knecht, 1998; The Ocean Policy Summit, 2005].

Marine governance is a contested and political activity. The functions of effective marine governance serve to induce political will to pursue more sustainable marine governance efforts.

This chapter focuses on the factors that are associated with managing marine resources in a sustainable manner. It aims to answer the questions: "What factors contribute to better management?" and "How have international institutions contributed to better management?" This exercise is intended to develop a set of suggestive benchmarks by which specific marine management efforts may be evaluated, and also to identify some best practices by which management may be improved.

Evolving Understandings about Managing Marine Collective Action Problems

There has been widespread development in the practice and study of marine governance/management over the last 40 years. Many regimes and multilateral environmental agreements (MEAs) were developed that now cover most of the world's seas, as well as most activities that affect those seas. There is no single global marine governance system. Rather, there are numerous regional and functional efforts, with varying degrees of experience and study. Table 1 provides an illustrative list of marine governance efforts.

Yet, as de Chazournes [2005] observes "… what remains to be fully ascertained is the degree of compliance with them, in particular when such agreements are likely not only to affect the environmental, but also the economic policies of the State parties."[1] There is wide variation in terms of their effectiveness, indeed wide variation in terms of the extent to which information is available for making informed judgment about whether the environment is better, and whether deliberate state policies have had an impact on observed environmental change (for good or bad).

The study of governance of the international commons has also received extensive treatment over the last 30 years, following the emergence of new issue areas in international relations. The findings presented in this chapter are developed deductively from theories about environmental governance and collective action, and inductively from comparative studies of specific environmental governance efforts where the identified factors correlated with more effective governance efforts. Empirical studies of collective governance of shared and transboundary resources have also inferred that more comprehensive substantive governance correlates closely with the provision of specific administrative governance functions [Skolnikoff, 1972; Ruggie, 1975; Kay and Jacobson, 1983; Young, 1989, 1999a, 1999b; Sand, 1990; Haas et al., 1993; Weiss and Jacobson, 1998; Victor et al., 1998; Wettestad, 1999; Miles et al., 2002; Sandler, 2004].[2]

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1 For more general discussions on compliance with international accords, see Shelton [2000], Choucri [1993], and Zaelke et al. [2005].

2 For similar insights applied to domestic protection of the commons see Ostrom [1990].

Table 1: Marine Governance Efforts

Marine Area	Efforts*
Oil Pollution of the Open Oceans	International Maritime Organization (IMO) Regimes, International Convention for the Prevention of Pollution from Ships (MARPOL)
Land-based Sources	Med Plan, UNEP Guidelines, Agenda 21 Chapter 17, Ramsar Convention on Wetlands (Ramsar), Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (GPA)
Marine Living Resources	International Convention for the Conservation of Atlantic Tunas (ICCAT), North Atlantic Salmon Conservation Organization (NASCO), Northwest Atlantic Fisheries Organization (NAFO), FAO fisheries arrangements, regional fisheries agreements, UN Fish Stocks Agreement, International Convention for the Regulation of Whaling (Whaling Convention), Commission for the Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR), Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), Convention on Biological Diversity (CBD), Convention on Migratory Species (CMS), Ramsar, Marine Mammals Guidelines
Marine Pollution	UNEP Regional Seas Programmes (13), Baltic Sea, North Sea, Caspian Sea, London Convention, MARPOL, IMO Funds
POPs and Toxics	Stockholm Convention on Persistent Organic Pollutants (Stockholm Convention), Rotterdam Convention on the Prior Informed Consent (PIC) Procedure for Certain Hazardous Chemicals and Pesticides in International Trade (Rotterdam Convention), Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (Basel Convention), FAO Prior Informed Consent (PIC) Guidelines

*Efforts include global and regional regimes as well as soft law. Sources: www.unep.org; www.greenyearbook.org/

The social science literature on marine governance rests on broader efforts to study collective action, as they have emerged in political science and economics since the 1960s. These works have helped to: *(1)* clarify the barriers to effective collective action; *(2)* describe the mechanisms of collective governance; and *(3)* assess the effectiveness of governance efforts.

Barriers to Collective Action

Analysts have identified a wide variety of barriers to collective action at the national and international levels that inhibit effective marine governance for most issues. Administrative design and capacity issues inhibit the ability of states and resource managers to effectively make and enforce comprehensive marine policies [Bell and Russell, 2002; Bell, 1997; Ascher, 2000; Bell, 2000; Adeel, 2003]. Few governments have environmental agencies with sufficient staff, resources, or authority to be able to formulate comprehensive marine policies. Enforcement is also difficult, due to weak political will, few inspectors, enforcement authority, and adequate environmental monitoring equipment. Moreover, most functional organizations responsible for marine governance lack a sufficiently broad mandate to be able to monitor marine quality, develop management policies that encompass the wide array of activities contributing to environmental risk (in large part because such decisions are the traditional domain of other, older, more powerful and well-entrenched agencies), or to induce such bodies to internalize the externalities that their policies encourage. This problem of institutional myopia exists at the international level as well, where the United Nations and other international institutions generally lack sufficient authority or scope to be able to induce widespread policy change, or to coordinate complex policies effectively with other functional agencies. Another consequence of this organizational incoherence is a paucity of meaningful evaluation studies of environmental regimes or of environmental conditions. Fisheries management is an extreme problem, due to the investment costs sunk in fisheries fleets which drive overconsumption.

Incomplete and poor quality of information and knowledge about the marine environment also impedes the ability to exercise comprehensive management. There is often insufficient information about marine stresses, their causes and effects, or the array of appropriate responses to possible risks.

The commons nature of issues means that sovereign governments are unwilling to address them in an effective manner. Effects are displaced in time and space beyond the traditional territorial jurisdiction of most modern states.

Not all governments care about marine governance. Political will is weak for a number of reasons. Public opinion surveys indicate that concerns about marine issues are modest, and few publics are eager to commit to financial resources and to deal with marine threats, especially if these are outside their coastal waters. Developing country governments are still more worried about resource scarcity issues, whereas industrialized governments are more concerned about pollution matters. Domestic political realities interfere with effective marine managements. Typically, the costs of marine protection are concentrated in a few politically influential sectors, whereas the benefits of marine management are diffuse. Consequently, domestic political pressure tends only to favor delay or modest responses.

Mechanisms of Collective Action

Second is the focus on the social mechanisms by which states try to respond collectively to problems of collective action. The study of governance started with a discovery of the literature on public goods in the late 1960s and the appreciation that effective collective action requires that decisionmakers be made aware of the longer term consequences of national actions, be made accountable to other parties for their actions, and be provided with the material and administrative wherewithal to be able to live up to their collective obligations.

Analysts have grown more sophisticated in their appreciation of the nature of governance for all international issues, not just the environment. International relations initially focused on descriptive studies of international law. In the 1980s, attention turned to studies of international regimes: "sets of implicit or explicit principles, norms, rules, and decisionmaking procedure around which actors' expectations converge in a given area of international relations" [Krasner, 1983]. By the 1990s, the study of regimes expanded to look at international institutions in general: "persistent and connected sets of rules (formal and informal) that prescribe behavioral roles, constrain activity, and shape expectations" [Keohane, 1989].[3] The virtue of this is to sharpen the difference in focus between formal arrangements negotiated between states that guide collective behavior (formal organizations) and shared beliefs that guide understanding of interest and expectations of others' behavior (informal institutions). In this way the study of collective action could take account of both the formal administrative arrangements' guiding behavior and also the causal and normative beliefs that would guide substantive management of particular issues.

In the 1990s, research programs also took account of a broader phenomenon of governance. Rosenau and Czempiel [1992] edited a book which had launched an analysis of governance without government, and one of its chapters defined governance as:

> *"... a system of rule that is dependent on intersubjective meanings as on formally sanctioned constitutions and charters. Put more emphatically, governance is a system of rule that works only if it is accepted by majority (or at least, by the most powerful of those it affects), whereas governments can function even in the face of widespread opposition to their policies. In this sense governance is always effective in performing the functions necessary to systemic persistence, else it is not conceived to exist... Thus it is possible to*

[3] Similar definitions and approaches are offered by North [1990], Ostrom [1990], and Young [1997].

> *conceive of governance without government of regulatory mechanisms in a sphere of activity which function effectively even though they are not endowed with formal authority"* [Rosenau, 1992].

Benedict [2001] provides a useful definition of the current application of "global governance:"[4]

> *"A purposeful order that emerges from institutions, processes, norms, formal agreements, and informal mechanisms that regulate action for a common good. Global governance encompasses activity at the international, transnational and regional levels, and refers to activities in the public and private sectors that transcend national boundaries."*

Governance entails a procedural component of administrative functions diplomats frequently invoke when designing institutional arrangements. Some of these were initially identified as the 3Cs: cooperative environment, capacity building, and building concern [Haas et al., 1993], but the list has subsequently been extended and elaborated. These are now regarded as administrative functions that are performed in effective international governance, rather than phases of environmental governance, as in practice they overlap and there is no clear linear sequence with which they were performed [The Social Learning Group, 2001]. These functions include agenda setting, framing, rulemaking, enforcement, and assessment [Haas, 2004a; Kanie and Haas, 2004; Speth and Haas, 2006]. Zacher [1999] identifies a similar list of functions performed in United Nations governance of economic issues.

Governance is a process, or more accurately a set of social processes that entail contestation. Governance is not purely administrative, and enjoys a number of ancillary effects. Administrative procedures can channel contestation in constructive modes by providing rules for participation and reconciling differences.

Governance entails a shift in analytic focus from the policies that may contribute to better management of marine resources to the process by which collective action proceeds. While policy analysts argue about the appropriate policies for better marine management, the full array of governance functions helps to understand the conditions under which integrated management is more likely to be widely applied.

[4] The Commission on Global Governance in its 1995 report *Our Global Neighborhood* adopted a similar notion, pp. 2–3.

The United States National Research Council's Committee on the Human Dimensions of Global Change observes [Brewer and Stern, 2005]:

> *"Analyzing environmental governance as a problem of institutional design is useful because it reframes the central governance question from one of selecting a single best governance strategy (e.g., choosing between top-down regulation and market-oriented policies) to one that considers a full range of governance options and seeks to match institutional forms to specific governance needs."*

In practice, these administrative functions are performed by a number of different groups of actors, including governments (or states), international organizations, multinational companies (MNCs), nongovernmental organizations (NGOs), and scientific networks. For the purpose of this chapter, focus will be on the activities of international organizations (IOs), although a key criterion for the effectiveness of activities performed by IOs involves their ability to constructively mobilize participation by other actor groups. The most effective governance in practice utilizes synergies from different groups that utilize institutionalized tensions among the parties. For example, the joint regulatory arrangements between NGOs and MNCs yield more binding results than what MNCs desire, and command stronger compliance than what NGOs are able to achieve through selective political campaigns.

Assessing the Effectiveness of Governance Efforts

Last is effectiveness. That is: "Do the social institutions actually deliver the desired outcomes?" This literature also has evolved over time. Lawyers traditionally investigated compliance, largely counting the number of ratifications and describing domestic enforcement mechanisms converting international obligations to domestic law.

More recently effectiveness itself has been inspected more closely. Questions of whether actions are adequate to achieve environmental protection are important from a policy perspective, as is the questions of causal inference raised by international relations scholars interested in the extent to which institutions are able to induce behavioral change by actors.

"Effectiveness" was widely studied in the 1990s, as academics and policymakers sought to identify factors that contributed to better international environmental cooperation and protection. Effective arrangements are those that entail policy changes by states in accordance with the intentions of negotiated treaties that lead to, or are likely to lead to improvements in environmental quality [Weiss and Jacobson, 1998; Victor et al., 1998; Sprinz and Helm, 1999].

Yet in general it is difficult to measure or obtain good evidence about the extent of environmental change, much less the extent directly attributable to conscious efforts. Accurate and reliable long-term data that is regionally specific and is based on the same indicators is hard to come by, as is good data on national compliance. It is much easier to rely on proxies associated with effective behavior, that is, factors present in the cases where analysts concur that effective governance occurs. In policy analysis terms, this assessment looks at outputs over outcomes.

Criteria for Evaluating Marine Governance

Studies of marine governance and environmental governance more generally have identified a number of factors that correlate with more effective governance. Examples of effective regimes where the environment is confidently believed to have improved, or on the path to improvement include the stratospheric ozone regime, European acid rain, the management of Antarctic living resources, and efforts to protect the North Sea and Baltic Sea. Some mid-level successes in which environmental decline have been reversed include the Mediterranean, South Pacific, and southeast Pacific regions.

Three principal causal mechanisms relate these governance functions to more effective marine governance. These are coercion, inducements, and persuasion. Some functions, particularly related to compliance, rely on coercion to compel states to behave in new ways and to pursue more active marine governance. Some functions enable states to get something else they value from engaging in marine governance: inducement. Other functions persuade states of the value of marine governance; either of the desirability from their own perceptions of national interests that marine governance is desirable, or that they should engage in more vigorous marine governance: persuasion. Particular governance functions, such as environmental monitoring, policy analysis, and public education, among others, influence effectiveness through multiple causal mechanisms, through both inducements and persuasion. These forces operate directly on government administrations (the state) and on the population (the public) to whom they are accountable. Thus some capacity-building efforts are addressed towards building administrative capabilities, while other efforts are addressed towards building and mobilizing public concern and pressure on their governments.

Thus capacity building may have multiple effects [Sagar and VanDeveer, 2005]. Capacity building can build administrative capacity for managing problems, as well as inducing longer term and unpredictable learning by government officials and policy elites.

Governance factors will not be equally influential on all countries. For instance, administrative capacity building may be most important for less developed countries. Public education may be more influential in richer democracies.

Table 2 summarizes the factors associated with effective marine governance. These factors and some best practices in performing those factors are discussed below.

Agenda Setting

Agenda setting is necessary for a problem to enjoy sustained attention from the international community. Agenda setting entails monitoring, publicity, and framing. Ongoing scientific monitoring is necessary to generate meaningful data about possible marine risks. Publicity is necessary to relay such findings to decisionmakers and the public. Frames are necessary so that responses and policies are made possible in a way that can generate responsible action.

Stable environmental monitoring programs are necessary to provide an accurate picture of marine conditions

Effective monitoring must provide accurate long-term data on compatible indicators over time. Accurate time-series data is vital for providing an early warning sign of environmental threats, as well as assessing the impact of governance efforts. Good monitoring programs should be capable of providing timely data on environmental quality that is capable of ensuring that potential alarms reject false positives and false negatives.

Monitoring may be done by networks organized by international institutions — such as UNESCO's IOC for the open oceans, UNEP's monitoring networks undertaken in concert with FAO, WHO, and WMO, and the Mediterranean Action Plan's monitoring network or by networks organized by governments or through networks of scientific institutions. In all cases national laboratories are coordinated through an international network through the guidance of international organizations. Some other bodies collect and publicize monitoring data, including GESAMP, UNEP's Global Environment Outlook, and ICES.

Satellite monitoring is surely helpful for assessing organic threats and oil spills, although they are not adequate for assessing inorganic contaminants.[5] Moreover, reliable remote sensing requires periodic

[5] Satellite systems for land cover monitoring is available at http://www.na.unep.net.

Table 2: Summary Table of Effectiveness Factors

	Assessment Factors	Best Practices
Agenda Setting	• Providing accurate environmental data through monitoring • Publicizing findings • Framing the issues broadly	• Selective use of NGOs, international organizations (IOs), states and scientific networks • Nurture media contacts • Diverse participation
Norm Development	• High profile individuals associated with marine governance • Collectively endorsed statements/declarations • Soft law	
Rulemaking	• Venue • Numbers (small number of actors whose behavior needs changing, relatively small number of actors involved in developing policy responses) • Voting rules • Frequency • Perceived fairness • Profile • Financial transfers • Technology transfers • Knowledge transfers • Treaty design: formal enforcement provisions (sanctions, arbitration procedures); verification, monitoring • Institutional density	• Rely on legitimate IOs with autonomy and resources • Technology panels with lead countries to identify best environmental practices (BEPs) and best available technologies (BATs) • UNEP Industry and Environment Office, Tokyo Technology Center
Science-based Rulemaking	• Epistemic community • Standing science panels	• Interdisciplinary standing international panels • Research precedes policy, or at least independent • Info should be timely, authoritative, and useful

Table 2: (continued)

	Assessment Factors	Best Practices
Compliance	• Verification • Sanctions • Arbitration • Capacity building - Administrative resources - Financial transfers - Technology transfers - Public education - Elite education - Knowledge transfers	• High quality information through third party impartial evaluations • Shaming by NGOs • Leadership in Environment and Development (LEAD) training programs
Financing	• Support for collective activities • Support for national compliance • Ability to mobilize funding for marine governance	• Technology transfers • Financial transfers • Lead countries on panels
Synergies	• Horizontal linkages • Vertical linkages • Joint activities	• Pool monitoring, training

interaction with ground stations and direct observations to validate observations and data.

NGO campaigns can be highly effective, so long as they are based on accurate monitoring. For instance, the Shifting Baselines Ocean Media Campaign issues the Rotten Jellyfish Awards for media stories documenting the worst instances of marine declines.[6]

Few monitoring programs pursue long-term synoptic measurements. In part because they are funded by governments and intended to serve as early warning signals; such monitoring schemes are abandoned if they do not yield worrisome results. Yet these then fail to provide a meaningful baseline, nor are they available should environmental stresses grow. A current temptation to monitor only hotspots, in part for reasons of cost-cutting, run the risk then of failing to provide true warnings of threats from substances whose study is ignored.

There is an untapped policy potential in considering nontraditional indicators of environmental disruption, such as focusing on the behavior of benchmark species or of social indicators that would be reflective of environmental disruptions (such as prices of species as a sign of scarcity, or migratory patterns of people highly dependent upon access to marine resources).

[6] http://www.shiftingbaselines.org/news/jellyfishawards.htm

Environmental alarms must receive publicity in order to attract widespread attention

Decisionmakers seldom learn directly of results from monitoring activities. Monitoring results must be publicized broadly for mass publics to become concerned and for governments to react. Publicity often occurs from widely publicized disasters, such as Jacques Cousteau's public announcements of the impending death of the Mediterranean in the early 1970s, or oil spills in the open oceans for oil spill regimes. Thus governance arises in response to an unusual event, rather than from observations of changes in natural systems. NGO publicity campaigns and NGOs' media contacts also play a role in disseminating monitoring findings. Thus effective governance institutions may do well to foster relationships with the media to be able to relay new findings.

Marine governance issues are more likely to be addressed in an integrated manner when they are framed comprehensively

The existence of accepted norms or frames can provide a roadmap to address a particular issue by identifying presumptive institutions and doctrines or policies for governance. In order for information to be regarded as meaningful or authoritative it must be presented in a way that implies human responsibility and also that such observations are not ambiguous, or may be a fluke, or attributable to non-anthropogenic sources. Participating organizations must be seen as legitimate, so that their information will be processed quickly and taken seriously. Membership of the organizations must be sufficiently broad and diverse to ensure that information is sufficiently comprehensive as well. The mandate of the framing institution is thus strengthened when it is conferred with multiple ingredients needed for an integrated and comprehensive marine governance approach.

For instance, in the early days of the Mediterranean Action Plan, FAO provided monitoring reports of Mediterranean water quality that emphasized the relatively depleted organic material in the sea, consistent with its institutional mandate to focus on factors relating to fisheries productivity. UNEP's monitoring at the time included a far broader array of indicators that also related to chemical contaminants in the sea. Similarly, studies about the IMO in the 1980s criticized its agenda and framing for representing the interests of its principal constituency, the tank owners, and not a more comprehensive or environmental policy agenda [M'Gonigle and Zacher, 1981]. Sponsoring organizations also have policy orientations that may affect the presumptive substance of negotiated arrangements which they will help guide. For instance the Bretton Woods institutions — the International Bank for Reconstruction and Development (IBRD) (now one of five institutions in the World Bank Group) and the International Monetary Fund (IMF) — tend to favor economic policy levers, whereas UNEP has been more inclined towards adopting environmental quality standards.

Norm Development

All actors make choices based on some set of normative assessments of what is appropriate behavior in any particular circumstance. Norms are important because they create expectations of how other actors will behave, as well as providing policy parameters for an actor's own actions.

Widely accepted norms can strengthen states' resolve to participate in marine governance

Widely accepted norms of behavior (or principles) can set states' expectations about marine governance, as well as providing legitimate guidelines against which they can be held politically accountable. In the international realm, functionally specific universal norms have been developed in the areas of human rights and refugees protection. Such norms typically take the form of UN declarations and soft laws. They are developed through the actions of transnational activist networks. Independent International Commissions are often associated with the development and popularization of such ideas. High profile international figures are then associated with the adoption and diffusion of such norms, using their international positions (such as the High Commissioner for Human Rights and the High Commissioner for Refugees) to further promote the norms and to cajole other parties to adhere to the norms. In the environmental arena, writ large, the Executive Director of UNEP has aspired to such a role, although UNEP lacks sufficient authority in the international system to provide a firm foundation for such action.

Ongoing efforts have been promoted to establish principles of and for marine governance by luminary international policy advocates — such as Elizabeth Mann Borgese and Arvid Pardo — through the Pacem in Maribus conferences, at the 1998 UN Year of the Oceans celebrations, and at annual global coastal zone management conferences. A number of norms have been asserted for environmental and marine governance, although they do not appear to command widespread support, and many are probably incompatible in practice [Costanza et al., 1998; Independent World Commission on the Oceans, 1998]. Some current governance norms in wide circulation include common but differentiated responsibility, the precautionary principle, the polluter pays principle, and sustainable development, to name a few.

Corporate guidelines can provide a normative basis for marine governance behavior as well. UNEP's Industry and Environment office in Paris has promoted voluntary guidelines documenting best environmental practices (BEPs) and identifying best environmental technologies (BETs) for use. The *Exxon Valdez* principles provide a corporate set of norms. Industry groups, particularly when operating in conjunction with NGOs and scientists, can provide powerful guidelines for effective marine management, such as are emerging through the Marine Stewardship Council.

Rulemaking and Negotiated Settlements

A number of factors combine to strengthen the bargaining context within which environmental negotiations are conducted and thus make it easier for states to reach meaningful agreements. An array of factors improves the prospects of reaching binding obligations. In the absence of such factors, negotiated arrangements are only likely to take the form of least common denominator-type efforts, such as what occurs in most international fisheries regimes.

Venue

At the very least a venue is necessary for discussions to occur. A venue is typically provided by a host government, an international organization, or after a Convention's entry into force, the Conference of the Parties (COP).

The venue must be regarded as legitimate for member governments to willingly participate. Not just any venue will work to provide the necessary logistical and administrative functions. Potentially contentious issues can be far more expeditiously addressed in institutions that command legitimacy in the eyes of stakeholders. Such institutions are increasingly those with representation open to civil society groups. In addition, legitimacy rests on a widespread sense or perception of the fairness by which decisions are taken, including the fairness of the process by which negotiated outcomes are pursued as well as the distributional equity of the outcomes themselves.

Participation

The number of participants is important. A relatively small number of parties make it easier to negotiate and to develop meaningful policies to mitigate shared problems. Negotiations are more efficient with smaller numbers. Consequently efforts that have a minimal number of parties, organized within regional bodies rather than global functional bodies, are more likely to be able to efficiently resolve political disagreements and reach meaningful negotiated settlements expeditiously. In practice, bloc-diplomacy and caucusing often reduces the number of parties that have to participate in negotiations.

Access by NGOs, scientists and civil society are also likely to make for more robust and legitimate governance arrangements. Widespread involvement of stakeholders in negotiations makes the arrangements more effective.

Frequency of meetings

The more interaction between parties the more likely it is to see meaningful compromises and more integrated policies adopted, and for parties to learn from one another. Continuing negotiations rather than one-shot negotiating sessions are better at generating meaningful compromises, as over time, states grow more familiar with one another's positions and are also willing to make concessions at one session in the anticipation that those concessions may be reciprocated at future meetings. Single high-level conferences are unlikely to yield the same results as ongoing preparatory meetings leading to treaty adoption followed by ongoing COPs.

Voting rules

Voting rules can also be important. Consensus makes it most difficult to achieve agreement, whereas a simple majority facilitates agreement. Weighted majority schemes have been devised to assure a better tradeoff between legitimate outcomes and the potential for deadlock or bullying.

Political profile of negotiations

A high level profile for negotiations also encourages breakthroughs and meaningful commitments that mid-level bureaucrats lack the authority to make. Thus, many COPs and meetings now include brief high-level Ministerial meetings before or after the longer sessions, at which such deals may be presented. Also, the North Sea and Baltic countries intersperse their annual meetings with periodic Ministerial meetings every 3–5 years at which major commitments and new agendas are developed for the regimes.

Institutional strength: The more resources institutions can provide, the more likely states are to support marine governance

The institutional sponsor of marine governance negotiations must have independent resources in order to induce recalcitrant parties to accept compromises and move beyond a least common denominator negotiated outcome. Such resources typically include the ability to provide material inducements for negotiating parties to accept meaningful marine governance arrangement (note that the causal mechanism by which such resources induce state compromise may have either to do with their administrative utility for improving a state's ability to actually enforce its obligations, or because these are generic resources of value to the state for which they will make compromises).

Three broad sets of factors have been identified that are associated with inducing states to support and comply with environmental treaties. These are various forms of transfers or rewards that states may enjoy as a consequence of cooperating: financial transfers, technology transfers, and knowledge transfers. Financial transfers provide money for improving compliance with international obligations, and are particularly attractive to poorer developing countries. Technology transfers include sales and gifts of environmental cleanup technology and technical equipment for environmental monitoring. Knowledge transfers consist of training programs for government officials in environmental management, monitoring, and verification activities. Knowledge transfers also include environmental training programs for national scientists and even NGOs.

Treaty design

Ensuring effective governance requires that participants are able to develop policies in which they have faith, and also have the political and administrative ability to enforce their wishes. Without this, other countries are reluctant to enter into joint arrangements, and also efforts are not effective if states cannot enforce their obligations.

International environmental lawyers believe the most important legal design provisions include policy verification elements, environmental monitoring, arbitration and adjudication procedures, and sanctioning mechanisms for noncompliance.

Building public concern

Heightened national concern can pressure governments to take stronger action on the environment. Effective regimes and organizations have included programmatic elements for building national concern. These efforts include public education campaigns; sponsoring TV and radio and media shows; and also expanding the participation of national NGOs and scientists in international discussion. Building environmental norms at the international level can heighten national concern. Similarly publicizing monitoring results can build national environmental concern as well as contributing to improved compliance.

UNEP has engaged in a number of public education efforts, including radio and television shows, posters, popular print materials, and developing rotating museum exhibitions. NGOs have much experience with public education campaigns that may be informative to study to yield best practices. Labeling and certification campaigns also serve an educational role.

Science-based Rulemaking

With the involvement of organized scientific inputs to the policy process, negotiated outcomes are much more likely to yield integrated management efforts rather than mere political compromises. For instance in the North Sea, marine governance efforts take the form of across-the-board reductions in emissions of a variety of substances that were chosen by a process of political compromise. Conversely, in the Mediterranean the specific substances and the environmental standards chosen for those substances reflect scientific consensus about the nature of the threats to the Mediterranean environment.

Much experience has been amassed in the last 20 years about mobilizing environmental science for science-based rulemaking. Global environmental assessments have been completed for ecosystems, climate change, biodiversity, and other topics. Global marine assessments have been conducted for fisheries-related issues, ecosystems assessments, and other topics. While generating usable information, global assessments tend to be expensive (estimates of the Millennium Ecosystem Assessment run at USD 20 million, with similar values for each IPCC assessment of global warming) and may monopolize the available scientific community.

A number of standing commissions also operate, such as GESAMP. GESAMP suffers from its lack of close connection to the member governments and decisionmakers. Some IOs, such as ICES, have their own science network resources that can be deployed. While ICES has a comparative advantage for fisheries knowledge, it lacks a specialized network for pollution issues, and does not have the ear of decisionmakers. Some regimes have standing research bodies that are responsible for developing independent policy advice about the marine resource, identifying problems, and suggesting environmental or resource standards for adoption. These include the Mediterranean, North Sea and Baltic Sea, CCAMLR, and Whaling Convention.

Studies of environmental assessments that were intended to identify usable policy knowledge for environmental governance have identified a number of salient points about assessments that successfully informed negotiated rulemaking. The core group developing and disseminating policy-relevant science must be part of a network of like-minded scientists — an epistemic community. In addition, the knowledge deployment process must be seen as legitimate and be accessible to decisionmakers. Assessments must be credible, legitimate, and salient [Haas, 2004a, 2004b; Farrell and Jaeger, 2006]. Credibility means that the key knowledge producers and their consumers believe their product is true. Legitimacy means that the claims are developed through a process that minimizes the potential for bias and is more equitable in terms of participation by those who are dependent upon the information. Finally saliency means that such information is provided in a timely manner and contains information that is useful for making public policy by decisionmakers: that is, in practice it arrives in conjuncture with the policy process and provides advice which can be converted into laws or decisions by decisionmakers.

The criteria of these points have been elaborated by UNEP [2003]:

- Credibility: Quality Assurance (QA) mechanisms in place, external peer review method guidelines adopted with regular review, assessment is based on empirical data, assessment involves partners, assessment uses an indicator framework.

- Legitimacy: undertaken at country request or in response to international/regional convention; national stakeholders involved in all phases.
- Saliency: assessment responds to a convention or a national request, is regular, provides policy advice, has provision for review, identifies policymakers as end-users, has stakeholder involvement, outputs are oriented to user, information freely available.

The best practices on mobilizing scientific networks to provide policy relevant information include [Haas, 2004c]:

- Create standing international interdisciplinary scientific panels or committees organized around specific topics.
- Create subcommittees responsible for different functions of governance, such as basic research, environmental monitoring, policy analysis, and policy verification and evaluation.
- Carefully survey the scientific population to identify individuals who share causal understandings.
- Ensure that networks and international panels have interdisciplinary representation, including the social sciences. Individuals should have high regard in their own disciplines as well as being able to talk to experts from other disciplines.
- Funding should come from multiple sources.
- Avoid governmental designation of scientists to meetings and for them to participate on panels.
- Assure timely submission of scientific reports before political meetings.
- Models and assessments should be conducted at geographic scales that are meaningful to policymakers.

A broader consideration of the proper institutional design for consensus building among and between scientists and policymakers entails timing. When consensus has been achieved before an issue reaches the agenda and policy discussions begun, then scientists can merely be introduced as experts, following the lessons above. However, at times it is necessary to simultaneously develop scientific consensus and advance policy debates. For such issues, such as was the case in the Mediterranean and ozone regimes, the parallel development of science and policy must be kept insulated from ongoing policy debates, with the two streams united only when consensus has been achieved. In other cases, where consensus remains elusive and policy debates have already attained their own momentum, as in climate change and biodiversity, it may be best if the two activities can be kept as separate as possible.

Enforcement and Compliance

Not all parties, even well-intentioned ones, necessarily live up to their international obligations. Enforcement and compliance factors help induce or teach countries to integrate integrated management and ecosystems management techniques into national marine practices. Several factors have been identified as critical: verification measures, arbitration and adjudication measures, clearly-written commitments, sanctions for noncompliance, resources to achieve compliance, and environmental monitoring.

Verification measures make it easier to identify and deter noncompliance

Most treaties and regimes include verification measures that collect information about parties' compliance with their obligations. States are more likely to comply if infractions are promptly and accurately reported. In practice it appears that compliance is poorly verified, and presumed to vary widely by country and by regime [United Nations Commission on Sustainable Development, 1999].[7]

Treaties vary widely in terms of who collects this information and how frequently. This is best done by impartial third parties (IOs, NGOs, or contracted private firms) collecting and disseminating information about the activities of states. Self-reporting runs the risk of allowing states to lie or misrepresent their records. For instance, after the Cold War ended it was discovered that the Soviets had been routinely lying about their whale catches and the amount of radioactive wastes they were dumping in the ocean. The Montreal Protocol encourages self-reporting by states that are incapable of reducing chlorofluorocarbon (CFC) emissions, but the Montreal protocol is unusual in that it also provides financial transfers for states to construct non-CFC-based chemicals. In practice most treaties rely on a complicated mix of verification arrangements.

Verification is also performed through general reports about national environmental performance, as conducted by the Organisation for Economic Co-operation and Development (OECD) and the European Environmental Agency (EEA) for European countries. A review of these efforts finds that they are often weak in terms of comprehensive evaluations, because they do not rely on the same indicators over time, and may not be published in a timely fashion. They do have an effect on building public concern [Rosenström and Lyytimäki, 2006]. The EU annual reporting on beach quality is also an effective means of verification, so

[7] Even in the EU, where capacity is high, reports of national noncompliance are often alarmingly bad [Haas, 1998].

long as the information is widely available, the assessments are believed accurate, and tourists are aware of the scheme.

A key lesson about verification drawn from arms control studies is that the most accurate and credible verification activities are those conducted by impartial third parties. The Baltic Sea parties have discussed the prospects of surprise inspections by third parties, but have not adopted these procedures.

Arbitration and adjudication can mitigate disputes about compliance

Arbitration and adjudication arrangements are necessary for reconciling disputes about compliance and interpretation of obligations. There are widespread provisions for the creation of arbitration bodies in most marine governance regimes, but none have ever been convened.

Clearly documented obligations make parties more willing to commit to negotiated rules

Clearly documented obligations make parties more willing to commit to negotiated rules because they make signatory parties more confident about the expectations and behavior of other parties using the marine resource on which they depend. Not only do they contribute to stronger negotiated outcomes, they can make compliance easier for states. Once written, most stringent rules become public knowledge as potential BEPs [Environmental Data Services Ltd., 1992].

Sanctions for noncompliance can deter noncompliance

Clear-cut penalties for noncompliance can deter noncompliance. Formal enforcement provisions include economic sanctions against parties that are in violation and legal provisions for arbitration over disputes in interpretation or for enforcing sanctions. Curiously, few international environmental treaties contain strong sanctions or compliance mechanisms.

In practice, sanctioning mechanisms take indirect forms. Governments can choose to penalize other countries that are seen to be violating marine governance standards, such as the trade restrictions the U.S. applied to Mexico in the instance of tuna and dolphins. IOs can apply conditionality terms to countries seen to be violating their environmental norms. The World Bank can suspend loans, as it did with Brazil in the 1980s over Amazonian forestry policies. Less acute means of pressure can also be applied, through parallel institutional arrangements (see synergies below).

A major mechanism of recent sanctioning occurs through NGO shaming campaigns. If accurate and timely information about infractions is available, NGOs may launch shaming campaigns against governments, firms, or municipalities that have failed to meet their international obligations.

Providing administrative and material resources can promote compliance

Sometimes states do not achieve compliance for reasons of inadequate capacity. If mechanisms are available to generate administrative and resource-based capacities for member governments then they may help promote compliance.

Enhancing access to providing material resources can help states and other actors enforce their marine governance commitments. Marine monitoring technologies and cleanup technologies — and training in their use — can all help. Direct outreach to include the private sector through identifying market opportunities for firms has helped achieved compliance in the Mediterranean, Baltic, and North Seas. Certification schemes can also help encourage private investment in activities that can contribute to compliance.

Many governments require administrative assistance in complying with marine governance arrangements as well. Officials may benefit from training in integrated coastal zone management (ICZM) techniques, as well as in verification and enforcement techniques. Training activities have been provided by UNEP, the World Bank, through national official development assistance (ODA), and also by NGOs supported by foundations, such as Leadership in Environment and Development (LEAD). Some states may also need direct financial transfers to pay for the costs of inspectors and monitoring.

Building social capacity can improve compliance

Building political will may make governments more willing to commit resources to marine governance. Public education efforts can mobilize public pressure and demands for more comprehensive marine management [Weinthal and Parag, 2003]. If the U.S. is any example, popular movies on marine subjects may have potential.[8] Governance activities that mobilize NGOs and domestic scientific groups can contribute to broadening public awareness and concern at the domestic level. Democratization is a means of capacity building.

Environmental monitoring provides an accurate picture of environmental quality

Scientific certainty about the causes of marine problems and the extent of the threats enhance the response by which governments will mobilize resources to promote marine governance. Robust monitoring programs generate the necessary information about problems to galvanize

[8] Such as Al Gore's *An Inconvenient Truth* on global warming and possibly the *Free Willy* movie for marine conservation issues.

concern and commitment for compliance. They provide ongoing information to enable verification and feedback for ongoing assessments. Thus, states can ascertain if their efforts are having an impact and develop new policies if new threats are identified, or if earlier concerns are shown to be exaggerated. Robust monitoring programs enable resilient responses to new threats, and provide baselines for regime self-assessments.

Financing

Adequate financing is necessary to pay for collective governance activities, as well as to pay for national responses. The total sum required for marine governance is unknown, although estimates in 1992 of what it would cost to achieve the overall sustainable development goals elaborated in Agenda 21 were in the range of USD 65–70 billion per year.

The national contributions to the annual budgets of international organizations (such as FAO, UNESCO, and UNEP) and to the dedicated trust funds for the support of specific regimes tend to be modest at best. Such financing is supplemented by project grants to COPs, and at times IOs, from the GEF, UNDP, World Bank, and regional development banks. National financial support tends to come from these sources as well as from private direct foreign investment (DFI) and foreign aid (ODA) from governments. DFI now vastly eclipses the annual flows of ODA for most countries other than to the least developed.

Effective marine governance thus relies on the ability of the key actors to access and mobilize such financial transfers.

Private technology transfers have been encouraged by creative institutional design. In the Mediterranean, information about oil spill technology was made available to government officials during UNEP- and IMO-sponsored trade shows. In the North Sea and Baltic Sea, technical technology panels operate to highlight best environmental technologies for marine cleanups. The panels are chaired by countries with a specialization in the specific technologies being investigated by the panel, thus providing the chairs with a strong incentive to publicize new technologies.

NGOs have developed some novel financial instruments through partnerships with local firms, developing ecotourism projects and debt-for-nature swaps [Miles, 2005].

Economic growth from trade liberalization is often lauded as a source of increased revenue sources for environmental protection. In addition, as economies develop they shift away from pollution intensive industries towards more benign service sectors, along with presumably increasing public environmental concern and willingness to pay for environmental and resource protection [Cole and Neumauyer, 2005]. But such economic benefits are contingent on political will to commit to activities that will contribute to better marine governance, rather than accentuate the conflicts between economic activities that affect marine quality and resources. Thus, the greater the rate of economic growth, the stronger the need for institutional mechanisms and efforts to mobilize public concern.

Synergies

Governance efforts do not operate in a vacuum. Indeed, given the international matrix of states' social obligations, isolation inhibits effectiveness in most instances. While there has been much recent attention to synergies between governance arrangements, much less effort has been directed towards clearly identifying the dimensions or mechanisms by which synergies occur, and how synergies affect marine governance.

It would seem that the relative poor performance of fisheries governance vis-à-vis other marine governance efforts has to do, in part, with the relative isolation of fisheries regimes from the broader institutions of global environmental governance.

A large number of horizontal linkages will increase the robustness of marine governance efforts over time

Horizontal linkages have to do with the overlapping memberships of marine governance arrangements (COPs, IOs, regimes). Overlapping memberships offers the potential for states to pursue policy harmonization across the institutions of which they are a member, in order to rationalize policies and ensure that their firms face uniform regulations [Stokke and Cofey, 2004].

A few examples can indicate the potential from horizontal linkages that contributed to efforts to strengthen standards and broaden governance coverage. The tributyltin (TBT) antifoulant was first regulated in the North Sea by OSPAR (Convention for the Protection of the Marine Environment of the North-East Atlantic) Commission, and then the standards were transmitted to the Mediterranean by the IMO [Santillo et al., 2001]. The overlapping memberships of the EU, North Sea, and Baltic Sea regimes led environmental leader countries to seek to transfer commitments made within one regime to the others. The Convention on Long-range Trans-boundary Air Pollution (LRTAP) even adopted a cooperative arrangement with the Paris Commission (PARCOM) and the Med Plan to take account of airborne emissions into the ocean.

Discharge of polychlorinated biphenyls (PCBs) into the ocean was first regulated at North Sea Ministerial Conferences in 1984 and 1987.

The OECD then adopted a decision on PCBs, followed by the Med Plan in 1995, the EU in 1996, UNEP's Governing Council in 1996, and ultimately in the Stockholm Convention on POPs [Koppe and Keys, 2001; Santillo et al., 2001].

Forum shopping may be a mechanism for transmitting obligations. For instance, anti-whaling advocates have tried to add whales to the CITES list of protected species.

Tight vertical linkages may increase the robustness of marine governance efforts over time, if those linkages are tied to integrated frames

Vertical linkages have to do with the extent to which issue-specific governance efforts are subordinate to: *(1)* universally shared obligations; *(2)* principled commitments; or *(3)* a legally binding formal authority. In this regard, higher level notions — or powerful international organizations whose enforcement powers reach down to marine management issues — are legally binding obligations.

Tight connections between formal authorities operating at different physical scales may improve the potential for mitigating international externalities. For instance, if local authorities are involved in decisionmaking with national authorities, governance efforts may be better able to capture cross-scale effects, as well as improving compliance prospects though including stakeholders in decisionmaking [Young, 2002].

While tight nesting may relate marine governance to more comprehensive universal norms or prospects for legal enforcement, not all higher level international frames encourage integrated or comprehensive planning. Many international economic frames encourage market-based policy approaches and tools. For vertical nesting to promote integrated marine management, the marine management efforts must be subordinate to complementary higher level integrated frames. In this regard, the trade and environment conflict in the WTO is emphasized by environmentalists for fear that trade liberalization concerns (or frames) will prevail over environmental regulations.

Pooling resources may be a source of efficiency

Many marine governance arrangements require similar governance functions. Administrative efficiency gains can be achieved by joint provision of many overlapping functions. In addition to the administrative benefits from pooling efforts, it is possible to build cross-region networks capable of building political will and capacity within their own governments. Many monitoring activities can be done across regions. Much training — of government officials in ICZM techniques as well as laboratory scientists in research, monitoring and verification techniques — can easily be done to include multiple regimes. Public education activities can easily be pooled. Other functions are region-specific and cannot be as easily pooled.

Still, it is important to keep these efforts focused on the core elements of marine governance. During the 1990s, UNEP sought to hook many regional training efforts to the more popular and better funded climate change and biodiversity projects which actually seemed to have the effect of diverting attention from marine governance to the more lucrative issue areas.

Opportunities for sharing experiences

Many governments and actors can learn about integrated management and its application through indirect links with one another. These can occur in several ways. Actors can share best practices and experiences at seminars or meetings, or also through indirect networks of policy specialists. Thus marine governance can be strengthened through convening such meetings, and also by building and strengthening networks of expertise.

Prominent actors, including the World Bank and the United States, provide a demonstration effect for other countries to emulate. ICZM, environmental impact assessments, and particular environmental standards are often imitated from authoritative sources. European governments also look to one another for lessons. Joint workshops at which national experiences are presented also provide a mechanism for lesson drawing and sharing [Jänicke and Carius, 1992; Jänicke and Weidner, 1995a, 1995b; Weidner and Jänicke, 2002].

Conclusion

A lot of discussions have been devoted to writing and evaluating marine governance. In this chapter, some of the broad outlines of the challenges presented by marine governance, and some suggestive lessons that can be applied to assess and improve marine governance in the future were presented. Further work needs to be conducted to carefully assess individual efforts to appraise progress to date, to ascertain the potential for improvements, as well as to the potential contributions to effective marine governance by multiple actors active in global governance. Such assessments would focus on the criteria presented in this chapter, as well as surveying participant stakeholders regarding their satisfaction, regime successes, regime failures, and lessons about best practices.

Marine governance will face new challenges, beyond that of merely appraising and reinforcing existing arrangements. New threats to marine governance are sure to arise, and will have to be addressed. Functional gaps in marine governance should be systematically investigated and addressed. Evolving governance highlights the growing role of non-State actors, and marine governance efforts will have to be reformed and developed to accommodate the involvement of new non-State actors, and to constructively deploy their contributions to improve marine governance efforts. Lessons drawn from appraisals of ongoing efforts can contribute to institutional reforms and policy lesson drawing for improved marine governance in the future.

References

Adeel, Z. 2003. *East Asian experience in environmental governance: Response in a rapidly developing region*. United Nations University Press, Tokyo. 246 pp.

Ascher, W. 2000. "Understanding why governments in developing countries waste natural resources." *Environment*, 42(2):8–18.

Bell, R.G. 1997. "Developing a culture on compliance in the international environmental regime." *The Environmental Law Reporter*, 27(8):10402–10412.

Bell, R.G. 2000. "Building trust." *Environment*, 42(2):20–32.

Bell, R.G. and C. Russell. 2002. "Environmental policy for developing countries." *Issues in Science and Technology*, Spring 2002.

Benedict, K. 2001. "Global governance," pp. 6232–6237. In: *International Encyclopedia of the Social and Behavioral Sciences*. Edited by N.J. Smelser and P.B. Bates. Elsevier.

Boelaert-Suominen, S. and C. Cullinan. 1994. *Legal and institutional aspects of integrated coastal area management in national legislation*. Food and Agriculture Organization of the United Nations, Rome. 118 pp.

Brewer, G.D. and P.C. Stern. (eds). 2005. *Decisionmaking for the environment*. The National Academic Press, Washington, DC. 281 pp.

Choucri, N. (ed). 1993. *Global accord*. MIT Press, Cambridge. 562 pp.
Cicin-Sain, B.K. and R.W. Knecht. 1998. *Integrated coastal and ocean management: Concepts and practices*. Island Press, Washington, DC., USA. 517 pp.
Cole, M.A. and E. Neumauyer. 2005 "Environmental policy and the environmental Kuznets curve: Can developing countries escape the detrimental consequences of economic growth?" pp. 298–318. In: *Handbook of global environmental politics*. Edited by P. Dauvergne. Edward Elgar, Cheltenham, UK.
Commission on Global Governance. 1995. *Our global neighborhood: The report of the Commission on Global Governance*. Oxford University Press, USA. 410 pp.
Costanza, R., F. Andrade, P. Antunes, M. van den Belt, D. Boersma, D.F. Boesch, F. Catarino, S. Hanna, K. Limburg, B. Low, M. Molitor, J.G. Pereira, S. Rayner, R. Santos, J. Wilson, M. Young. 1998. "Principles for sustainable governance of the oceans." *Science*, 281(5374):198–199.
de Chazournes, L.B. 2005. "The Global Environment Facility (GEF): A unique and crucial institution." *Review of European Community and International Environmental Law*, 4(3):193–201.
Environmental Data Services, Ltd. 1992. *Dangerous substances in water: A practical guide*. Environmental Data Services, Ltd., London.
Farrell, A. and J. Jaeger. (eds). 2006. *Assessments of regional and global environmental risks: Designing processes for the effective use of science in decisionmaking*. Resources for the Future Press, Washington, DC. 301 pp.
Haas, P.M. 1998. "Compliance with EU directives: Insights from international relations and comparative politics." *Journal of European Public Policy*, 5(1):17–37.
Haas, P.M. 2004a. "Addressing the global governance deficit." *Global Environmental Politics*, 4(4):1–15.
Haas, P.M. 2004b. "Science policy for multilateral environmental governance," pp. 115–136. In: *Emerging forces in environmental governance*. Edited by N. Kanie and P.M. Haas. United Nations University Press, Tokyo. 295 pp.
Haas, P.M. 2004c. "When does power listen to truth? A constructivist approach to the policy process." *Journal of European Public Policy*, 11(4):569–592.
Haas, P.M., R.O. Keohane and M.A. Levy. (eds). 1993. *Institutions for the Earth: Sources of effective international environmental protection*. MIT Press, Cambridge. 448 pp.
Independent World Commission on the Oceans. 1998. *The ocean: Our future*. Edited by M. Soares. Cambridge University Press, New York. 248 pp.

Jänicke, M. and A. Carius. 1992. "Framework conditions for environmental policy success: An international comparison." Annual Meeting of the American Political Science Association. Chicago.

Jänicke, M. and H. Weidner. (eds). 1995a. *Successful environmental policy — A critical evaluation of 24 cases.* Sigma, Berlin. 411 pp.

Jänicke, M. and. H. Weidner. 1995b. "Successful environmental policy: An introduction," pp. 10–25. In: *Successful environmental policy — A critical evaluation of 24 cases.* Edited by M. Jänicke and H. Weidner. Sigma, Berlin. 411 pp.

Kanie, N. and P.M. Haas (eds). 2004. *Emerging forces in environmental governance.* United Nations University Press, Tokyo. 295 pp.

Kay, D.A. and H.K. Jacobson. (eds). 1983. *Environmental protection: The international dimension.* Allanheld, Osmun, Totowa, NJ. 340 pp.

Keohane, R.O. 1989. *International institutions and state power: Essays in international relations theory.* Westview, Boulder. 270 pp.

Koppe, J.G. and J. Keys. 2001. "PCBs and the precautionary principle," pp. 64–75. In: *Late lessons from early warnings: The precautionary principle 1896–2000.* Edited by P. Harremoës, D. Gee, M. MacGarvin, A. Stirling, J. Keys, B. Wynne and S.G. Vaz. European Environment Agency, Copenhagen.

Krasner, S.D. 1983. "Structural causes and regime consequences: Regimes as intervening variables," pp.1–23. In: *International regimes.* Edited by S.D. Krasner. Cornell University Press, Ithaca, NY. 372 pp.

M'Gonigle, M.R. and M.W. Zacher. 1981. *Pollution, politics, and international law: Tankers at sea (Science, technology, and the changing world order).* University of California Press, Berkeley. 416 pp.

Miles, E.L., A. Underdal, S. Andresen, J. Wettestad, J.B. Skjaerseth and E.M. Carlin. (eds). 2002. *Environmental regime effectiveness.* MIT Press, Cambridge. 508 pp.

Miles, K. 2005. "Innovative financing: Filling in the gaps on the road to sustainable environmental funding." *Review of European Community and International Environmental Law,* 14(3):202–211.

North, D.C. 1990. *Institutions, institutional change and economic performance: Political economy of institutions and decisions.* Cambridge University Press, Cambridge. 152 pp.

Ostrom, E. 1990. *Governing the commons: The evolution of institutions for collective action.* Cambridge University Press, Cambridge. 280 pp.

Rosenau, J.N. 1992. "Governance, order, and change in world politics," pp. 4–5. In: *Governance without government: Change and order in world politics.* Edited by J.N. Rosenau and E.-O. Czempiel. Cambridge Studies in International Relations. Cambridge University Press, Cambridge and New York. 311 pp.

Rosenau, J.N. and E.-O. Czempiel. (eds). 1992. *Governance without government: Change and order in world politics.* Cambridge Studies in International Relations. Cambridge University Press, Cambridge and New York. 311 pp.

Rosenström, U. and J. Lyytimäki. 2006. "The role of indicators in improving timeliness of international environmental reports." *European Environment*, 16(1):32–44.

Ruggie, J.G. 1975 "International responses to technology: Concepts and trends." *International Organization*, 29(3) Summer:557–584.

Sagar, A.D. and S.D. VanDeveer. 2005. "Capacity building for the environment: Broadening the scope." *Global Environmental Politics*, 5(3):14–22.

Sand, P.H. 1990. *Lessons learned in global environmental governance.* World Resources Institute, Washington, DC. 60 pp.

Sandler, T. 2004. *Global collective action.* Cambridge University Press, Cambridge. 299 pp.

Santillo, D., P. Johnston and W.J. Langston. 2001. "Tributyltin (TBT) antifoulants: A tale of ships, snails and imposex," pp. 135–148. In: *Late lessons from early warnings: The precautionary principle 1896–2000.* Edited by P. Harremoës, D. Gee, M. MacGarvin, A. Stirling, J. Keys, B. Wynne and S.G. Vaz. European Environment Agency, Copenhagen.

Shelton, D. (ed). 2000. *Commitment and compliance.* Oxford University Press, Oxford. 560 pp.

Skolnikoff, E.B. 1972. *The international imperatives of technology.* Research Series No. 16. Institute of International Studies, University of California, Berkeley

Sorensen, J. C. and S.T. McCreary. 1990. *Institutional arrangements for managing coastal resources and environments.* Revised 2nd Edition. National Park Service and U.S. Agency for International Development. Washington, DC. 165 pp.

Speth, J.G. and P.M. Haas. 2006. *Global environmental governance: Foundations of contemporary environmental studies.* Island Press, Washington, DC. 1790 pp.

Sprinz, D.F. and C. Helm. 1999. "The effect of global environmental regimes: A measurement concept." *International Political Science Review/Revue internationale de science politique*, 20(4):359–369.

Stokke, O.S. and C. Coffey. 2004. "Precaution, ICES and the Common Fisheries Policy: A study of regime interplay." *Marine Policy*, 28:117–126.

The Ocean Policy Summit. 2005. http://www.globaloceans.org/tops2005/index.html

The Social Learning Group. 2001. *Social learning and the management of global environmental risks.* Volume 1. MIT Press, Cambridge. 226 pp.

UNEP. 2003. *Global Marine Assessments: A survey of global and regional environmental assessments and related scientific activities*. UNEP-WCMC/UNEP/UNESCO-IOC. 132 pp.
United Nations Commission on Sustainable Development. 1999. "Oceans and seas report of the Secretary General: Trends in national implementation." E/CN.17/1999. Advance unedited draft.
Vallega, A. 1992. *Sea management: A theoretical approach*. Elsevier Applied Science, London. 259 pp.
Victor, D.G., K. Raustiala and E.B. Skolnikoff. (eds). 1998. *The implementation and effectiveness of international environmental commitments*. MIT Press, Cambridge. 737 pp.
Weidner, H. and M. Jänicke. (eds). 2002. *Capacity building in national environmental policy: A comparative study of 17 countries*. Springer, Berlin. 448 pp.
Weinthal, E. and Y. Parag. 2003. "Two steps forward, one step backward; Societal capacity and Israel's implementation of the Barcelona Convention and the Mediterranean Action Plan." *Global Environmental Politics*, 3(1):51–71.
Weiss, E.B. and H.K. Jacobson. (eds). 1998. *Engaging countries*. MIT Press, Cambridge. 615 pp.
Wettestad, J. 1999. *Designing effective environmental regimes*. Edward Elgar, Cheltenham, UK. 261 pp.
Young, O.R. 1989. *International cooperation*. Cornell University Press, Ithaca. 288 pp.
Young, O.R. 1997. "Global governance: Toward a theory of decentralized world order," pp. 273–299. In: *Global governance: Drawing insights from the environmental experience*. Edited by O.R. Young. MIT Press, Cambridge, MA.
Young, O.R. 1999a. *Governance in world affairs*. Cornell University Press, Ithaca. 224 pp.
Young, O.R. (ed). 1999b. *The effectiveness of international environmental regimes*. MIT Press, Cambridge. 325 pp.
Young, O.R. 2002. *The institutional dimensions of environmental change: Fit, interplay, and scale*. MIT Press, Cambridge, Massachusetts.
Zacher, M. 1999. *The United Nations and global commerce*. United Nations Department of Public Information, New York. 78 pp.
Zaelke, D., K. Donald and E. Kruzikova. (eds). 2005. *Making law work: Environmental compliance and sustainable development*. 2 Volumes. Cameron May, London.

CHAPTER 13

Regional Maritime Regime Building in Northeast Asia[1]

Mark J. Valencia

Introduction

Scientific and technological advances, combined with nationalism and economic need, have prompted almost all coastal countries in Asia to claim 200 nautical miles exclusive economic zones. One consequence of this "sea enclosure" movement is the growing recognition that global standards and regimes may not adequately address the special circumstances of certain national and regional maritime needs and interests. Consequently, marine regionalism developed where groups of countries perceived that some of their mutual needs and interests, based on physical geography, complementary uses, or policy, distinguish them from other countries. These countries believe that these needs and interests are best satisfied by a regional approach.

[1] This chapter is in part drawn from Valencia [1996,2000b, 2001a, 2001b].

This chapter establishes the context for the initiation and evolution of such regional regimes in Northeast Asia. For its purposes, Northeast Asia includes China, Japan, Democratic People's Republic of Korea (DPR Korea or North Korea), Republic of Korea (RO Korea or South Korea), Taiwan, and Russia. The marine regions include the Yellow Sea and the East China Sea, taken as a unit, and the Sea of Japan. It assesses the prospects for regional maritime regime development there. Specifically, it describes the natural setting and the political and socioeconomic context of building maritime environmental and fisheries regimes; analyzes the progress, as well as problems involved in the undertaking; delineates advances in regional maritime security arrangements; specifies factors which encourage regime formation and those that retard or constrain it; and draws conclusions and lessons learned.

Marine Regionalism in Northeast Asia: The Context

The Natural Environmental Setting[2]

The definition of the region to be covered by any regime is based in part on its natural characteristics. The characteristics of the semi-enclosed seas in Northeast Asia, specifically the Yellow and East China Seas and the Sea of Japan (East Sea), differ somewhat from each other. However, they have some obvious commonalities and linkages.

The following description of the natural characteristics of Northeast Asian seas illustrates the transnationality of living resources and pollutants. It underscores why the region's seas should be managed cooperatively as a unit.

The Sea of Japan

The Sea of Japan (East Sea)[3] is almost completely encircled by land. The general pattern of surface circulation indicates that pollutants, once deposited, and larval fish, once spawned, may be distributed throughout the Sea. In winter, pollutants deposited off the Russian and RO Korean coasts could be swept into DPR Korean waters. In summer, pollutants deposited off the DPR Korean coast could be transported into both Russian and RO Korean waters. Also, pollutants in the Tatar Strait could find their way into northern Japanese waters. Thus, for purposes of regime design, the Sea of Japan could be treated as a separate entity. Pollutants,

[2] Based from Morgan [1992].
[3] Based from Valencia [1989b].

however, can also be brought into the Sea from the East China Sea, through the Korean Strait, and from the north, through the Tsugaru and Soya Straits. All three straits also serve as passageway for fish migrating in and out of the Sea.

The most important current in the Western Pacific north of the equator is the Kuroshio, which brings warm tropical water to the northeast. It flows close to the south and southeast coasts of Japan before turning to the east at about 36°N. A large branch of the Kuroshio, the Tsushima Current, enters the Sea from the south. Its main flow runs north along the Japanese coast, but is highly variable seasonally and annually, sometimes being accompanied by large meanderings. This current sends a small branch to the north along the southeast coast of the Korean Peninsula. This small branch is called the East Korean Warm Current.

The Tsushima Current extends into the northern Sea and eventually diverts into a counterclockwise flow, moving south along the Russian coast where it rapidly mixes with cold coastal waters and becomes known as the cold Liman Current. This current runs farther west to the east coast of the Korean Peninsula, through Peter the Great Bay. Then, it finally changes direction towards the central part of the Sea, where fronts are formed with the northerly Tsushima Current. The Liman Current sends a small extension farther west along the northeastern coast of the Korean Peninsula, which is locally called the North Korean Cold Current, and forms a front with the northern fringe of the East Korean Warm Current.

Under the influence of the monsoonal wind system that is southerly in summer and northwesterly in winter, the surface currents reverse direction twice each year. In summer, the current is largely counter-clockwise. But in winter, when water exchange through the Korea Strait is at its minimum, other currents are present. These currents are the Tsushima Current off the western coast of the Japanese islands, the Primorye Current off Primorye, and the East Korean Current off the eastern coast of the Korean Peninsula.

The Sea is quite deep with a maximum depth of about 3,650 m. It has a comparatively large absorptive capacity for pollutants. The large Sea of Japan/East Sea Basin and the Japan Abyssal Plain lie north of 40°30'N. Other prominent features in the north include the Tartary Trough, several seamounts, including the huge Bogorov Seamount, and the ridges and troughs along the continental slope off the islands of Honshu and Hokkaido. Ridge and trough topography predominates south of 40°30'N and includes the Yamato Rise or Ridge, Korea Continental Borderland (also known as the Korea Plateau), Tsushima Basin, Yamato Basin, and the ridges and troughs along the continental slope of Honshu.

The hydrological regime of the Sea is unique. The bottom topography and the enclosed nature of the Sea facilitate the formation of its characteristic water masses. In general, there is a warmer section on the

Japanese side and a colder section on the Korean-Siberian side. Though somewhat isolated, the Sea is actively influenced by the Pacific Ocean. The water column is divided into two vertical zones: the surface (0–200 m) and the deep (below 200 m). The hydrological characteristics of the first vary in time and space, while the second is essentially homogeneous, both horizontally and vertically, throughout the year. Therefore, pollutants that sink below 200 m will stay there for a long period of time.

The polar front separates the cold and low saline waters of the northwestern Sea from the warm and high saline waters entering the Sea through the Korea Strait. The resultant vigorous mixing facilitates dilution and dispersion of pollutants. Due to strong northwesterly winds blowing from the continent, intensive upwelling develops from late October to early November near the southern shores of Primorye. Discrete instances of short-lived upwelling also occur from September to early October. In late November, cooling leads to forceful mixing and destruction of stratification in the northwestern Sea. This produces more uniform temperature distribution at the surface.

These oceanographic features determine the distribution of biota. On the northwest shelf and continental slope of the Sea, between Olga Bay and Zolotoi Cape, organic productivity is very high. Deep-water bottom fauna, represented by gastropods (snails), mollusks (scallops and mussels), crustaceans (shrimps), and polychaetes (sea worms) form immense aggregations, exceeding 1,000 gallons per m^2. Its rate of accumulation of organic matter in sediments is considerably higher compared to other Primorye shelf parts, due not only to the impact of the cold Primorye current and natural processes of sediment accumulation but also to the descending movement of water in the convergence zone. Pollutants at the surface could be rapidly transported to the depths and incorporated into the rich biomass.

During winter in shallow coastal areas, water temperature drops to the freezing point. The coldest and saltiest water sinks rapidly, especially in stormy weather. This water spreads over the bottom of the original site to greater depths, sometimes reaching the shelf edge and creeping along the continental slope. The main areas of water supply to the Basin lie in the coastal area from Cape Povorotny to Vladimir Bay and also in the central Peter the Great Bay and in Posyet Bay. Thus, pollutants deposited here may be rapidly transported at depth throughout the Sea. Primary production is especially high where the Tsushima Current and North Korean Cold Current mix.

High oxygen concentrations are present in the Sea and are a substantial contributing factor to its rich fisheries. The northeastern Sea can be divided ecologically into South Primorye, which covers the area from Posyet Bay to Cape Povorotny; Middle Primorye, which spans north from Cape Povorotny to Olga Bay; and North Primorye, the extreme northern Sea, including Tatar Strait and the southern part of Sakhalin Island. The interface between the meanders of the Tsushima Current with the cold Primorye Current is an impenetrable barrier for the organisms of the Middle and North Primorye ecotypes.

There are also distinct differences between southern and northern ecotypes. Mussels that form banks in the littoral of the Sea of Okhotsk create masses in the South Primorye ecotype at depths of 4–8 m. The mollusks in rocky areas of the southern region are substituted in the north by seaweeds. The most important limiting factors governing the distribution and normal development of bottom-dwelling sedentary organisms are pollution, heavy siltation, and extreme variations in temperature and salinity. When there are many storms and heavy swells, mussel larvae cannot settle and attach themselves to the substrate. For others, the limiting factor is mainly temperature and competitive stress from other organisms. For algae, it is salinity and competition.

Occasionally and as a result of the inflow of a strong Tsushima Current, some groups of tropical animals, such as sea snakes, marine turtles, fish, pelagic squids, and jelly fish, are transported as far as the Russian Far East. However, these organisms soon die without reproducing. Ribbon fish usually live in the deeper zone of the Western North Pacific. But after heavy winter storms, they are transported by the Tsushima Current and are left stranded on the west coast of Honshu. Similarly, many porcupine fish, sea snakes, marine turtles, giant squid, and even whales are stranded ashore from time to time [Honma and Kitani, 1981; Honma et al., 1983]. The deeper zone of the Sea is characterized by northern or boreal fish that enter the Sea while there was still open communication with the Pacific Ocean and the Sea of Okhotsk. At that time, these invaders had no natural enemies. Thus, the boreal fish easily accomplished species differentiation. Indeed, several fish are unique to the Sea of Japan.

East China Sea and Yellow Sea

Neither the East China Sea nor the Yellow Sea alone can be considered a single semi-enclosed sea [Valencia, 1987]. This is because the boundary between the two is quite arbitrarily set as a line running from north of the Yangtze River's mouth to Cheju Island. The two seas are, therefore, in open communication. Also, there is a partial opening to the Pacific Ocean to the east through the numerous straits between the Ryukyu Islands, as well as a *cul-de-sac* in the northern part, the Bohai Sea and Korea Bay.

The Yellow Sea covers an area of about 400,000 km^2 and at its maximum, spans about 1,000 km long by 700 km wide. It is very shallow, with an average depth of just 44 m and a maximum depth of about 100 m. The Bohai Sea has a mean depth of only 21 m and a maximum of

72 m. Clearly, Yellow Sea is unlike the Japan Sea or East Sea in that it lacks a long-term sink for pollutants. The seafloor slopes gently from the Chinese continent and more rapidly from the Korean Peninsula to a north-south trending seafloor valley, with its axis close to the Korean Peninsula. The dividing line between silt derived from China and sand derived from Korea nearly coincides with the seafloor valley. China argues that this natural dividing line should be the continental shelf boundary.

The East China Sea also has a broad continental shelf, with the depth of the shelf breaking at 150–166 m. However, depths increase rapidly to the east and reach a maximum of 2,717 m in the Okinawa Trough. The Sea annually receives more than 1.6 billion tons of sediments, most of them coming from the Yellow (or Huang He) and Yangtze Rivers, which have formed large deltas.

Winds over the Sea have distinct monsoonal characteristics. They determine the variations in the Sea's water properties. In winter, cold and dry winds are usually from the NNW and average about 8–9 m per second; in summer they are from the S-SSE and average about 5–6 m per second. Winter storms occur every 3–8 days and gale-strength winds usually prevail after the passage of a cold front. In summer, gale or stronger winds are associated with the passing of typhoons, which occur with a frequency of slightly less than 2 per year. Thus, any pollutants are rapidly mixed with seawater and diluted both horizontally and vertically.

Yellow Sea water is connected to the Bohai Sea in the north and to the East China Sea in the south, thus forming a continuous circulation system. The circulation in both winter and summer is counterclockwise, with the Yellow Sea Cold Current flowing southward along the Chinese coast and the Yellow Sea Warm Current flowing northward along the eastern side of the Yellow Sea basin. Close to shore on both sides of the northwest Yellow Sea, less saline coastal water flows alongshore with the coast to its right. In summer, the circulation is very slow; it is less than 0.12 knots at the most. There is an eastward current across the Cheju Strait; its speed is greater near Cheju Island in winter and becomes stronger in the middle of the Strait in summer. Off northern RO Korea, along the 36°N to be very specific, the current flows east to northeastward.

The major rivers discharging directly into the Yellow Sea include the Han, Datung, Yalu, Guang, and Sheyang. The Liao He, Hai He, and Yellow Rivers around the Bohai Sea have important effects on salinity in the western Yellow Sea, whereas the Yangtze River exerts strong influence on the hydrography of the southernmost part of the Sea. All rivers have peak runoff in summer and minimum discharge in winter. These rivers discharge considerable pollutants, which can be transported to adjacent countries' waters, particularly from China to the southern Korean Peninsula. For example, the Southern Liaoning Coastal Current in the north derives its freshwater from the Yalu River. And the Coastal Current to the south is more saline in summer than during the winter, in spite of higher runoffs in spring and winter. This is because river plumes in the Bohai Sea spread over the surface of the interior and are mixed with the offshore water. The autumn western coastal current in the south contains a significant amount of freshwater that is believed to have come from the Yangtze River. Indeed, the Winter Yellow Sea Cold Water, which is a mixture of the Warm Current and coastal waters, thrusts southeastward offshore just north of the Yangtze River mouth. It has a far-reaching influence on the hydrography of the northern East China Sea.

Tidal ranges along China's coast are much smaller than those along the coasts of DPR Korea and RO Korea. In China, they range from less than 1 m around the tip of the Shandong Peninsula to 3 m north of the Yangtze River's mouth. Tidal ranges along the Korean Peninsula are more than 8 m in northwestern RO Korea. Tidal currents on the western boundary are about 2 knots, except for stronger currents along the middle part of the Jiangsu coast. Along the eastern boundary, the tidal currents are usually greater than 3 knots and can be a hazard to navigation when approaching ports.

During the calm and warm weather months of late spring to early summer, the water column is well stratified and little bottom sediment is resuspended into the water column. During winter, however, the strong cold winds associated with Arctic outbreaks from the north, mix and homogenize the water column, thereby resuspending bottom sediment and resulting in considerable turbidity. The net southeasterly flow of water during these Arctic outbreaks means that sediment and any pollutants they may contain are pushed across the Yellow Sea. Warmer and saltier water occupies the central part of the basin.

Concentrations of dissolved oxygen and nutrients have similar seasonal variations. In summer, the concentrations of dissolved oxygen and nutrients are well stratified. The lower oxygen content in shallow water, or the surface layer, reflects the higher temperature there. On the other hand, the lower oxygen concentration in the bottom layer is due to oxidation of organic matter, as well as the lack of renewal. There is an oxygen maximum at and just below the thermocline. In winter, the concentrations of oxygen and nutrients are vertically homogeneous.

As compared with other shelf regions in the northwest Pacific, the Yellow Sea has a relatively low primary production, which is about 68 $gCm^{-2}yr^{-1}$. Primary production in the northern region is usually higher than that of the southern region. The lowest level is in the coastal waters of Jiangsu.

Biotic communities of the southeastern Yellow Sea are very complex in species composition, spatial distribution, and community structure. This could be due to the very complicated oceanographic conditions. The diversity and abundance of the fauna are comparatively low. Marked seasonal variations are characteristic of all the biotic communities. Turbidity and sediment type affect the distribution of planktonic and benthic organisms in coastal waters.

Warm temperate species in the Yellow Sea fauna are the major component of the biomass and account for more than 70 percent of the total abundance of resource populations. Meanwhile, warm water species and boreal species account for about 10 percent. Fish are the main living resource and 200 species are found. Of these, 45 percent are warm water forms, 46 percent warm temperate forms, and 9 percent cold temperate forms. The number of crustacean species is relatively small. It is only 54 and of this, warm water and boreal forms account for 65 and 35 percent, respectively. Because of the cold temperature, some warm water shrimps do not enter the northern Yellow Sea while some cold water shrimps are not found in the northern East China Sea.

There are only 14 species of cephalopods. Warm water forms and warm temperate forms account for 65 and 35 percent, respectively. There are no cold water species. Of the warm temperature species, *Sepia andreana* and *Euprymna morsei* are endemic to the Yellow Sea and do not appear in the East China Sea. About 11 mammal species are found. Except for four temperate species, namely minke whale, sperm whale, humpback whale, and finless porpoise, most are cold temperate forms. Examples include harbor seal, northern fur seal, stelles sea lion, fin whale, blue whale, right whale, and gray whale. Of these, fin whale and right whale migrate into the northern Yellow Sea to 39°N in winter and spring; and harbor seal migrate into the northern Bohai Sea in winter and spring for reproduction.

The habitats of resource populations in the Yellow Sea can be divided into two groups: nearshore and migratory. Indeed, like pollutants, the distribution of fishery resources is transnational. Nearshore species include skates, greenline, black snapper, scaled sardine, and spotted sardine. These species are mainly found in bays, estuaries, and around islands. But they also move to deeper waters during winter. The migratory species, such as small yellow croaker, hairtail, and Pacific herring, have distinct seasonal movements and some, like the chub mackerel, Spanish mackerel, and filefish, migrate out of the Yellow Sea to the East China Sea in winter. The distribution of these two groups often overlaps, especially in overwintering and spawning periods. When water temperatures begin to drop significantly in autumn, most resource populations migrate offshore, toward deeper and warmer waters, and concentrate mainly in the Yellow Sea depression. There are three overwintering areas, namely: the mid-Yellow Sea, which lies at 34–37°N and with depths of 60–80 m; the southern Yellow Sea, which lies at 32–34°N and has depths of about 80 m; and finally, the northern East China Sea. The deep-water areas of the central Yellow Sea and northern East China Sea are the overwintering grounds for most species that migrate over long ranges. Clearly, these areas must be protected from pollution and overfishing.

There are also several important concentrations of vulnerable resources in the Yellow and East China Seas [Morgan and Valencia, 1992b]. The Ryukyu archipelago in the East China Sea harbors whale calving grounds, turtle breeding areas, coral reefs, mangroves, protected areas, and marine mammals. There is also a remarkable concentration of turtle breeding areas, mangrove stands, coral reefs, and protected areas in the Sakashima Gunto. The Japanese island of Shikoku and its southern outlier have all these vulnerable resources, except for whale calving grounds, and in addition, harbor numerous aquaculture sites. The heavily used Korea Strait is a spawning ground for both demersal and pelagic fish, as well as whale calving areas. The island of Taiwan is enveloped by mangrove and coral reef sites, protected areas, and aquaculture sites. And the southwest coast of Korea also has many aquaculture sites and protected areas. These vulnerable resources would be priority areas for protection under a regional marine environmental protection regime.

Jurisdictional Claims and Disputes[4]

There is considerable diversity and overlap in maritime claims among the region's entities. Russia claims the entire group of maritime zones permitted by the 1982 UN Convention on the Law of the Sea. Its claim to territorial seas that are 12 nautical miles wide dates from 1921; a claim to the continental shelf in terms of the 1958 Convention on the Continental Shelf was made on 6 February 1968 and a 200-nautical-mile exclusive economic zone, or EEZ, was decreed on 1 March 1984. DPR Korea has not made a specific claim to the continental shelf but did claim territorial waters of 12 nautical miles and an EEZ of 200 nautical miles on 1 August 1977. A month before DPR Korea made its claims, Japan proclaimed territorial seas of 12 nautical miles wide except in some critical straits, and a fishing zone of 200 nautical miles. Japan has not made a formal claim to a continental shelf but has agreed to joint development with RO Korea for the shelf between them. RO Korea claimed territorial seas of 12 nautical miles on 30 April 1978, except in Korea Strait, and made a general claim to a continental shelf in a presidential proclamation dated 18 January 1952. In 1996, China, Japan, and RO Korea formally claimed overlapping 200 nautical miles of EEZs.

China claimed territorial waters spanning 12 nautical miles wide in a declaration dated 8 September 1958. There have also been announcements by the Ministry of Foreign Affairs concerning its continental shelf. On 15

[4] Based from Prescott [1992] and Dzurek [1992].

March 1973, after the *Glomar IV* had been drilling in areas authorized by RO Korea, China asserted that the seabed resources along the coast of China belonged to China. On 14 February 1974, China reserved all rights over the continental shelf extending from its coast, including that under the East China Sea. This release mentions the principle of natural prolongation for the first time. China has never published precise limits to its continental shelf, but appears to claim the entire shelf in the East China Sea up to the Okinawa Trough.

Taiwan extended its claim to a territorial sea to 12 nautical miles in September 1979 and at the same time claimed an EEZ of 200 nautical miles. Taiwan did not sign the Convention because it has no diplomatic relations with Jamaica, and the United Nations Credentials Committee would not accept the credentials of Taiwan's delegates.

In order to avoid confrontation and conflict, unilateral maritime claims in Northeast Asian seas were generally not explicit. But this also means little progress has been made in negotiating bilateral marine boundary agreements. Only 2 out of the 11 potential boundaries have been defined. Boundary agreements include the agreement between Japan and RO Korea, signed on 30 January 1974, which defined their continental shelf boundary for about 260 nautical miles through the Korea Strait and the western entrance to the Yellow Sea. More significantly, the agreement details the two countries' joint development of their overlapping continental shelves in the northern East China Sea. In January 1986, DPR Korea and Russia assigned an agreement on their common continental shelf and EEZ boundary.

Potential and actual disputes abound. For example, although DPR Korea announced an EEZ claim that extends only to the "half-line," the agreed boundary between DPR Korea and Russia apparently extends to the central portion of the Yamato Bank fishing ground and thus, would not be acceptable to Japan and RO Korea. Three potential boundaries are complicated by serious disputes over ownership of islands. These are Tok Do/Takeshima between RO Korea and Japan, the Diaoyutai/Senkaku Islands between China and Japan, and the Northern Territories/Southern Kuriles between Japan and Russia.

Despite the lack of precision in the definition of bilateral marine boundaries, friction has so far been minimal. Although maritime regimes governing activities in disputed areas are nonexistent, weak, or frequently ineffective, governments have avoided catastrophic situations by controlling the extent of their economic and technological activity. Countries generally seem to use marine areas that clearly belong to them and avoid zones where conflict could arise. The disputed areas are political frontiers. Furthermore, China, Japan, Taiwan, and RO Korea have avoided creating serious situations by generally limiting prospecting for oil and natural gas to nondisputed sections of the continental margin.

There are, however, important exceptions. They include exploration in the Japan and RO Korea joint development zone, which is opposed by China; Chinese and Japanese exploration in the East China Sea in areas claimed by both; and scientific research by both RO Korea and Japan in disputed areas of the Sea of Japan. Fisheries incidents in disputed areas are also too common and occasionally become violent.

The Political Context

Northeast Asia has long been a security complex [Buzan, 1991] involving Russia, China, Japan, and the United States. Here, bilateral and regional issues have global implications and vice versa. During the Cold War, international relations in the region were heavily influenced by the dynamics between the Soviet and the U.S. and were thus almost indistinguishable from the global system [Morrison, 1993]. With the end of the Cold War, however, the layering of conflict involving outside powers has peeled away to reveal an emerging Asia-Pacific system. The future central dynamic of this system is likely to depend on relations among the Northeast Asian countries themselves. In the past century, these relations have been characterized by cyclical patterns of amity and enmity, frequent tension between the strongest powers in the region, and resultant attempts to forge alliances with the lesser powers. Moreover, Northeast Asian countries have operated on the basis of "worst case" scenarios. The large powers were motivated by a fear of being isolated by the other powers; the lesser powers most feared a hegemonic alliance of the two strongest powers [Oksenberg, 1993]. Most intra-regional conflicts tend to be along the boundaries between the major powers — the Korean Peninsula, Taiwan, Manchuria, Mongolia, and Sakhalin, or the Kuriles. The seas between these powers were a dangerous frontier as well.

Because survival has ceased to be the prime concern of powerful states, their quest for relative gains has become less driven and consistent. Some argue that their behavior can now best be understood in the context of international institutions that both constrain states and make their actions more predictable [Keohane, 1990]. Most Northeast Asian governments are now more motivated toward maximizing wealth than control over territory and their increasing economic interdependence makes outright conflict too costly. With the development of political multipolarity and the abandonment of Stalinist economic models, economic relationships have begun to develop a more "natural" pattern. These economic relations have the tendency to concentrate in boundary areas where adjacent regions have obvious economic complementarities. These regions are the so-called "natural economic territories," or NETs [Scalapino, 1993], and they include southern China, the Yellow Sea Rim, the Tumen River area, and the Sea of Japan Rim.

The trans-Pacific economic axis which was very prominent during the Cold War, is being gradually modified by more multidirectional intra-Asian relationships [Morrison, 1993]. This multidirectional pattern implies a more diversified set of cooperative and conflictual economic relations in much of the North Pacific, creating a need for rules, codes of conduct, and harmonization of domestic practices affecting international transactions and, thus, regional institutions. Indeed, economic interaction across ideological and political boundaries is creating a "soft" regionalism in Northeast Asia. It is one which lacks organizational structure but which is accepted and even encouraged by governments [Scalapino, 1992]. This cross-border economic exchange and the emergence of NETs raise questions of jurisdiction and control. At the same time, these two encroach on national sovereignty. Nationalism is being rekindled and is competing with internationalism and regionalism in the formulation and implementation of national policies. The interplay between localism, nationalism, and internationalism will be a major theme of political relations in Northeast Asia for several decades to come.

Within this overall direction, some traditional concerns are likely to persist [Morrison, 1993]. China and the two Koreas worry about an independent, assertive, militarily resurgent Japan. Japan and RO Korea worry about a China that can combine economic development and political will not just to attain genuine military power but also to project it. Additionally, all Northeast Asian states wonder if, when, and how Russia will reemerge as a major power and what that will mean for them. The nature of Sino-Japanese relations remains a major question for the future of the region and has the potential of being the central axis not only of Northeast Asia but for the larger North Pacific or Asia-Pacific regions as well. Strategic cooperation, rather than conflict, between the two is critical to the future of Asia [Brzezinski, 1994]. These two powerful countries need to work out a new relationship with each other more or less by themselves, in a regional environment in which ideology and other powers are not major factors, for example. The eventual relationship between the two will likely be a product of the redefinition of their own roles in the region and the world at large.

A positive scenario is a China and Japan that have assumed positions of influence and responsibility in global affairs, whose economic systems interact in a mutually beneficial manner, and whose political and cultural values are not offensive to each other or to the rest of the world. In this positive scenario, China and Japan will also develop effective modes of governing their own countries and cooperating with each other on bilateral and regional issues, including ocean management.

In a negative scenario, China and Japan will remain insecure in their places in the world and in their relations with each other. Nationalism grows in both countries as a reaction to increased economic interaction and influence on each other and to outside pressures to change their systems. Nationalism in China is being used as a glue to hold its society together, while in Japan it may stem from economic malaise and sense of unfair treatment. As nationalism grows, so do military budgets and capabilities. The alliance between the U.S. and Japan increasingly fuels China's suspicions. Historical and transborder issues are politicized. Maritime frontiers, in particular, become dangerous "no man's land," and territorial disputes, such as the Senkakus/Diaoyutais, reemerge as "hotspots."

These scenarios are painted in rather stark fashion. The future of Sino-Japanese relations is likely to be characterized by elements of both cooperation and tension or conflict. The contrast, however, illustrates that this relationship can have strong positive or negative effects on the overall political environment and the development of regional regimes in Northeast Asia. Unfortunately, the negative scenario seems more applicable at present.

The Korean Peninsula has, for most of this century, remained a potential locus of rivalry among the North Pacific's large powers. But because of the normalization of relations of both Russia and China with RO Korea, DPR Korea no longer constitutes an impediment to most forms of regional political and economic relations among other countries. Pyongyang itself has extended tentative feelers towards greater regional economic cooperation, including its participation in the Tumen River Area Development Project, in international economic forums, and in environmental protection efforts, especially in the marine sphere [Valencia, 1994a].

Developing Regionalism

Northeast Asia and the North Pacific are almost unique for their lack of regional institutions. Buzan [1993] notes that Asia is remarkable for "its combination of several quite highly industrialized societies, with a regional international society so impoverished in its development that it compares poorly with even Africa and the Middle East." This impoverishment reflects the conflicts among the governments in the region, particularly the divided countries which create enormous problems of membership.

Although solutions to divided states and regional problems are primarily the responsibility of the parties immediately concerned, they cannot be resolved solely by those parties because external states are also involved, be it directly or indirectly [Scalapino, 1992]. Thus, solutions to Northeast Asian regional issues must be sought through a series of concentric arcs: the immediate parties, the vitally interested external nations, and the regional or international organizations that can exercise influence or provide assistance.

The end of the Cold War has not necessarily made the prospects for a stable regional order any brighter. Instead, the two major powers in the region, China and Japan, are suspected of aspiring to impose a post-American hegemonic stability in the region. Both, however, presently lack the "comprehensive power" capacity and status to do so [Funbashi et al., 1994]. The question, then, is whether Northeast Asian countries can embrace an institutional mechanism for regional stability.

The decline of Pax Americana is relevant to the study of maritime issues in Northeast Asia. Throughout the Cold War era, Northeast Asia achieved some stability as a product of American hegemony [Cumings, 1992]. With the end of the Cold War, that hegemonic stability is increasingly being called into question. At the same time, the dynamics of Northeast Asian regional political and economic competition calls for more concerted regional efforts to deal with the management of critical natural resources, particularly those shared by all the Northeast Asian nations, such as the marine environment and its living resources. The absence of an external hegemony in maritime management [Haggard and Simmons, 1987] satisfies an important condition for the application of multilateralism in a regional context. Because it may be extremely difficult to achieve multilateral cooperation for common security in Northeast Asia, an *a la carte* approach focusing on specific issues is more appropriate [Segal, 1991]. Thus, present political trends provide an unequaled opportunity to think boldly and to be innovative about solutions to problems of international relations, in general, and about maritime regime building in Northeast Asia, in particular.

Regionalism is also becoming more attractive to developing states. This is due to two reasons. The first is their growing political maturity. The second is the perceived potential of regionalism to promote their economic development and to mitigate their disadvantaged position in the international system [Taylor, 1990]. Some argue that multilateral norms and institutions can make significant contributions toward stabilizing the peaceful transformation of the international system and that they are likely to become increasingly important in the management of change at the regional level [Ruggie, 1993]. Indeed, we agree that transnational ocean resource issues and conflicts can be turned into opportunities to build confidence, dampen frontier tension, and improve relations in this region that is so critical to world peace and prosperity.

Already apparent is a gradual development of a thin net of regional institutions covering the region in the economic, environmental, and to a lesser degree but within a broader Asia-Pacific framework, the political arenas. The world and the Asia-Pacific region, in particular, are demonstrating a renewed interest in multilateralism [Ruggie, 1982]. Economically, the principal broad-gauged quasi-governmental institution is the Pacific Economic Cooperation Council (PECC), which grew out of a 1980 Conference in Canberra. The intergovernmental Asia-Pacific Economic Cooperation forum (APEC) followed in 1989 and consists of annual ministerial meetings and 10 working groups. The heads of government met in a leadership conference in conjunction with the APEC ministerial meeting in Seattle in November 1993 and have done so since [Baker, 1993a, 1993b; Far Eastern Economic Review, 1995]. PECC includes among its membership all the major North Pacific economies, with the exception of DPR Korea, which does not participate. APEC, on the other hand, does not include Russia.

In the security arena, the outstanding recent event has been the formation of the 18-member ASEAN Regional Forum (ARF) which was created to discuss Asia-Pacific region-wide security issues [Ching, 1994]. The ARF includes all the great powers of the North Pacific. RO Korea has tabled a proposal for a Northeast Asia Security Dialogue [Choon, 1994] within the ARF.

An informal or Track-Two approach has also emerged in the form of the Council for Security Cooperation in the Asia-Pacific (CSCAP). This is a multilateral, nongovernmental organization dedicated to promoting security dialogue in the Asia-Pacific region. This council supports, among others, multilateral approaches to regional conflicts and the creation of multilateral mechanisms to promote dialogue on effective governance. In this context, its working group on maritime security has been very active [Pac Net, 1994].

Indeed, the development of both formal and informal channels of communication has been a characteristic of Asia-Pacific cooperation, as well as an essential step in the process of institutionalization [Higgott, 1993; Aggarwal, 1993]. In this sense, the ASEAN approach to political understanding and cooperation may be quite relevant to Northeast Asia [Morrison, 1993]. Through ASEAN, habits of consultation and even a nascent feeling of regional identity were cultivated, increasing sensitivities within governmental elites to each other's interests and developing some norms for how to conduct their relations with each other. The ARF, supplemented by CSCAP and more frequent meetings of permanent officials, might build confidence in Northeast Asia for similar but separate arrangements.

These trends are important because what is most worrying about potential conflict in Northeast Asia is that it would take place in a region which has diversity and disputes that have never been ameliorated by multilateral cooperation and where security has always been defined by military might. A fundamental question for peace in the region may consequently revolve around the prospects for multilateralism. This may be especially so in the case of China, and to a lesser extent, DPR Korea. Clearly, China's power and influence will grow in the years ahead and this is itself a strong argument for involving China in emerging regional tasks and institutions. Undoubtedly, the first step toward the peaceful settlement of international conflicts is the creation of a sense of international community [Morgenthau and Thompson, 1985; Scalapino, 1994]. The creation of such a community presupposes at the very least the mitigation and minimization of conflict so that the interests and common needs shared by different nations outweigh the interests separating them. Common recognition that even a poor regime is better than none compels nations to collaborate to the extent of developing a minimally satisfying solution. A functional approach can help the growth of positive and constructive common work, habits, and interests. This decreases the significance of boundaries or conflicting claims by overlaying them with a natural growth of common activities and administrative agencies. The challenge for the region, then, is to find a variety of multilateral arrangements that will demonstrate that a habit of dialogue and working together can build common security. Tactical learning, in which the behavior of states towards cooperation is changed, must give way to complex learning, in which values and beliefs about reaching goals through cooperation are changed [Higgott, 1993].

Relevant Parties in Regional Regime Building

The principal relevant parties comprise four groups, namely: the national governments of littoral states; the national governments of outside states with particular maritime interests in the region; international agencies; and private companies. Although these actors are arguably the most important, others include provinces, ministry and agency bureaucracies, and increasingly, in Japan, Russia, and RO Korea, private interest groups or nongovernmental organizations (NGOs). The interests of these actors sometimes overlap, but are seldom identical and they frequently conflict.

For the Sea of Japan, the littoral states include DPR Korea, Japan, Russia, and RO Korea. For the East China Sea, the littoral states include China, Japan, DPR Korea, RO Korea, and the economic entity of Taiwan. Principal outside states with varying degrees of interest in the Sea of Japan region are China, Mongolia, and, in the realm of security, the United States. For the East China Sea, the circle widens beyond Mongolia and the United States to include principal commercial users of the sea lanes, such as Australia and ASEAN.

International agencies with marine relevance that have interests in the region include the Asian Development Bank with its investments in marine-related projects; the United Nations Environment Programme (UNEP), which has the Northwest Pacific Region Action Plan (NOWPAP, including China, DPR Korea, Japan, RO Korea, and Russia); the International Maritime Organization (IMO), which promotes treaties on safety at sea and prevention of ship-sourced pollution; the Intergovernmental Oceanographic Commission whose Subcommission for the Western Pacific (WESTPAC) includes the Northeast Asian Seas and its coastal countries in its coverage; and the fisheries programs of the Food and Agriculture Organization of the United Nations. In addition, there are several intergovernmental organizations whose terms of reference include Northeast Asian Seas. One is the North Pacific Marine Science Organization (PICES) which includes Canada, China, Japan, Russia, and the United States. Another is the Japan-East China Sea Surveys (JECSS) involving China, Japan, and RO Korea. Still another is the GEF Large Marine Ecosystem project focused on the Yellow Sea (YSLME). The Partnerships in Environmental Management for the Seas of East Asia (PEMSEA) plays an important role in capacity building and networking among key countries in the region. The fourth group comprises private companies such as shipping firms, oil companies, and banks, both within and outside the region.

Although the decisions of state-level actors are usually considered the principal factors in regional marine management and cooperation, this assumption is being eroded by recent and rapid changes in the political arena. Accepted perceptions of the operation of the political system itself are being challenged [Keohane and Nye, 1977], including the very ability of the traditional international structure of independent nations and states to respond to new global challenges. The growing influence of NGOs such as national interest groups or multinational corporations is receiving increased attention. In the past, industrial actors were seen largely as national organizations which affected only the policies of their local governments. Now, it is increasingly recognized that they are also independent "transnational" actors, often with interests in many states, who influence international decisionmaking and offer their "flag" states new forms of leverage on the policies of other countries.

Also emerging are new conceptions of old actors. The study of "transnational" relations has provided a new perspective of just what constitutes international politics. It is a perspective which has undermined the old concept of the state itself. With the diversification of actors and issues, various competing bureaucratic interests act across national boundaries, carrying on their business subnationally or "transgovernmentally," building foreign alliances in much the same way as the new nongovernmental actors. These new insights into the interactions of national and international actors are changing the concept of the nature of the international organization itself. Thus, international organizations can be viewed as clusters of intergovernmental and transgovernmental networks. Within these organizations, there is a continuous mixing of officials dealing with such a variety of issues that the function of the agency may be as much a place to activate potential coalitions as to engage in more formalized undertakings.

The Growing Prominence of Maritime Security Issues in Northeast Asian Multilateral Cooperation

Maritime issues are rising to the forefront of Northeast Asian security concerns [Ball, 1994]. The Convention on the Law of the Sea has introduced new uncertainties and conflict points into Asia, particularly in regard to EEZ and continental shelf claims and boundaries. Many emerging lines of communication, illegal fishing, and exploitation of others' offshore resources are essentially maritime in nature. Addressing issues like environmental protection, illegal activities at sea, and resource management necessitates acceptance of broader responsibilities and different priorities by military authorities, both for force structure development and their operations and training [McCafrie and Bateman, 1995]. These concerns, together with the requirements for defense self-reliance and force modernization, are reflected in the significant maritime dimension of the current arms acquisition programs in the region. A few examples are maritime surveillance and intelligence collection systems, multi-role fighter aircraft with maritime attack capabilities, modern surface combatants, submarines, anti-ship missiles, naval electronic warfare systems, and mine warfare capabilities. Unfortunately, some of these new capabilities tend to be more offensive, inflammatory, and, in conflict situations, prone to inadvertent escalation. It is increasingly recognized that regional mechanisms must be instituted to address these issues.

Within the security sphere, the growing acceptance of the notion of comprehensive security [Barnett, 1984; Lancaster and Gellman, 1994] is a positive development for maritime regime building. Comprehensive security implies that security should and can be achieved through a web of interdependence, including cooperation in economic development and scientific research and a general enhancement of human interactions. In this perspective, military might alone does not define security nor generate long-term peace. Indeed, the failure to comply with basic standards of good neighborliness, such as preventing or notifying neighbors about transnational pollution or carrying out transboundary environmental cleanup and impact assessments can cause significant tension. The concept of "comprehensive security" is gaining currency among policymakers in the Asian region.

A corollary of both comprehensive security and increasing interdependence is cooperative security. The concept of cooperative security holds that it is necessary to acknowledge the complex linkages between conventional and unconventional forms of security threats. Thus, focus is shifted to the creation of "habits of dialogue" and multilateral norms and instruments for building confidence, reducing threats, raising the cost and threshold of confrontation, and the peaceful resolution of disputes. Cooperative security is based on three main ideas, namely: *(1)* security with one's neighbors as opposed to security against them; *(2)* a broad interpretation of security threats to include, among others, environmental degradation and resource access; and *(3)* an emphasis on multilateral institutions and processes for managing regional issues and promoting habits of dialogue and cooperation [Acharya et al., 1995].

Asian specialists list the following maritime problem areas as requiring greater cooperation: piracy, smuggling, illegal immigration, transnational oil spills, incidents-at-sea, search and rescue, navigational safety, exchange of maritime information, illegal fishing, and management of resources in areas of overlapping claims [Hitchcock, 1994; Paik, 1994; Weeks, 1995; Meconis and Weeks, 1995].[5] These issues are all maritime safety problems of a civil, as opposed to a military nature. Proposals for maritime cooperation can be formulated not against a single adversary but rather to deal with common problems of crime, human depredation, pollution, and natural disaster. Progress on the harder issues may well depend on successful development of a softer, essentially civil, maritime safety regime. Certainly, successful cooperation in the marine realm can build the confidence necessary for initiatives in other spheres and for the jump from tactical to complex learning.

Arguably, the most significant of the current proposed maritime confidence and security building measures is the concept of regional oceans management [McCafrie and Bateman, 1995]. There has been considerable progress in this regard in the Pacific, particularly for environmental protection, in the form of the South Pacific Regional Environment Programme,[6] and fisheries, through the South Pacific Forum Fisheries Agency.[7] Although numerous organizations have been proposed or

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[5] For background and specific proposals for cooperation in a variety of maritime sectors, see Morgan and Valencia [1992a] and Valencia [1988, 1989a, 1990a, 1990b].

[6] Agreement establishing the South Pacific Regional Environment Programme (SPREP), Apia, Western Samoa, 1993, found at //sedac.ciesin.org/pidb/texts/acrc/SPEnviro.txt.html.

[7] South Pacific Forum Fisheries Agency Convention, Honiara, Solomon Islands, 1979, found at //sedac.ciesin.org/pidb/texts/acrc/SPFishAg.text.html.

established for this purpose in Southeast Asia, most progress in ocean management ends up being bilateral rather than multilateral.

Multilateral management of Northeast Asian seas, however, will be especially complicated. Although the littoral states share the same historical and cultural background, they differ in internal political systems, external economic alignments, and levels of economic development. Indeed, relations among the states bordering this marine region have been tenuous and even estranged. For the past half century, the political environment in the Northeast Asian region has inhibited multilateral ocean management programs. For Northeast Asia, the end of the Cold War, the extension of maritime jurisdiction, and the coming into force of the Law of the Sea Convention provided a narrow window of opportunity to forge a new order for regional seas before resurgent nationalism further complicates these issues.

The last few years have witnessed both significant positive and negative developments in maritime confidence and security building in Northeast Asia. There seem to be several common factors encouraging positive developments. New bilateral fisheries agreements, such as those between China and Japan in 1997, China and RO Korea in 1998, and a prior notification agreement signed between China and Japan in 2001 are clearly conflict-avoidance mechanisms. They were a result of a past practice of maritime conflict avoidance, the introduction of the EEZ regime, conflicting claims, an increasing frequency and intensity of incidents, and, above all, domestic political pressure in Japan and RO Korea. In sum, leaders considered the political relationships between China, Japan, and RO Korea too important to be undermined by the rising nationalism accompanying these disputes. These decisionmakers concluded that it was in these countries' common interest to compromise and reach at least interim solutions. On the negative side, however, a very confusing fisheries arrangement involving RO Korea, Japan, and Russia was allowed to fester much too long before cooler and wiser heads eventually prevailed. By not short-circuiting this seemingly innocuous fisheries dispute, more fundamental differences were allowed to surface. These included the question of sovereignty over the southern Kuriles and lingering suspicion and animosity left over from World War II.

The rise of piracy and the possibility of maritime terrorism have stimulated competition among outside powers to forge and lead regional arrangements. The Tokyo Declaration of December 2003 calls for enhancement of Japan's and ASEAN's cooperation in counter-terrorism, anti-piracy, and combating transnational crime.[8] The Regional Cooperation Agreement on Anti-Piracy in Asia was adopted in November 2004 by

[8] Tokyo Declaration for the Dynamic and Enduring Japan-ASEAN Partnership in the New Millennium, 11–12 December 2003.

ASEAN, Japan, China, RO Korea, and India, and is presently being implemented [UPI Intelligence Watch, 2005]. China hosted the first consultation meeting on regional maritime cooperation with ASEAN in 2005 [Jianhua, 2005].

The leadership of an outside maritime power, the United States, has also led to maritime cooperation in the war against terrorism. It is not clear, however, how long-lasting and robust this cooperation will be. Unilateral actions by the same leader have created concern regarding the role and rule of international law and what may be expected of cooperators. Moreover, there is growing concern regarding military and intelligence-gathering activities in the EEZs, such as U.S. reconnaissance flights around China and Chinese flights around Japan. China's increased intelligence activities around Japan may also be linked to U.S. leadership, such as the enhanced security alliance between the U.S. and Japan and the heightened suspicion this created in China. The DPR Korea spy boat incident in Japanese waters and the DPR Korea and RO Korea clash in the Yellow Sea stem from the unresolved situation on the Korean Peninsula. The use of force in these incidents was particularly alarming. Finally, the increased acquisition of maritime power and the festering disputes over islands and maritime space continue as an integral part of the security mosaic in Northeast Asia. Thus, the obstacles to maritime regime formation include diverse fundamental national interests and high politics. It is clear that where relations are poor and colonial era or Cold War disputes linger, as is evident in the relations between DPR Korea and RO Korea, China and Taiwan, and the Northern Territories and Southern Kuriles, maritime incidents can easily and rapidly escalate tension and even result in conflict. Track-Two dialogues have not made much of a direct contribution to maritime confidence building in Northeast Asia.

There are two obvious trends in the building of maritime confidence and security. One is positive and the other is negative. The positive trend is the construction of a diverse web of bilateral understandings and exchanges which can expand and have a spillover effect on relations in general. Given this network of arrangements, a multilateral agreement on a "code of conduct" for Northeast Asian seas would be a natural next step. Initially, multilateral arrangements should address common maritime problems like search and rescue, environmental protection, drug trafficking, and smuggling. Additionally, successful cooperation in ocean management could spill over into trust-building among coast guards and navies. Of relevance here is the U.S. proposal for a Maritime Domain Awareness System for the region which may be defined as "the effective understanding of anything associated with the maritime domain that could impact the security, safety, the economy or the environment." But to build a truly effective system, the cooperation of all Asian littoral countries is required [Johnson, 2005].

There are hidden constraints even in positive trends [East-West Center, 2001]. There is no single comprehensive institution or initiative and while the multiple parallel dialogues overlap in participants, objectives, and focus, some critical issues are neglected. Nevertheless, this structure of multiple communities, or communities within communities, seems to work because there are linkages between them [East-West Center, 2001]. However, existing navy-to-navy contacts and cooperation seem to be more tactical than strategic. Therefore, the convergence of proposals by China, RO Korea, and Russia for a multilateral security forum for Northeast Asia is very significant.

The positive trend is, nevertheless, overlain with a larger security dilemma. This dilemma is a pre-existing pattern of suspicion and distrust based on fundamental political and ideological differences which extend like sensitive tentacles into the maritime sphere. Therefore, the extension of jurisdiction and the nationalism that accompanies it, combined with enhanced armament and technology, have made the maritime frontier more dangerous for political relations. Moreover, two new ingredients must be considered. These are the U.S.-led war on terrorism and the potential confrontation with, or enhanced embargo of, DPR Korea. These developments will have a profound effect on maritime confidence building. These can enhance relations between allies or deepen the suspicions among the excluded or opposed. But these clouds will eventually pass, leaving the region with the deeper security construct and the conflicting trends in maritime confidence and security building that arise from it.

Problems and Inadequacies of Existing Marine Environmental Regimes

There is considerable redundancy of activities envisaged under the auspices of WESTPAC, UNDP/GEF, PICES, and NOWPAP. WESTPAC anticipates conducting training in the modeling of coastal circulation in order to predict and control accidental oil spills. It also developed a WESTPAC Action Plan as a followup to UNCED. Both activities appear similar to activities contemplated by NOWPAP. However, WESTPAC activities can also complement the strong national marine scientific and technological capabilities in Northeast Asian states. Moreover, WESTPAC's SEAWATCH program may be helpful in the implementation of NOWPAP. Work by Northeast Asian WESTPAC members, which include all five states that participate in NOWPAP, on continental shelf circulation, ocean dynamics, paleogeographic mapping, tectonics and coastal zones, and on MusselWatch and harmful algal blooms, focused on Northeast Asia rather than Southeast Asia, or is implemented on a western Pacific-wide basis without subregional focus. The objectives of the UNDP/GEF Program also seem to greatly overlap those of the NOWPAP and the Program also includes DPR Korea and China in its terms of reference. A mechanism may be needed to coordinate WESTPAC and UNDP/GEF activities with NOWPAP, similar to the Coordinating Body on the Seas of East Asia (COBSEA) operative in Southeast Asia.

Despite the numerous initiatives, it will clearly be far easier to implement environmental assessment, legislation, and institutional arrangements than a regional management and financial structure. The concept of the EEZ is not yet ingrained in the psyche of policymakers. Besides, the more obvious problems and the initial effects of new ones are most likely to arise in waters close to land. National attention is, therefore, concentrated on protecting the health of the coastal waters rather than the offshore, especially in enclosed and semi-enclosed seas. Moreover, countries generally resist involvement of other nations in their coastal waters, no matter how well intentioned these involvements may be. Despite efforts at national, regional and international levels, the current sectoral and mono-disciplinary approach to the multiple uses of marine and coastal resources will not provide an effective framework for achieving sustainability. Aside from physical and ecological degradation of the coastal and nearshore zones, and of course, nuclear waste dumping, pollution from land-based sources is at present the single most important threat to the Northeast Asian marine environment. It contributes some 70 percent of the pollution load of the oceans. Intensified human activities in the coastal zone there cannot be supported, more so if the marine environment is considered as an "infinite sink" or receptacle for wastes and an endless free supply of resources.

Prospects for improved transnational cooperation in resource development and use may, thus, depend upon better understanding of the causes and consequences of marine pollution in both coastal and open-sea areas. Indeed, increased knowledge is extremely important to the creation of regimes and accounts for the expansion and strengthening of marine pollution regimes worldwide [Boczek, 1986]. The most successful efforts to deal with marine environmental problems appear to have been carefully nurtured with simultaneous institution-building and scientific and treaty-drafting activities at the regional level. These activities, however, can come about only with strong and sustained littoral state support and state or international organizational leadership. Environmental consciousness in the region must be further raised, new institutional arrangements developed, and new economic theory applied, incorporating environmental benefits and pollution costs. Laws must be harmonized and cooperative monitoring achieved, particularly where future industrial development is concerned. Particular emphasis should be placed on ocean dumping, red tides, and the environmental hazards of nuclear power and dumped nuclear waste.

Another problem for true multilateral cooperation in marine environmental management is that Northeast Asian countries have fundamental differences in their approaches to regional cooperation in environmental protection [Taek-Whan, 1994]. China believes cooperation in Northeast Asia should focus on urgent issues, such as industrial pollution, soil erosion, desertification, decrease in agricultural output, marine pollution, and depletion of marine resources. China prefers an informal mechanism to facilitate: *(a)* periodic meetings and exchange of relevant information and personnel in environmental management, legislation, pollution control, data monitoring and collection, resource accounting, pricing policy and economic incentives; *(b)* joint research on hazardous waste, acid rain, and environmental management; *(c)* pilot projects on desulfurization in power plants and toxic and hazardous waste treatment facilities; *(d)* the prevention and control of lake eutrophication; and *(e)* the prevention of marine pollution. Further, it believes that the developed countries in the region and certain international institutions should contribute technical and financial assistance to projects in these issue areas.

This position may reflect in part the fact that China is more an exporter than importer of pollutants. Indeed, China considers transboundary environmental issues to be quite sensitive. It opposes joint research on monitoring of air pollution, ostensibly because WHO's Global Environmental Monitoring System (GEMS) initiative already has a program for that purpose. But it is also possible that the reason behind China's opposition is that it is a main exporter of air pollution. China also supports DPR Korea's participation in regional environmental programs and it is also possible that this could be because it may be exporting pollutants to China.

Regarding the establishment of a forum for regional environmental cooperation, Japan prefers to start with an exchange of information and knowledge and then to gradually move to policy-oriented dialogue on common environmental concerns. Japan supports the establishment of a central secretariat to organize meetings, publish a newsletter, and administer subcommittees which would handle concrete issues. The country, however, feels that the establishment of a framework for implementation of multilateral cooperation will take many years. It believes that discussions on a new institutional mechanism are premature and that it is preferable to implement joint programs. Japan has suggested four priority areas for programs, specifically: regional marine conservation, acid rain, air pollution, and water pollution.

Japan opposes a regional forum composed solely of officials of environmental agencies because it feels economic ministries must also be involved. Furthermore, Japan maintains that a regional environmental cooperative body should not become just another channel of assistance.

Rather, it should spawn concrete projects involving sharing of domestic experiences and monitoring of the regional state of the environment and transfrontier pollution. Moreover, such projects should not duplicate Japan's existing bilateral and multilateral assistance projects, including the existing UNEP Environmental Technology Centers in Osaka and Shiga.

Russia clearly requires financial assistance to protect its environment. It prefers ecosystem-based management and more practical and action-oriented cooperation programs. On the other hand, RO Korea emphasizes the necessity of regional cooperation for environmental protection. The country feels that such cooperation should include both technical projects preferred by China and environmental management projects, such as a joint survey of the state of the environment, that are preferred by Japan. In fact, RO Korea attempted to arbitrate between China and Japan by proposing a top priority project in energy and air pollution. RO Korea also supports a coordinating mechanism for environmental assessment and management which would channel financial assistance from UNDP and ADB and institute regional projects. RO Korean priorities include transboundary air pollution, marine pollution, capacity building, technical cooperation, and waste management. It is also concerned that the many initiatives on environmental cooperation in Northeast Asia be harmonized.

The most formal forum, the Senior Officials Meeting, has revealed the sharpest differences. China opposes a focus on transboundary air pollution; Japan opposes new institutionalization of cooperation and providing financial assistance to it. RO Korea supports both approaches. These disparate positions may be explained in part by the perceptions that China is more an exporter than an importer of marine pollutants. Japan is neither, except for oil that may be spilled from its tankers. RO Korea is perhaps more an importer than an exporter of pollutants. Russia certainly exports more marine pollutants and DPR Korea probably exports more than it receives. Therefore, at this stage, less formal forums appear more efficient because they do not produce highly binding mechanisms. Although inconsistencies and overlaps exist, different forums may actually play complementary and reinforcing roles and thus support a trend towards establishment of an efficient cooperative regional mechanism.

The Changing Situation and the Inadequacies of the Existing Fisheries Regimes

Although the Northeast Asian entities have undertaken unilateral and bilateral measures to regulate foreign fishing in their claimed waters [Valencia, 1990a], none of the regulatory regimes include all coastal or fishing nations. Indeed, there are vast areas that are not covered under any formal agreement and some areas where agreements appear to overlap. Accordingly, there is no forum wherein all Yellow Sea or East China Sea fishing nations can meet to discuss the distribution of catches. Moreover, discussion of Sea of Japan and Yellow Sea shared stocks must include DPR Korea. This situation constrains the sharing of scientific information. The bilateral agreements attempt to share catches of shared stocks. But the bilateral fisheries commissions established under the agreements generally do not publish their decisions or results of scientific deliberation for peer evaluation or general public information. Without information on the basis for decisions made, the necessity of and rationale for the regulations can neither be fully understood nor can their success be evaluated. This situation creates the possibility that competitive bidding could drive quota allocation, which could undermine stock management.

Despite some advantages, notably the lack of overt conflicts over fisheries due mainly to self-restraint, the present regime is fundamentally flawed. Few species can be managed by only one country. Although the stocks are often transboundary in distribution and affects two or more states, there is no corresponding multinational body to manage them. Additionally, the parties concerned often produce significantly different resource assessments. Japan is the fisheries hegemon, with a virtual monopoly of information. Even so, there remain significant knowledge gaps. One such example involves the stocks in the Seas of Japan and Okhotsk.

In theory, this system comprising an interlocking web of bilateral agreements dominated by one nation, Japan, could successfully manage the region's fisheries, particularly if hidden factors serve to make the regime more equitable. But the extension of jurisdiction by all the states in the region, the development of China's offshore fishing capability, the utilization of unconventional species, and the full or overexploitation of most stocks indicate a need for regime change. The fact that many species are overfished is itself indicative that the system is not working. It also underscores the need for multinational monitoring and regulation of this multispecies fishery, and ultimately, of fair allocation of the resource.

Prospects for Maritime Regime Formation

General Integrative and Non-integrative Factors

Now that all the coastal nations in Northeast Asia have formally extended their maritime jurisdictions to 200 nautical miles or more over resources and many activities, almost no marine area is left unclaimed and many areas are claimed by two and even more countries. Clearly, the countries bordering the Northeast Asian seas are trying to identify and pursue their national interests in the oceans. But many ocean resources and activities, such as fish and fishing, pollutants and environmental protection, sea lanes and shipping, and hydrocarbon-bearing basins and hydrocarbon exploration, are transnational in character. As nations gain sufficient understanding of the transnational and interdependent character of the ocean environment and the resources and activities that it harbors and sustains, cooperation will increasingly be recognized as not only desirable but necessary.

Another fundamental integrative factor is the 1982 United Nations Convention on the Law of the Sea. With its signing by 119 nations in December 1982 and its coming into force in November 1994, the venue for addressing issues of ocean law and policy moved from the global to the regional and bilateral level. Article 122 of the Convention defines an enclosed or semi-enclosed sea in two ways: geographically, on the basis of its narrow physical connections with nearby bodies of water; and legally, that it consists entirely of the territorial seas and EEZs of two or more countries. All Northeast Asian seas, namely the Sea of Japan, the East China Sea, and the Yellow Sea, are semi-enclosed seas. The importance of semi-enclosed seas in the management of marine regions is emphasized in Article 123 of the Convention, which states that:

> *"States bordering an enclosed or semi-enclosed sea should cooperate with each other in the exercise of their rights and in the performance of their duties under this convention. To this end they shall endeavor, directly or through an appropriate regional organization:*
> *(a) to coordinate the management, conservation, exploration, and exploitation of the living resources of the sea;*
> *(b) to coordinate the implementation of their rights and duties with respect to the protection and preservation of the marine environment;*
> *(c) to coordinate their scientific research policies and undertake, where appropriate, joint programs of scientific research in the area; and*
> *(d) to invite, as appropriate, other interested states or international organizations to cooperate with them in furtherance of the provisions of this article."*

The Convention provides the international legal framework within which regional problems should be solved. The fact that all Northeast Asian States except DPR Korea have ratified the convention legitimizes regional cooperation in marine matters and puts pressure on DPR Korea and Taiwan to abide by the Convention's provisions.

A third fundamental integrative factor may be the United States' presence in Northeast Asia. The United States maintains that it will remain engaged as an active player in the economic, security, and political affairs of the Asian region. Indeed, America's interests compel any administration in Washington to help shape the emerging Pacific Community [Solomon, 1994]. The United States has significant influence in the region and its encouragement and support of regional cooperative efforts may enhance the likelihood of their taking root there and growing in degree and kind. The political environment thus created could have positive implications for marine regionalism there.

But regional cooperation is more easily stated as a goal rather than implemented. A major impediment to regional maritime cooperation is a conceptual dichotomy inherent in the Law of the Sea Convention. On the one hand, the treaty enjoins its ratifiers to cooperate in managing semi-enclosed seas. On the other hand, Article 56 gives the coastal state:

> "(1) *sovereign rights over the natural resources, whether living or nonliving, and over other activities for the economic exploitation of the zone; and*
>
> (2) *jurisdiction as to the establishment and use of artificial islands and other structures and installations, marine scientific research, the preservation of the marine environment, and other rights and duties provided at the Convention.*"

Because most, if not all, of the waters of Northeast Asian seas have been partitioned into the territorial seas and EEZs of the littoral states, the provisions of Article 56 represent a serious obstacle to regional cooperation unless and until the littoral states agree to yield some of their newly won rights to a regional body.

Moreover, the relationship between perceptual regions in the ocean and physically defined regions may be complex and confusing. Some issues to which regional action is addressed or for which it is contemplated may not be confined to a semi-enclosed sea or other clearly distinguishable area [Alexander, 1981]. Indeed, decisionmakers may perceive policy problems within a regional context but throughout an area considerably at variance with physically defined geographic units. Thus, a marine region may be differentiated from other areas on the basis of coastal configuration, such as a semi-enclosed sea, but a marine region may also be identified as a "management region," where a well-defined management problem exists and may be handled as a discrete issue. Third would be an "institutional" region where one or more formal arrangements exist, namely, that area defined by the limits of competence of a regional environment protection effort. The limits of an "institutional" region should have some correspondence with the limits of the "management region" within which exists the problem the institution is designed to address. The ideal is where the management and institutional regions correspond with the physical region. This is often the case in semi-enclosed seas.

A semi-enclosed sea like the Sea of Japan or the Yellow Sea can be considered an "international management region," that is, a natural system or managerial unit which is not subject to the effective management of one state. Here, artificial divisions or boundaries are overlain on trans-national natural systems. The outer boundaries of such regions are defined by the boundaries of natural systems and the actual or potential extent of jurisdictional claims [Young, 1977]. Although some natural systems may extend well beyond jurisdictional claims, legal and political realities argue for cooperation limited to the jurisdiction of the cooperating states. Regional arrangements are thus a supplement but not a substitute for global administrative or managerial systems. Political differences may inhibit the specific definition of the boundaries of a region, particularly if one or more parties refuse or are unable to participate in a regional regime. Fortunately, it is usually not necessary to achieve precision on the outer boundaries of a region in order to initiate cooperation. Ambiguous formulations allowing for differing interpretations can be used to overcome disputes over matters of central principle [Armstrong, 1992]. Agreement on a core area is usually sufficient, and the geographic scope of specific arrange-ments can then evolve on the basis of experience and ad hoc negotiations.

The mobility of water, fish, pollutants, and ships is a fundamental rationale for regional action within semi-enclosed regional seas [Alexander, 1981]. Regional action can also be an asset, if not a necessity, in acquiring and interpreting data about the physical nature of the marine environment within a given area. Synchronic surveys of ocean or atmospheric conditions may be necessary to obtain a holistic understanding of natural marine phenomena, such as water mass formation and flow. Economic incentives for regional action may include joint contributions by countries of a region to projects of high cost or to those ventures that demand a high degree of technical skill or efficiency. Regional cooperation can also be an asset in establishing rules and regulations, particularly against extra-regional actors, such as foreign tankers which transit an international management region. A united stand by three or more countries is more difficult for outside shipping and other interests to assail compared to a unilateral promulgation of regulations by a single state. Finally, there can be a confidence-building spinoff from regional or subregional action in marine activities to cooperative activities in economic and security spheres.

Useful Lessons and Their Applicability to Northeast Asia

Reasonably successful and comprehensive multilateral regimes have been created for the Baltic,[9] the North,[10] and the Mediterranean[11] Seas, and the South Pacific Ocean. Attempts at functional marine regionalism have been made in the South China Sea [Djalal, 2001] and the Indian Ocean [Jayewardene, 2001]. From these and other examples, it is possible to deduce some general factors that favor or retard multilateral maritime regime formation. These factors may be applicable in Northeast Asia.

First of all, the parties must share norms of behavior [Miles, 2000]. This is important because norm-guided behavior is the minimum requirement for regime existence [List and Rithberger, 1998]. Furthermore, norms affect the values placed by participants on actions and strategies regardless of their consequences. They also affect perceptions of policy options, including the tendency to take advantage of opportunities. Clearly, member countries must perceive that the benefits of participation in a cooperative arrangement outweigh costs. Benefit and cost considerations include direct benefits, such as better use of marine resources, as well as indirect benefits, such as the advancement of a state's aspirations for regional leadership. In the initial stages of cooperation, costs should be kept as low as possible.

Also relevant in benefit and cost considerations are the objectives and functions of the arrangement. Multiple-use regimes have found it difficult to overcome the frequently contrary factors that create their need [Juda and Burroughs, 1990]. Multiple-use approaches lack a vigorous political constituency because these usually form around a single use. By their very nature, multiple-use regimes partition opportunity among interest groups and thus create a more complex political milieu. They must also overcome segmented entrenched interests, which are comfortable with single use regimes. These interests include agencies within governments, which tend to resent allocation of funds, personnel, and authority to international endeavors.

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[9] For background, analysis, and proposals for cooperation in the Baltic Sea, see Ijlstra [1992]; Kullenberg [1986]; Dybern and Fonselius [1986]; ICES [1986]; Pedersen [1982]; and Voipio [1981].

[10] For background, analysis, and proposals for cooperation in the North Sea, see Andresen and Flostad [1988]; Carison [1979]; Peet [1986]; Smith et al. [1984]; Smith and Lalawani [1984]; Young and Fricke [1975]; Andresen [1989]; and Andresen [1995].

[11] For background, analysis, and proposals for cooperation in the Mediterranean Sea, see Boxer [1978]; Chircop [1992]; Ginsburg et al. [1974]; Vallega [1988]; Holt [1974]; UNEP [1978]; UNEP [1980]; Protocol for the Protection of Mediterranean Sea Against Pollution from Land-based Sources [1982]; MARPOL 73/78: The International Convention Concerning Pollution and the Mediterranean [1986]; and UNEP [1985].

It appears, then, that sector-specific approaches have a greater chance of success than some supranational or multipurpose system that seeks to perform a multitude of functions within the framework of a single authority. This conclusion is a political reality despite the logic and apparent need in some areas for an integrated management system. A corollary is that success is encouraged by the recognition and promotion of subregional efforts rather by an overemphasis on comprehensive regionalization. To minimize controversy and politicization in cooperative efforts, perhaps priority should be placed on innocuous sectors and combined with decentralized decisionmaking authority.

Positive perceptions of cooperation are also necessary for successful regional efforts. Clearly, public and private institutions must establish regional links. There should also be a regional goal and a cadre of powerful persons committed to the regional concepts. For example, ASEAN countries have consistently opposed a formal treaty on environmental protection as being too rigid and potentially divisive. And the Northeast Asian countries are clearly divided on this issue. In order to maintain momentum, expectations of progress must be reasonable but they must be satisfied. Conversely, if no progress is made within a reasonable time, the movement toward cooperation is weakened. It is also possible that its objectives will be altered.

Several UNEP Regional Seas Programmes were only initiated after scientific revelations of regional pollution or a well-publicized environmental disaster. This is because governments tend to be forced into action only when significant political constituencies insist upon it. In Europe, the transition in relevant knowledge, perceptions, and values as they relate to the world's oceans produced a groundswell. The present generation views ocean space differently from previous generations. Although ocean ecosystems will probably never be completely understood, their complicated nature is slowly being revealed. Europeans are becoming increasingly aware of their capacity to damage the ocean environment, with both immediate and long-term practical effects readily understandable to those without training in ocean science. For example, the loss of income to businesses dependent upon beachgoers and the loss of the opportunity to bathe in the ocean during a hot summer owing to the presence of assorted waste products in coastal waters generate enormous pressures on policymakers to "do something."

The prerequisites, however, of an effective public policy debate, such as clear statements of risk and the identification of costs and benefits, do not mesh well with the slowness, deliberateness, and uncertainty of the scientific process [Bryner, 1995]. In Northeast Asia, there is a general disconnect between public concern and policymakers. In most countries of the region, there is little or no public policy debate.

Disagreements stemming from uncertainty can be overcome by agreement on the precautionary principle, that is, agreeing to take action even when cause and effect are only suspected rather than proven. Indeed, as pollution increases and becomes a publicly perceived problem, ocean management moves closer to center stage as a significant public policy concern meriting attention. The combination of a thorough planning process, public pressure, and high-level political conferences were key factors in the formation of maritime regimes in Europe. These perceptions and processes are not strong or widespread in Northeast Asia. Clearly, regime formation is fundamentally dependent on who the participants are; changing perceptions of benefits and costs of a regime; and the level, quality, and types of information available [Miles, 2000].

There are both obvious and subtle reasons why regimes do not form. These include limited management authority, a lack of effective enforcement power, disagreement among member states, shortage of funds, and shortage of trained personnel or equipment. More subtle problems can include limited information (or the ability to use it), jurisdictional limitations, differing time horizons, and “freedom” costs [Juda and Burroughs, 1990]. All of these constraints are present in Northeast Asia.

Lack of information regarding scientific knowledge relevant to effective ocean management can cause disagreements between governments and inhibit the generation of sound national and international policy. Boundary disputes or uncertainties retard the implementation of jurisdictional control, without which cooperation is made more difficult. Furthermore, existing jurisdiction may not encompass the entire ecosystem so that some critical elements requiring management are beyond state control. Ironically, although segmented or sectoral approaches to cooperative ocean management are much more likely to gain the political support necessary to progress, they may ultimately be unsuccessful in resolving the problem at hand, particularly if conflicting uses and users are involved. These constraints are especially evident in Northeast Asia.

There is obviously a time gap between the average length in political office of ministers and the tens of years required to implement and sustain successful regimes. Yet policymakers need to show results in the short term. This dilemma favors multiple short-term programs which may be insufficient for the achievement of long-term results. This is a constraint in Northeast Asian countries like Japan, RO Korea, and Russia where there are very frequent changes in relevant officials and their tenure is short and uncertain.

“Freedom” costs at both the individual and state levels may ultimately block successful regime initiation as well. Individuals and states will have to surrender their absolute “freedom of the sea,” that is, their absolute rights to use the ocean environment at any time, for any purpose and without regard for the interest and well-being of anyone else. Such freedoms will be surrendered with considerable reluctance in the absence of anything less than a clear, overwhelming, and immediate need. In Europe, formal sovereignty was perceived to be different from operational sovereignty, or the legal freedom of action. The latter was eroded in the interest of effective collective action. Indeed, environmental interdependence and related international negotiations reinforced formal sovereignty while resulting in the self-limitation of operational sovereignty [Keohane et al., 1993]. Traditional and rigid concepts of sovereignty in Northeast Asia may prevent regime formation there.

Regime Initiation

Informal initiatives or Track-Two diplomacy can be very useful in inducing formal cooperation and intergovernmental statements, albeit in other forums. For example, the principles of cooperation developed by the South China Sea Workshop in 1991 were the basis for a more formal ASEAN Declaration on the South China Sea in 1992, which ultimately led to the November 2002 ASEAN-China Declaration on the Conduct of Parties in the South China Sea.

The advantages of such Track-Two initiatives are many, specifically:

- they are usually coordinated by organizers who are more or less free of political influence by governments;
- they offer a forum for government officials and policymakers of different countries to meet one another, as well as academic and scientific experts, and sometimes private sector representatives; the same forum could be used to discuss current issues in an informal and congenial setting, supposedly free from the constraints of official protocol;
- they offer officials an “off-the-record” (“back-channel”) opportunity to meet privately with counterparts to discuss bilateral issues that are proving difficult to resolve through formal intergovernmental diplomacy;
- they create incentives and provide the means for specialists to form a constructive and mutually beneficial relationship with officials of their own and neighboring countries, and to access information that may not otherwise be available;
- they enable representatives of the least developed countries within a region to participate in international meetings and consultations that they could not otherwise afford to attend; and

- they contribute to the establishment, maintenance, or upgrading of publishable academic or technical literature in regions deficient in high-quality research facilities.

Track-Two initiatives, however, also have a number of disadvantages, namely:

- they tend to be perceived either as too "academic" or as potentially critical of current political processes;
- their practical influence on policy depends on the willingness and ability of the participating officials to take a leading and dynamic role;
- they are usually taken within the framework of a medium-term project whose funding is subject to a number of conditions, budgetary constraints, deadlines, and other administrative requirements imposed by the funding source that affect the scale, tempo, style, and flexibility of the operation; and
- if the organizers assume a public information, public participation, or public advocacy role, they risk alienating policymakers and thereby losing contact with their bureaucratic participants who are the link with officialdom.

The most successful approach seems to be subregional and dual track. For example, while the Track-Two forum serves as a catalyst, the Track-One level attempts to form an intergovernmental mechanism, or a regime. The birth of the Mediterranean Action Plan (MAP) was possible not only because of political will at the Track-One level but also because of the Track-Two groundwork that preceded it. Indeed, the preliminary scientific groundwork enabled a convergence of perceptions of the problems and fostered a common interest in addressing them at the political level.

In launching such informal initiatives, the process should have the following characteristics:

- Inclusive — This means that any directly interested countries or parties are included.
- Sensitive — This requires starting with less sensitive issues which participants are comfortable discussing without fearing the disapproval of their respective governments or authorities.
- With senior participation — The participants should be senior or rising personalities in their respective governments.
- Flexible — It is important not to prematurely institutionalize the structure of the process by, for example, creating a permanent mechanism over the objections of any participant.
- Ad hoc and incremental — The process should be ad hoc and step by step while taking into account cost-effectiveness. It is important

to begin with a manageable subregion like the North Sea or the Gulf of Thailand and expand to peripheral areas like the North-East Atlantic or the South China Sea.

- **Gradually broadening and deepening** — Regime participation should begin with those states which are most heavily affected, contribute most to the problem, and have the largest capacity to deal with it. The cooperation should slowly be broadened and deepened while promoting benefits for the regional states.
- **Patient** — Managing potential conflicts is a long-term affair in which the lack of immediate concrete results should not be cause for despair and frustration.

Leadership

The roles of the initiator, the convenor, and the sponsor of the process are critical. The ideal is a person from the region who is perceived as neutral and whose country is not directly involved in any territorial or sovereignty disputes. The initiator and the convenor, often the same person, must have patience, dedication, tenacity, and sufficient knowledge of the delicate issues involved. At the same time, the convenor must be able to maintain the respect and the continued support and cooperation of all participants to keep the process moving forward. The roles of initiator and convenor are clearly very delicate and require extremely skilled diplomats.

In the Mediterranean example, UN agencies provided the necessary leadership to a region that was ready to accept it. Both the General Fisheries Commission for the Mediterranean (GFCM) at the beginning, and UNEP eventually, were highly respected by regional states and other supporting international organizations. It appears to be essential for the lead organization to coordinate closely with other organizations and to be responsive to the collective regional will. Because of their multilateral and nonpartisan character, UN agencies have the merit of enabling states in conflict to sit at the same table.

Regime Evolution

Positive regime evolution can be enhanced by an increase in problem-solving capacity and a dual strategic approach, that is, a combined "soft" political and "hard" legal approach. Also contributing to positive evolution are the level of maturity of the regime, contextual factors such as public opinion, and a membership comprised of fairly equal and fairly wealthy nations. Another important positive factor is a combination of a high level political component and strong state and individual leadership, together with a more low key commission approach. Compliance should be elicited through a judicious application of mild pressure, convincing arguments, and exposure, as well as through elaborate reporting procedures. The regime should be highly transparent and include various subnational actors. A strong knowledge base and external shocks help increase public awareness, which in turn spurs the regime forward.

Building effective regimes takes time. There are various stages of regime formation and development. Although a regime may initially, and for some time, be a "travel and talk club," it may still become highly effective eventually. Also, what may be very important in initiating regimes may not be so important during the implementation stage. For example, building a solid knowledge base and the role of epistemic communities and entrepreneurial leadership may be particularly important in the initial phase. But over time, the significance of such factors tends to diminish.

Effectiveness in a narrow sense may not be a full and fair measure of a regime. For example, although the Mediterranean Sea is not cleaner today than it was 25 years ago and objectives and standards of MAP have frequently not been met or postponed, the process of cooperation has attained value per se. The existing regime provides principal and subsidiary forums in which regional states can address common issues with discrete negotiations. Regime members continue to be active and to periodically renew vows of regional solidarity, stake claims to benefits generated, commit resources, and more recently, allow more participation of civil society, both regionally and domestically.

Structure

Powerful national focal points

National focal points must be powerful and not sectoral or marginalized. Unless regime participation is at the highest level of decisionmaking or the responsibility of powerful cross-sectoral agencies such as economic planning, participation will be perceived as weak. So will the regime.

Challenge of integration

The true integrated approach has an inevitable and troublesome byproduct. This byproduct is complexity, which increases as knowledge grows. This may lead to difficult decisions on "boundaries" in an otherwise unwieldy management process. Ecosystem-based integrated coastal area management requires a reexamination of regime boundaries and participation, including extra-regional participation.

Regime financing

To reinforce ownership and accountability, regime-building costs and core costs should be perceived to be borne equitably by regime participants. The UN Scale of Assessments, which was developed on a global scale, might not be equitable at a regional level, where there are fewer state actors. Also, if the majority of contributions come from only a few states, these states are likely to have the primary influence on regime development.

Regime control

It is essential that regional states perceive ownership of their regime in their region and extra-regional or international organization support as facilitative only. Thus, the central decisionmaking process in a regional regime concerned with environment and development must be controlled by a forum of regional states, although the process may have a broad range of input from intergovernmental and nongovernmental organizations that can influence the decision.

Outside aid

Outside assistance to regimes often has subtle or not-so-subtle side effects. In the South Pacific, for example, the fact that many countries in the region are dependent on outside aid makes them less able to criticize the activities of the countries that assist them financially, such as Japan. For example, to appease the nuclear powers, the South Pacific Nuclear Free Zone Treaty permits nuclear-powered vessels and ships carrying nuclear weapons to go through the Treaty waters without restrictions.

Regime Functions

Treaty-making

A formal treaty is often the stated or unstated goal of a regime. But treaty-making is a slow process that may delay regime building and give the impression of inefficiency. The process of convening groups of experts to conduct preparatory work, negotiate, and adopt a treaty in a diplomatic forum; securing the necessary number of ratifications to bring it into force; and implementing it can take many years. Moreover, there is always the danger, as was the case in the Mediterranean, of different states adhering to different legal regimes regarding the same issue. There is no question that a legal framework to govern expectations in a multilateral context has great long-term value. But a regime must first assist member states in anticipating formal commitments through a gradual process of preparation and capacity building.

Regime accountability

Accountability through reporting can be crucial to regime adherence. For example, under the Mediterranean Action Plan Phase I, there was a generic national reporting requirement in the unamended Barcelona Convention. This was tightened and elaborated in the Amended Barcelona Convention. The legal obligation to report on national implementation action in the biennium has certainly promoted accountability vis-à-vis other regime participants, including civil society.

Public information and participation

A regime that does not provide for public participation at regional and national levels risks remaining a "travel and talk" club with little accountability or effectiveness. Civil society participation has an important multiplier effect in broadening the popular support base. Commitment to public participation is important for increasing support for the regime, especially as it becomes more ambitious.

Knowledge building

Knowledge-building activities are at the heart of the regime. They serve to encourage participation, develop common conceptions and perceptions, and ultimately steer the regime. These activities give a regime a dynamic quality and are critical for the setting of standards and timelines.

Capacity building

In a regime where there are great disparities in critical knowledge and skill, capacity building is as important as effective communication in problem solving. The ability to convert common intent into effective concerted action requires a reasonably similar capacity level. The principle of common but differentiated responsibilities should be accepted only with the understanding that capacity to undertake regime commitments must be built by assistance from states within the regime.

Process

For the process of formation to be successful, the political environment must be supportive. A delicate balance must be struck between "stronger" and "weaker" countries. If more powerful countries dominate less powerful countries, the latter may not participate. But if weaker countries are "uncooperative," a powerful country can kill an initiative by simply being unsupportive because this sends a negative signal to other participants and potential donors. Wherever and whenever possible and practicable, major external powers should support the development of a constructive atmosphere in the region for peace, stability, and progress. The interests of powerful nonregional countries should be taken into account and their potential contribution to conflict avoidance should not be ignored. However, if a major regional power objects to their involvement, they should be perceived as outside supporters of the dialogue, not as participants or decisionmakers.

Moreover, the countries in a region must share basic values and political concepts. For example, a sense of "community" must develop among the participants. And there must be a gradual progression in the region from the concept of national resilience and absolute sovereignty to the concept of regional resilience, regional cohesion, and regional identity. For example, the Pacific Island communities have a natural cultural affinity and generally enjoy working and coordinating policies with each other.[12]

More pragmatically, countries in the region must be willing to develop concrete cooperative efforts and programs or projects so that the potential conflicts can be managed by converting them to actual cooperation. Additionally, countries must be willing to support various forums for dialogue in cooperation, be this bilateral or multilateral, formal or informal. These dialogues should aim initially at producing an agreed code of conduct for the region. Linkages and networking among academics, experts, and think-tanks are important particularly in the preliminary and initial stages, as are linkages between and among various regional and sub-regional initiatives. Discussion by Track-Two forums can be helpful in encouraging Track-One activities to be more responsive and imaginative in dealing with potential conflict. Moreover, previous state experience in attempts at conflict resolution should be utilized. For example, in taking the initiative in the South China Sea, Indonesia's effort benefited from ASEAN's experience in attempting to manage the conflicts in Indo-China, particularly in Cambodia, and by its own experience in managing and seeking a solution to the conflicts in southern Philippines.

Countries should also be willing to explore third party mechanisms for dispute settlement and if appropriate, utilize them, including good offices, mediation, arbitration, and adjudication by the International Court of Justice or the Law of the Sea Tribunal. Additionally, countries should, wherever and whenever possible, attempt to settle their land, maritime, and jurisdictional boundaries though negotiations and respect the agreed boundaries. For some disputed areas, the application of the joint development concept can build trust and confidence.

Finally and most importantly, for a regime to be sustained, it must yield benefits that could not otherwise be obtained. For example, Pacific

[12] The Pacific Islands have not, however, made any governmental moves to create a regional human rights organization. See Van Dyke [1989].

islanders have created functioning regional organizations that have played important roles in allowing the small islands to speak with a more uniform and louder voice when negotiating with larger powers. The Forum Fishing Agency has been particularly effective in that regard.

Applicability of Lessons Learned

There are some general lessons that may be drawn from the foregoing and applied elsewhere, including in Northeast Asia.

Contributing Factors to Regime Formation

Contributing factors to maritime regime formation include:

- preexisting habits of cooperation and institutional development, whether in the same sector or more generally, including the presence of relevant functioning institution;
- national and regional leadership;
- clearly defined benefits to be gained through regional cooperation, which may be based on the presence of significant management challenges that have clear regional dimensions;
- the need for capacity building, whether at the national level or through regional sharing of management capabilities;
- the presence of external threats, such as distant water or a dominant fishing nation, that may consolidate the regional position and which may require a united front for an effective response;
- intra-regional maritime disputes which threaten security generally and which motivate formation of a regime for conflict avoidance or dispute resolution;
- the existence of significant transnational networks of scientific communities or other communities that can provide both information on management issues and the stimulus for action;
- public awareness and concern with a given issue or range of issues;
- similar levels of economic development and capacity to fund the regime;
- a regional perception of participation of extra-regional states as beneficial or at least a move that will not be opposed by major regional leaders; and
- informal arrangements and institutional approaches that avoid the pitfalls of formal ratification.

Caveats and Choices

The choice of management unit is critical but usually unclear. From an ecological perspective, the effort should include all states which border or impact a large marine ecosystem (LME) or the geopolitical marine ecosystem, which also includes states in the hinterland that drains into the semi-enclosed sea. But political reality and efficiency often dictate a more limited scope and membership. In fact, the world community concept of integrated ocean management has become so complex and sophisticated[13] — much more so than during the UNCLOS III era — that the national level of management is inadequate, at least for developing countries. But the regional or macro-regional level introduces too many additional complications and unsustainable costs. So, by default, the best unit for cooperative ocean management and for ocean regime building is often the subregion.

With regards to the scope of activities and functions, a broad interdisciplinary mandate can be perceived as duplicating and competing with the mandates of specific regional or UN bodies and thus engender their opposition. To avoid this situation, a marine affairs organization should lead where there is no competitor, be supportive and cooperative where there are preexisting relevant activities or programs, and be catalytic in focusing attention and engendering support for others' ongoing efforts. Flexibility is key and a formal prioritized set of activities should be avoided. Similarly, the effort should be initially limited and focused. It should not move too rapidly towards a structure or important potential participants may resist. Instead, it should maintain a rather informal approach.

Another important choice to be made is the decision regarding participation of maritime powers situated outside the region. On the one hand, these powers undertake maritime activities, such as fishing, shipping, and oil and gas exploration, in the region. They can contribute funds necessary for the regional regime to form and progress. On the other hand, these powers may undermine the jealously guarded leadership role or status of regional powers and may even unduly influence the regime in their favor.

[13] The UNEP Regional Seas Programme, like UNCLOS III, was the product of the 1970s, when concern over pollution threats occupied center stage in the international arena. Today, in an age of greater sophistication, it is clear that the oceans are threatened by a much more complicated array of problems and deficiencies that call for an integrated approach to longer-term objectives of ocean management.

Constraints

The following are serious constraints to regime formation and positive evolution.

- **Use of an inappropriate model** — The original model of regional marine environmental cooperation was designed for the Mediterranean. It was too ambitious to be amenable to effective implementation in less-endowed regions.[14] The regional action plans and conventions often did not lead to the adoption of the desired amendments in national legislation. Nor did their activities and programs consider a number of root causes of the environmental problems in their marine and coastal areas, such as upstream pollution sources, degradation by land-based pollutants, and irrational management of resources.
- **Excessive diversity** — The regional scale of the UNEP initiative involved excessive dependency on the diplomacy of groupings of too many countries. Even more difficult, these countries have differing interests, priorities, and capabilities.[15] Moreover, most developing countries lack professional and technical expertise in ocean management on the scale required to sustain sophisticated regimes.[16]
- **Low priority** — In most developing regions, ocean management, particularly ocean environmental management, is still given too low a national priority to justify the large-scale expenditure of scarce financial resources.[17] Furthermore, aid organizations are gradually insisting on conversion of their projects to sustainable ones through indigenous support.
- **No long-term commitment** — Permanent commitment to regime maintenance is unlikely in most developing regions, as long as

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[14] Any rigorous regime entails substantial costs. It was always the hope of UNEP officials that the countries of each designed regional sea would eventually be able and willing to absorb a growing proportion of these costs. But given the nature of these instruments much of the funding required would have to go into training programs in science and technology, not just for a relatively low-cost inspectorate, as in the case of strictly regulatory regimes.

[15] The solution to this problem might be to explore the possibility of subregional cooperative arrangements with smaller groupings of three to five neighboring littoral states, as in the Gulf of Thailand.

[16] If the UNEP Regional Seas Programme were being designed now, it would probably draw upon the resources and talents of civil society institutions on a scale that was unimagined in the mid-1970s.

[17] So far as known, no developing region has taken over full financial responsibility for the maintenance of a regional network in the field of ocean law, policy, and management.

external funding sources are willing and able to support projects covering only over a medium-length period of 5–10 years.[18]
- Insufficient public awareness of the problem and solutions
- Redundancy of issues and of national and international agencies addressing the issues
- Selfish national interest — In cases wherein all countries and their diplomats, often driven by domestic politics, want to gain more benefit than they give
- High politics and a lack of regional consciousness — Active opposition from a major regional power can severely retard regime formation. In the Indian Ocean, India opposed Sri Lanka's leadership and formed a potentially competing but more exclusive organization that included the other two major powers bordering the Indian Ocean: Australia and South Africa.

Constraints to maritime regime building in Northeast Asia also include structural incompatibilities and institutional inadequacies. Countries regulate different substances and use different policy instruments. There is a lack of lateral coordination within and between environment and resource management agencies; lack of integration between economic and environmental policies and planning processes; inadequate authority and budgets for environment agencies to ensure sufficient weight in decisionmaking processes; lack of environmental information; undeveloped managerial and administrative resources at all levels of government; low levels of public awareness and underfunded and understaffed environmental education programs; short-term horizons that drive political and organizational decisions; outdated provisions in existing environmental laws and gaps on key issues like solid hazardous wastes and radioactive pollution; slow enactment of domestic legislation to implement international treaty commitments; inefficient markets where prices do not fully reflect environmental costs and benefits; and uncertain ownership or control of natural resources.

On the other hand, regional cooperation in Northeast Asia can bring economic benefits from knowledge spillovers and accelerated learning curves; economies of scale in data collection and information management, including storage and dissemination; economies of scale in scientific, managerial, and administrative training; better and cheaper enforcement mechanisms; economies of agglomeration, or the creation of one or more centers or forums for regional environmental management, including

[18] Environment in general still has a low priority in most developing countries, as measured by *per capita* expenditures, despite 3 decades of continuous global diplomacy to raise environmental standards led by the more affluent states. On environmental initiatives within Southeast Asia, see Johnston [1998].

knowledge spillovers, reduced transport costs, and cheaper inputs; reduced transaction costs of trade and investment stemming from a common environmental regulatory framework; resource pooling; and elimination of regional competition that lower standards.

Applicability of Lessons Learned to Northeast Asia Regime Building

The general premise in the recent literature is that lessons learned in one region are transferable to another [Haas, 2000; Valencia, 2000a]. In contrast, analysis of the experience in other regions concludes that each region is *sui generic* and that specifics, if not principles, of regimes must be designed *de novo* for each region. Nevertheless, some useful general concepts and caveats for regime design in Northeast Asia can be deduced.

In Northeast Asia, regional cooperation is at a much earlier stage of development than Southeast Asia. But marine policy problems will play an increasingly important role in the region's international relations. Indeed, there are numerous indications that the entities concerned are being drawn slowly but surely into what may become a continuing dialogue through which constructive and mutually beneficial regional marine arrangements may be initiated and developed.[19]

There are also serious obstacles to marine regionalism in Northeast Asia. DPR Korea remains a steadfast socialist country juxtaposed to the capitalism of Japan, RO Korea, and Taiwan. In political terms, there are four countries with six governments, with little history or experience in multilateral cooperation. In this context, a primary obstacle to truly regional cooperation is the difficulty of involving both China and Taiwan in a multilateral marine policy regime covering areas claimed by both, particularly given the increasing tension in their relationship [Asia Wall Street Journal, 1995; Baum, 1992, 1995]. However, there is a glimmer of hope because China and Taiwan have occasionally formed a united front regarding South

[19] Examples of relevant dialogue in Northeast Asia include the following meetings: *International Conference on East Asian Seas: Cooperative Solutions to Transnational Issues*, Seoul, RO Korea, 21–23 September 1992; *East China Sea: Transnational Marine Policy Issues and Possibilities of Cooperation*, Dalian, China, 27–29 June 1991; *International Conference on the Japan and Okhotsk Seas*, Vladivostok, Russia, September 1989; *International Conference on the Sea of Japan*, Niigata, Japan, 11–14 October 1988; *International Conference on the Yellow Sea*, Honolulu, Hawaii, 23–27 June 1987; and *Northeast Asian Conference on Environmental Cooperation*, Environment Agency of Japan and Niigata Prefecture, Japan, 13–16 October 1992. Japan has also established a center to elaborate the concept of regional cooperation and to prepare specific proposals for cooperation around the Sea of Japan. See also Asia Report [1993] and International Environment Reporter [1991].

China Sea issues and have agreed to jointly explore for petroleum in the East China Sea [World Journal, 1994; Valencia, 1994b].

A particular difficulty for marine regionalism in Northeast Asia is the isolation and pugnacious, nonparticipatory stance of DPR Korea. Since DPR Korea borders and claims continental shelf, "security zones," and EEZs in the Japan and Yellow Seas, its eventual participation in functional marine policy regimes is critical. There is also the problem of Russia. It is not clear who speaks for Russian Far East maritime policy and how stable and steadfast that policy is or will be. Although the participation of the major powers, China and Japan, is critical to a successful regime in Northeast Asia, both may be reluctant to participate unless they can dominate. In general, most big powers prefer to avoid multilateral regimes in which the smaller nations can form blocks against them. Thus, it will be necessary to present a convincing argument that such major powers can benefit more from a multilateral regime than from bilateral agreements that they can dominate.

Formal maritime regime formation in Northeast Asia is also retarded by several other factors, such as: China's reluctance to join potentially constraining multilateral efforts and its relative disinterest in Northeast Asian regional marine affairs; Japan's unwillingness to follow the lead of others, such as RO Korea; the reluctance of others to follow Japan's lead; the resurgence of traditional sovereignty concerns which undermine efforts at regional identity formation; deep-rooted differences in priorities regarding environmental protection; and the lack of a Track-Two or Track-One forum to discuss such issues.

Another complicating factor in Northeast Asia is the island and concomitant maritime boundary disputes that plague the region,[20] specifically, the Southern Kuriles/Northern Territories, Tok Do/Takeshima, and Senkaku/Diaoyutai. Also present are the overlapping continental shelf claims of China, RO Korea, Japan, and Taiwan in the East China Sea.

Maritime issues are generally only a ripple in the great ebb and flow of economic and political relations in Northeast Asia. But many national frontiers are now maritime in nature and nationalism can elevate these issues into symbols of national pride and integrity. Indeed, some maritime issues may be so crucially situated in time or substance vis-à-vis the balance of much greater issues that they could act like a rogue wave or surge that significantly disturbs political relations in the region. Disputes over islands or boundaries in areas of good petroleum potential could belong to this category. Considering the tenuous or even hostile relations between most of the states in the region and the likelihood of petroleum

[20] For a review of these boundary disputes, see Johnston and Valencia [1991] and Prescott [1987].

in disputed continental shelf areas, maritime issues could become the "tail that wags the dog" of international relations in Northeast Asia.

Thus, difficulties experienced in promoting the formation of ocean regimes in Northeast Asia may be due to the special, if not entirely unique, political characteristics of the region. Northeast Asia lacks any modern history or tradition of political cooperation. Northeast Asian states have always been uneasy neighbors at best and are often bitter enemies. Given the waning good relations, the cultivation of trust between governments continues to tax the diplomatic skills of these countries' most enlightened officials and politicians. Accordingly, the political environment of Northeast Asia does not seem congenial to a formal initiative for intergovernmental regime building. In fact, a bold proposal in this regard by one of these countries would almost certainly provoke suspicions on the part of at least two of the others.

There is also a marked degree of distinctiveness in the marine geography of Northeast Asia. Whereas most other marine regions consist of countries that look out at a single sea or ocean that is perceived as a shared, and potentially unifying, environment and is an extension of their land-based economies, the countries of Northeast Asia face either the North Pacific, which is too vast to be perceived as their "shared dominion," or a number of discrete seas, such as the Yellow Sea, East China, and Japan where sovereignty concerns tend to overwhelm the concept of shared authority and responsibility. Thus, the geography of Northeast Asia seems unfriendly to the ideal of regional cooperation in the semi-enclosed seas, at least as a linked whole.

Financial support for a regional marine organization is also a problem. The Northeast Asia region is ineligible for UN designation as a developing marine region because of the relative affluence of Japan and RO Korea. Only China and DPR Korea clearly meet the traditional UN criteria for such treatment. Perhaps only the Yellow Sea would qualify as a developing marine area, albeit with RO Korea as one of the three littoral states. This anomaly prevented the inclusion of the seas of Northeast Asia in UNEP's East Asian Seas Programme. It is also the reason behind the need for China to be treated as part of Southeast Asia for this purpose.

Other than such issues that stimulate nationalism, marine awareness in Northeast Asia is rather low. Despite growing interest and obvious need, Northeast Asian states continue to ignore most of the opportunities currently available in the marine sphere. The states seem incapable of resolving the growing multiple-use conflicts in their EEZs, let alone those conflicts that are truly transnational in character. Furthermore, the ocean as a whole continues to play a role in the national and regional development process far below its potential for most of the coastal states of Northeast Asia. These countries are simply not yet sufficiently aware of the serious need for a multilateral maritime regime that focuses on the management of fisheries resources and maritime environmental protection. In terms of maritime affairs as a whole, China's priority seems to be the South China Sea. Japan seems to pay more attention to the fate of its "Northern Territories" and to probes by DPR Korean and Chinese spy vessels than to any other maritime issue. DPR Korea has yet to demonstrate convincingly that its interests extend beyond its land borders. For China, environmental protection has generally been viewed as a domestic concern or, at most, as a worthwhile but trivial aspect of international cooperation.[21] RO Korea, like Japan, tends to be more concerned about air pollutants that originate in the deserts of western China than with marine pollution. Clearly, when thinking maritime, the tendency of Northeast Asian countries is to think about boundary disputes, not protection of the deteriorating marine environment or management of fisheries.

It is, therefore, not surprising that in Northeast Asia, there is still considerable resistance to the initiation of a multilateral management regime. Perhaps the most important inducement for a multilateral regime in Northeast Asia would be that such a regime would even up the levels of marine technology and expertise throughout the region. In short, the major tradeoff would be the benefit to Japan and RO Korea of adherence by China, DPR Korea, and Russia to a predictable regime with common minimum standards of pollutant discharge and fisheries management, in exchange for training and technical assistance from Japan and RO Korea. However, until elites in Japan and RO Korea realize that it is in their long-term interest to enhance their partners' capacity, regime formation will be difficult.

The current preference in Northeast Asia is for loose cooperation from which participants can defect without penalty. This loose environmental cooperation is likely to continue well into the future. It will focus on establishing stronger networks among governments and non-governmental actors in the region and promoting common understanding of what the goals and priorities of action should be. In many ways, the kind of cooperation that must emerge in Northeast Asia is similar to that between the European Union and the former East bloc states. There, one of the greatest stimulants for improving environmental regimes was the promise of greater economic and social cooperation and integration.

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[21] This is implied by the recommendations of Han et al. [1991].

The Way Forward

Given all the constraints, the way forward for maritime regime building in Northeast Asia would include the following elements:

- an influential sponsoring organization;
- a "loose" Track-Two initiative which would build the network from which could emerge national leaders or coordinators with some influence within national bureaucracies and which could help convert the effort into a dual-track process of regime building;
- an initial focus on a subregional sea that is not shared by a major uncooperative power unless, of course, that power chooses to lead or support the multilateral effort;
- an initial focus on environmental protection and possibly related marine scientific research rather than on resource management;
- identification of an acceptable leading country and sufficient funding for at least the initial stages of the effort;
- differentiated obligations tailored to the capacity of the different participants; because of the relative affluence of Japan, Taiwan, and RO Korea, it would be difficult to persuade a Western international development agency to undertake a major funding role in a dual track regime-building effort in Northeast Asia without matching or comparable contributions from these governments;
- a definition of the region which is acceptable to all participants, possibly excluding areas of overlapping claims;
- addressing of the interests of outside powers;
- invitation to other regional countries with interests in the three Seas to participate, with the understanding that the littoral countries would be the core players;
- praise for existing arrangements while underscoring the rationale for cooperation;
- encouragement of bilateral discussions and arrangements as complementary to the subregional effort and the goal of a multilateral regime; and
- avoidance of any impression that actions undertaken form part of an effort to resolve or mitigate boundary of territorial issues.

The effort should emphasize that:

- boundaries are a matter only for the parties concerned;
- cooperative effort is necessary, whether or not boundaries are resolved; and
- the goal is to create a positive atmosphere, or a sense of community, and a tradition of cooperation.

It would be enormously helpful if all Northeast Asian countries could appreciate the confidence and security building benefit of cooperative ocean management. Indeed, cooperation in ocean management could have positive spillover effects on naval security cooperation in Northeast Asia. Given some rapprochement on the Korean Peninsula and warming ties among China, RO Korea, and Russia, it is not too early to start thinking about multilateral security cooperation in Northeast Asia. The best place to start may be in the maritime arena.

There is a growing need for maritime trust-building initiatives due to the new uncertainties and conflict points created by the 1996 wave of maritime jurisdictional extensions to 200 nautical miles in the region. These jurisdictional extensions and the resulting disputes over maritime space and resources were thrust upon an already transitional and unstable political environment. However, these disputes can be mitigated by cooperative ocean management.

Cooperative bilateral maritime arrangements have been proliferating over the past several years and may provide the basis for possible trust-building and multilateral agreements. These arrangements include the bilateral fisheries agreements between Japan and RO Korea, Japan and China, and China and RO Korea. Additionally, there is a rapid increase in bilateral and multilateral naval exercises and exchanges. In 1998, Russia staged a search-and-rescue drill with Japan. In 1999, Japanese and RO Korean naval vessels staged a trailblazing search-and-rescue operation in the northern East China Sea. Russia and China also have engaged in joint naval maneuvers. RO Korea has proposed joint maritime search-and-rescue exercises with China, as well as an exchange of visits by naval ships. RO Korea has also asked Russia to join a naval exercise. Japan and Russia have held search-and-rescue exercises. Japan and China have resumed their security dialogue. Russia and DPR Korea have signed a new treaty of friendship and cooperation.

To build confidence among navies, multilateral initiatives must be realistic and pragmatic. These initiatives should use gradual, methodical approaches with clearly defined objectives. The best way is to begin small, avoid excessive formality, and use the bilateral initiatives as a foundation. The initial focus should be on low-level matters such as bilateral Incidents-at-Sea (INCSEA) agreements, which already exist in one form or another between the United States and Russia, the United States and China, Japan and Russia, Japan and RO Korea, and RO Korea and Russia.

Given this network of INCSEA agreements already in place and China's agreement with ASEAN on a declaration of conduct for the South China Sea, a multilateral agreement on a "code of conduct" for Northeast Asian seas would be a natural step forward. Initially, any multilateral arrangement should not be strictly military but address common civil maritime problems like search and rescue, environmental protection, drug trafficking, and smuggling. In particular, multilateral cooperation in ocean management could have positive spillover effects on trust building among navies.

However, there are still formidable obstacles to any multilateral security arrangement. DPR Korea has shown little desire to participate in multilateral discussions on security issues that would be necessary for a subregional INCSEA agreement. It has, however, joined the ASEAN Regional Forum, as well as Track-Two discussions in the CSCAP. Clearly, there is hope that peace may one day march rapidly forward on the Korean Peninsula. Tension between China and Taiwan, on the other hand, still poses a serious problem. Any attempt to include both in an official agreement would be folly, unless the arrangement would be considered an informal "understanding." This is another reason why beginning with cooperative ocean management can help build the trust necessary to take further steps.

Given Russia's continuing domestic problems, it is not likely to be a reliable or robust partner in any cooperative regime for some years to come. Nevertheless, Russia is necessary in building a foundation for regional peace. It would also be a good move to include RO Korea because this would be a political signal that the agreement is neither exclusive nor is it aimed at facilitating "a new concert of powers." The United States should probably be included, too, because of its long regional naval involvement, its alliances with Japan and RO Korea, and its forward deployed troops. Indeed, a U.S. role may be critical because without its intelligence support, Japan and RO Korea would probably be reluctant to join any multilateral security process or arrangement. In this context, the U.S. push for multilateral naval exercises in Asia could give the concept a big boost.

Further out to sea in space and time, an international naval or "self-defense" force might be created to ensure ocean peacekeeping, including safety of navigation. This joint force could focus on the area beyond national jurisdiction and emphasize protection of high seas fisheries, air and sea rescue, and open-ocean environmental monitoring. However, after all is said and done, navy-to-navy arrangements will depend on the quality of political relations and these can surely be enhanced by comprehensive multilateral ocean management.

Conclusions

The absence of robust multilateral maritime regimes in Northeast Asia reflects political calculations by nations and states regarding the rewards, risks, losses, and benefits of maintaining the status quo versus developing regimes acceptable and beneficial to all sides involved. Northeast Asian countries are simply not yet sufficiently aware of the seriousness of the need for multilateral maritime regimes that focus on the management of fisheries resources and maritime environmental protection. Taken together, this situation argues strongly for an ad hoc, issue-specific, evolutionary process for multilateral maritime regime building.

Each country must weigh the pros and cons of regime participation. For China, regime participation could lead to a fairer international legal environment, technology transfer from Japan, RO Korea, and Taiwan, and confidence building in itself as a member of the international community. However, China would have to limit its flexibility in the marine sphere and commit scarce resources to fulfill its regime responsibilities. Furthermore, Beijing prefers bilateral relationships that it can easily dominate. For Taiwan, regime participation would expand channels for discussions with China and enable maritime issues to be addressed. It would also enhance Taiwan's status vis-à-vis China. On the other hand, Taiwan might have to share its technological know-how and possibly sensitive data with other participants, including China. Moreover, it would probably have to pay more than its share for the implementation of the regime. If China and Taiwan are to be included in a regime, it must be nongovernmental. If this were to happen, most of East China Sea would most probably be initially excluded.

For Japan, participation in a maritime regime is favorable because of its economic and technological dominance, its knowledge and experience, and its web of bilateral maritime agreements. Benefits include the protection of regional fisheries resources and the environment, elimination of the transaction costs of annual bilateral fisheries negotiations, and enhancement of its status in the region. But a prominent role for Japan in a multilateral regime is inhibited by its preference for bilateral relationships which it can dominate; the Kuriles dispute with Russia; the memories of its neighbors regarding Japan's wartime behavior; Japan's priority on immediate national economic gain; and its bureaucratic conservativeness and generally reactive posture regarding international affairs.

DPR Korea, on the other hand, could use participation in a regime as a debut into the international community. It could also use its participation to feel out potential regional partners; to increase its financial, technical, and knowledge capacity; and to gain a cleaner environment. For DPR Korea, however, opening its society to foreigners and their cultures and practices could undermine control. Moreover, scarce resources would have to be diverted to fulfill its obligations to the regime.

For RO Korea, participation in a multilateral maritime regime could help avoid costly fisheries disputes; enhance conservation and management of fishery resources; enhance coordination with neighboring countries regarding the management of transnational fish stocks, possibly improve its access to neighbors' stocks; increase the efficiency of its fishing effort; improve its international stature; and expand its points of diplomatic contact with DPR Korea.

RO Korea recognizes that environmental degradation, depletion of fishery resources, maritime anarchy, and political conflict are not in its own, or any other nation's, interest. As a matter of fact, RO Korea supports a multilateral marine environmental protection regime and might even be willing to exercise leadership thereof. Although RO Korea is the only state to border all three Seas, it puts more emphasis on the Yellow Sea because it is more polluted and because RO Korea's western coast is more developed than its eastern shore.

Russia has much to gain and little to lose politically and economically by participating in a regional maritime regime, especially for the Sea of Japan (East Sea). It could gain technological and financial assistance, as well as diminished poaching by foreigners. But fisheries cooperation in particular and cooperation in environmental protection in general are hampered by bureaucratic confusion, ineffectiveness, lack of infrastructure, economic malaise, and a relative lack of interest in maritime affairs, particularly in Northeast Asian seas. Nevertheless, Russia does have considerable experience in fisheries arrangements and international cooperation in marine environmental protection, a legislative base upon which to build, and considerable fisheries and oceanographic expertise. Additionally, it is interested in fulfilling its proper role as a member of the international community. The rise of a domestic environmental movement and pressure from aid organizations could promote its participation in a regional marine environmental protection regime. However, Russia's participation in regional maritime regimes will likely be determined by the progress of Russian market reform, political relations between Russia and Northeast Asia, particularly Japan, and the impact of incipient NGOs.

To advance the process forward in Northeast Asia, the entities concerned might agree to begin discussing objectives and principles for multilateral maritime regimes. Indeed, there appears to be a confluence of incentives for such a dialogue. Russian foreign ministry officials are increasingly concerned that the United States may engage in "adventures" regarding DPR Korea and are exploring ways and means to enhance multilateral dialogue in the region, specifically including maritime cooperation. Thus, Russia would certainly support such an initiative. Meanwhile, RO Korea's Ministry of Maritime Affairs and Fisheries is also supportive of such a dialogue. Even China appears to be willing to consider limited multilateral approaches on a sea-by-sea basis. Although Japan would be reluctant to lead such an effort, it would probably participate if such efforts are initiated by another state or a UN agency.

With regards to extension of jurisdiction, several bilateral agreements on fisheries have already been renegotiated. They set the stage and form the basis for a more comprehensive regional agreement harmonizing the bilateral agreements and expanding the regime to include all the region's nations. Although the development of a regional marine environmental protection regime has been slow, a multilateral dialogue could immensely speed up the process.

Perhaps in the end, necessity will be the mother of cooperation [Valencia, 1985]. Although political constraints limit the possibilities for cooperation on maritime issues, political relationships can and have improved over time. The underlying economic potential of the marine resources of the region remains a part of its geography. With improved political conditions, a bigger share of this potential might become available for utilization. Clear understanding of the benefits of cooperation in such an undertaking may help to motivate and accelerate the improvement of political relationships throughout Northeast Asia.

References

Acharya, A., D. Dewitt and C. Hernandez. 1995. "Sustainable development and security in Southeast Asia: A concept paper." Draft prepared for the First Consultative Meeting on Development and Security in Southeast Asia, 1–3 June 1995, Manila, Philippines. 21 pp.

Aggarwal, V.K. 1993. "Building international institutions in Asia-Pacific." *Asian Survey*, 33(11), November 1993:1029–1042.

Alexander, L.M. 1981. "Regionalism at sea: Concept and reality," p. 285. In: *The environmental Law of the Sea*. Edited by D.M. Johnston. IUCN, Berlin.

Andresen, S. 1989. "The environmental North Sea regime: A successful regional approach," pp. 378–401. In: *Ocean Yearbook* Volume 7. Edited by E. Mann Borgese, N.S. Ginsburg and J.R. Morgan. The University of Chicago Press, Chicago.

Andresen, S. 1995. "The "effectiveness" of regional environmental co-operation in the Northern Seas." Paper presented at the Annual Meeting of the International Studies Association, 23–25 February 1995, Chicago.

Andresen, S. and B. Flostad. 1988. "Sea use planning in Norwegian waters: National and international dimensions." *Coastal Management*, 16:183–200.

Armstrong, A. 1992. "Breaking the ice: Initiatives to improve relations with a national adversary." Summarized in United States Institute of Peace. *In Brief*, March 1992.

Asia Report. 1993. "Russia." In: *Asia Report* No. 15, July 1993:44. Center for Russia in Asia, University of Hawaii, Honolulu.

Asia Wall Street Journal. 11–12 August 1995.

Baker, R. 1993a. "APEC confirms a U.S. shift in policy to Asia-Pacific." *Financial Review*, 23 November 1993.

Baker, R. 1993b. "Clinton to Pacific Rim: Shall we talk?" *Honolulu Advertiser*, 14 November 1993:B-2.

Ball, D. 1994. "A new era in confidence building: The second-track process in the Asia/Pacific Region." *Security Dialogue*, 25(2):157–176.

Barnett, R.W. 1984. *Beyond war: Japan's concept of comprehensive national security*. Pergamon, Brassey's, Washington, DC.

Baum, J. 1992. "Mind games." *Far Eastern Economic Review*, 12 August 1992:22.

Baum, J. 1995. "Pressure cooker." *Far Eastern Economic Review*, 24 August 1995:16–17.

Boczek, B.A. 1986. "Concept of regime and the protection and conservation of the marine environment," pp. 288–292, 294. In: *Ocean Yearbook* Volume 6. Edited by E. Mann Borgese and N. Ginsburg. University of Chicago Press, Chicago.

Boxer, B. 1978. "Mediterranean Action Plan: An interim evaluation." *Science*, 202 (10 November 1978):585–590.

Bryner, G. 1995. "Constructing international institutions to ensure effective implementation of global agreements." Paper presented at the Annual Meeting of the International Studies Association, 23–25 February 1995, Chicago.

Brzezinski, Z. 1994. Lecture on China at the East-West Center, 24 May 1994, Honolulu.

Buzan, B. 1991. *People, states and fear: An agenda for international security studies in the post-Cold War era*. Harvester Wheatsheaf, Hemel Hempstead.

Buzan, B. 1993. Panel discussion on: The Post Cold War Asia-Pacific Security Order: Conflict or Cooperation? during the Conference on Economic and Security Cooperation in the Asia-Pacific: Agenda for the 1990s, 28–30 July 1993, Canberra. 16 pp.

Carison, H. 1979. "Quality status of the North Sea. International Conference on the Protection of the North Sea." In: *Law of the Sea: Neglected issues*. Proceedings of the Law of the Sea Institute Twelfth Annual Conference, 23–26 October 1978, The Hague, The Netherlands. Edited by J.K. Gamble.

Ching, F. 1994. "Discussing regional security." *Far Eastern Economic Review*, 12 May 1994:38.

Chircop, A. 1992. "The Mediterranean Sea and the quest for sustainable development." *Ocean Development and International Law Journal*, 23:17–30.

Choon, L.C. 1994. "The Beijing-Seoul-Tokyo triangle." *Far Eastern Economic Review*, 13 October 1994:36.

Cumings, B. 1992. "The wicked witch of the West is dead, long live the wicked witch of the East," pp. 87–101. In: *The end of the Cold War: Its meaning and implications*. Edited by M.I. Hogan. Cambridge University Press, New York.

Djalal, H. 2001. "Managing potential conflicts in the South China Sea: Lessons learned," pp. 87–92. In: *Maritime regime building: Lessons learned and their relevance for Northeast Asia*. Edited by M.J. Valencia. Martinus Nijhoff, The Hague. 178 pp.

Dybern, B. I. and S.H. Fonselius. 1986. "Pollution in the Baltic Sea," pp. 351–382. In: Elsevier Oceanography Series 30. Edited by A. Voipio. Elsevier Scientific Publishing Company, Amsterdam.

Dzurek, D.J. 1992. "Deciphering the North Korean-Soviet (Russian) maritime boundary agreements." *Ocean Development and International Law*, 23:31–54.

East-West Center. 2001. "Key issues in Asia-Pacific security." Paper presented in a Senior Policy Seminar. East-West Center, Honolulu. 22 pp.

Far Eastern Economic Review. 1995. "Intelligence." *Far Eastern Economic Review*, 26 January 1995. 12 pp.

Funbashi, Y., M. Oksenberg and H. Weiss. 1994. *An emerging China in a world of interdependence*. Report to the Trilateral Commission. New York, Paris, and Tokyo.

Ginsburg, N., S. Holt and W. Murdoch. 1974. *The Mediterranean Action Plan and the maritime development of a region. Pacem in Maribus III*. Proceedings of a Conference, 28–30 April 1972, Split, Yugoslavia. The Royal University of Malta Press, Valleta.

Haas, P.M. 2000. "Prospects for effective maritime governance in the NW Pacific Region." *Marine Policy*, 24(4):341–348.

Haggard, S. and B.A Simmons. 1987. "Theories of international regimes." *International Organization*, 41(3):491–517.

Han, G., Z. Qiao, B. Hou, S. Liu, Z. Zhu, R. Sun, W. Mao and X. Zhang 1991. "China's environmental protection objectives in the 2000." *International Journal of Social Economics*, 18 (8/9/10):180–192.

Higgott, R. 1993. "Economic cooperation: Theoretical opportunities and political constraints." *The Pacific Review*, 6(2):103–117, 105.

Hitchcock, Jr. D. 1994. "East Asia's new security agenda." *The Washington Quarterly*, 17(1):95–96, 103.

Holt, S.J. 1974. "Mediterranean: International cooperation for a sick sea." *Environment*, 16:29–33.

Honma, Y. and T. Kitani. 1981. "Records of the marine mammals in the waters adjacent to Niigata and Sado Island in the Sea of Japan. Based partially on the old documents." *Bulletin of the Biogeographic Society of Japan*, 36:93–101.

Honma, Y., T. Kitani and R. Mizusawa. 1983. "Records of Cephalopoda in the waters adjacent to Niigata and Sado Island in the Japan Sea. Based partially on the pelagic squids stranded ashore." *Bulletin of the Biogeographic Society of Japan*, 38(12):23–29.

ICES. 1986. *Assessment of the marine environment of the Baltic cooperative research*. Report XX. ICES, Copenhagen.

Ijlstra, T. 1992. "Development of resource jurisdiction in the EC's Regional Seas: National EEZ policies of EC member states in the Northeast Atlantic, the Mediterranean Sea, and the Baltic Sea." *Ocean Development and International Law,* 23:2–3.

International Environment Reporter. 1991. "Japan to seek regional meeting to look at water pollution, other problems." *International Environment Reporter,* 4 December 1991.

Jayewardene, H. 2001. "The Indian Ocean: Lessons learned." In: *Maritime regime building: Lessons learned and their relevance for Northeast Asia.* Edited by M.J. Valencia. Martinus Nijhoff, The Hague. 178 pp.

Jianhua, Z. 2005. "Safeguarding maritime security — A Chinese perspective." Paper presented at the ASEAN Regional Forum, 2–4 March 2005, Singapore.

Johnson, H. 2005. "Maritime domain awareness." Paper presented at the ASEAN Regional Forum, 2–4 March 2005, Singapore.

Johnston, D.M. 1998. "Environmental law as sacred trust: Western values and Southeast Asian prospects," pp. 405–465. In: *Asia-Pacific legal development*. Edited by D.M. Johnston and G. Ferguson. University of British Columbia, Vancouver.

Johnston, D. and M.J. Valencia. 1991. "Northwest Pacific," pp. 104–120. In: *Pacific Ocean boundary problems: Status and solutions.* Publications on Ocean Development (the Netherlands) Volume 16. Martinus Nijhoff, London.

Juda, L. and R.H. Burroughs. 1990. "The prospects for comprehensive ocean management." *Marine Policy,* 34:23–35.

Keohane, R.O. 1990. "Multilateralism: An agenda for research." *International Journal,* 65(4):733–736.

Keohane, R.O., P. Haas and M.A. Levy. 1993. "The effectiveness of international environmental institutions," pp. 19–20. In: *Institutions for the Earth: Sources of effective international environmental protection.* Edited by P.M. Hass, R. Keohane and M.A. Levy. The MIT Press, Cambridge.

Keohane, R.O. and J.S. Nye. 1977. *Power and interdependence: World politics in transition.* Little, Brown and Company, Boston, 240 pp.

Kullenberg, G. 1986. "Long-term changes in the Baltic ecosystem," pp. 19–31. In: *Variability and management of large marine ecosystems.*

AAAS Selected Symposium 99. Edited by K. Sherman and L.M. Alexander. Westview Press, Inc., Boulder.

Lancaster, J. and B. Gellman. 1994. "National security strategy paper arouses Pentagon, State Department debate." *Washington Post*, 3 March 1994:A-14.

List, M. and V. Rithberger. 1998. "The role of intergovernmental organizations in the formation and evolution of international environmental regimes," pp. 67–81. In: *The politics of international environmental management*. Edited by A. Underdahl. Kluwer Academic Publishers, Boston.

MARPOL 73/78: The International Convention Concerning Pollution and the Mediterranean. 1986. In: *Ocean Yearbook* Volume 6, pp. 572–573. The University of Chicago Press, Chicago.

McCafrie, J. and S. Bateman. 1995. "Maritime confidence and security building measures in Asia-Pacific: Challenges, prospects and policy implications." Paper presented at the First Meeting of the CSCAP Working Group on Maritime Co-operation, June 1995, Kuala Lumpur.

Meconis, C. and S.B. Weeks. 1995. "Co-operative maritime security in the Asia-Pacific region: A strategic arms control assessment report." Department of Defense Report, July 1995.

Miles, E.L. 2000. "The new ocean regime: Facilitating implementation, compliance and evolution," pp. 6–22. In: *Ocean governance and maritime strategy*. Edited by D. Wilson and R. Sherwood. Allen and Unwin, Sydney.

Morgan, J.R. 1992. "The natural environmental setting," pp. 5–6. In: *Atlas for marine policy in East Asian Seas*. Edited by J.R. Morgan and M.J. Valencia. University of California Press, Berkeley. 152 pp.

Morgan, J.R. and M.J. Valencia. 1992a. *Atlas for marine policy in East Asian Seas*. University of California Press, Berkeley. 152 pp.

Morgan, J.R. and M.J. Valencia. 1992b. "Integrations," pp. 142–151. In: *Atlas for marine policy in East Asian Seas*. Edited by J.R. Morgan and M.J. Valencia. University of California Press, Berkeley. 152 pp.

Morgenthau, H. and K.W. Thompson. 1985. *Politics among nations: The struggle for power and peace*. Knopf, New York. 559 pp.

Morrison, C.E. 1993. "Changing patterns of international relations in the North Pacific." Paper presented at the Workshop on the Russian Far East and the North Pacific held at the East-West Center, Honolulu.

Oksenberg, M. 1993. "The East Asian quadrangle." As amplified in a 9 August 1993 oral presentation at the 'Asia in Transition' workshop in Seattle.

Pac Net. 1994. *Pac Net* No. 37, 18 November 1994. Pacific Forum/CSIS, Honolulu.

Paik, J.-H. 1994. "Strengthening maritime security in Northeast Asia." Paper presented at the 8th Asia-Pacific Roundtable on Confidence

Building and Conflict Reduction in the Pacific, ASEAN Institute for Strategic and International Studies, 5–8 June 1994, Kuala Lumpur.

Pedersen, F.B. 1982. "The sensitivity of the Baltic Sea to natural and man-made impact," pp. 385–399. In: *Hydrodynamics of semienclosed seas*. Elsevier Oceanography Series 24. Edited by J.C.J. Nihoul. Elsevier Scientific Publishing Company, Amsterdam.

Peet, G. 1986. "Techniques and methods for sea use planning and management in selected areas." Report of a literature study commissioned by Directie Noordzee, Rijkswaterstaat, 1989–1992, 44–5, SDU.

Prescott, J.R.V. 1987. *Maritime jurisdiction in East Asian Seas*. Occasional Paper No. 4. Environment and Policy Institute, East-West Center, Honolulu. 72 pp.

Prescott, J.R.V. 1992. "Maritime jurisdictions," pp. 25–35. In: *Atlas for marine policy in East Asian Seas*. Edited by J.R. Morgan and M.J. Valencia. University of California Press, Berkeley. 152 pp.

Protocol for the Protection of Mediterranean Sea Against Pollution from Land-based Sources. 1982. In: *Ocean Yearbook* Volume 3, pp. 489–496. The University of Chicago Press, Chicago.

Ruggie, J.G. 1982. "International regimes, transaction and change: Embedded liberalism in the post-war economic era." *International Organization*, 36(2):379–415.

Ruggie, J.G. (ed). 1993. *Multilateralism matters: The theory and praxis of an international form*. Columbia University Press, New York.

Scalapino, R.A. 1992. "Northeast Asia: Prospects for cooperation." *The Pacific Review*, 5(2):101–111.

Scalapino, R.A. 1993. Panel discussion on: "The Post Cold War Asia-Pacific Security Order: Conflict or Cooperation?" during the Conference on Economic and Security Cooperation in the Asia-Pacific: Agenda for the 1990s, 28–30 July 1993, Canberra. 16 pp.

Scalapino, R. 1994. "Back to the future." *Far Eastern Economic Review*, 26 May 1994:38.

Segal, G. 1991. "Northeast Asia: Common security or *a la carte*?" *International Affairs*, 67(14):755–767.

Smith, A.J., E. Kennet and M.B.F. Ranken. 1984. *Britain and the sea: Further dependence — further opportunities*. Scottish Academic Press Limited, Edinburgh.

Smith, H.D. and C.S. Lalawani. 1984. *The North Sea: Sea use management and planning*. University of Wales Institute of Science and Technology, Cardiff.

Solomon, R.H. 1994. "Asian architecture: The US in the Asia-Pacific community." *Harvard International Review*, 16(3):60.

Taek-Whan, H. 1994. "Northeast Asia environmental cooperation: Progress and prospects." Paper presented to the Workshop on Trade and

Environment in Asia-Pacific: Prospects for Regional Cooperation held on 23–25 September 1994 at East-West Center, Honolulu.
Taylor, P. 1990. "Regionalism: The thought and the deed," pp. 151–171. In: *Framework for international relations*. Edited by A.J.R. Groom and P. Taylor. St. Martin's Press, New York.
UNEP (United Nations Environment Programme). 1978. "Activities for the protection and development of the Mediterranean," pp. 584–597. In: *Ocean Yearbook* Volume 1. The University of Chicago Press, Chicago.
UNEP (United Nations Environment Programme). 1980. "Recommendation for the future development of the Mediterranean Action Plan," pp. 547–554. In: *Ocean Yearbook* Volume 2. The University of Chicago Press, Chicago.
UNEP (United Nations Environment Programme). 1985. "The Mediterranean Action Plan: retrospect and prospect." Presented at the Fourth Ordinary Meeting of the Contracting Parties to the Convention for the Protection of the Mediterranean Sea Against Pollution and Its Related Protocols, 9–13 September 1985, Genoa. Published as Document UNEP/IG.56/4, 26 June 1985.
UPI Intelligence Watch, 17 March 2005.
Valencia, M.J. 1985. "National marine interests in Southeast Asia," pp. 55–57. In: *Marine policy in Southeast Asia*. Edited by G. Kent and M.J. Valencia. University of California Press, Berkeley. 452 pp.
Valencia, M.J. 1987. "The natural setting," pp. 6–25. In: *International Conference on the Yellow Sea: Transnational ocean resource management issues and options for cooperation*. East-West Environment and Policy Institute Occasional Paper No. 3. East West Center, Honolulu.
Valencia, M.J. 1988. "The Yellow Sea: Transnational marine resource management issues." *Marine Policy*, 12(4):382–395.
Valencia, M.J. (ed). 1989a. *International Conference on the Sea of Japan: Transnational ocean resource management issues and options for cooperation*. East-West Environmental and Policy Institute Occasional Paper No. 10. East West Center, Honolulu.
Valencia, M.J. 1989b. "The natural setting," pp. 11–27. In: *International Conference on the Sea of Japan: Transnational ocean resource management issues and options for cooperation*. East-West Environment and Policy Institute Occasional Paper No. 10. Edited by M.J. Valencia. East West Center, Honolulu.
Valencia, M.J. 1990a. "Sea of Japan: Transnational marine resource issues and possible cooperative responses." *Marine Policy*, 14(6):507–525.
Valencia, M.J. 1990b. "Northeast Asian perspective on the security-enhancing role of CBMs," pp. 12–18. In: *Confidence and security-building measures in Asia*. Department of Disarmament Affairs, United Nations, New York.

Valencia, M.J. 1994a. "Preparing for the best: Involving North Korea in the New Pacific Community." *Journal of Northeast Asian Studies,* 13(1):64–76.

Valencia, M.J. 1994b. "The South China Sea issues: Context, conjecture and a cooperative solution." Paper presented at the VIII Asia-Pacific Roundtable, Institute for Strategic and International Studies, June 1994, Kuala Lumpur.

Valencia, M.J. 1996. *A maritime regime for Northeast Asia.* Oxford University Press, Hong Kong. 329 pp.

Valencia, M.J. 2000a. "Comment on prospects for effective maritime governance in the Northwest Pacific Region." *Marine Policy,* 24(5):439–440.

Valencia, M.J. 2000b. "Regional maritime regime building: Prospects in Northeast and Southeast Asia." *Ocean Development and International Law Journal,* 31:223–247.

Valencia, M.J. 2001a. "Relevance of lessons learned to Northeast Asia," pp. 131–149. In: *Maritime regime building: Lessons learned and their relevance for Northeast Asia.* Edited by M.J. Valencia. Martinus Nijhoff, The Hague. 178 pp.

Valencia, M.J. 2001b. "Conclusions and lessons learned," pp. 150–172. In: *Maritime regime building: Lessons learned and their relevance for Northeast Asia.* Edited by M.J. Valencia. Martinus Nijhoff, The Hague. 178 pp.

Vallega, A. 1988. *A human geographical approach to semi-enclosed seas: The Mediterranean case in regional development.* The University of Chicago Press, Chicago.

Van Dyke, J.M. 1989. "Prospects for the development of intergovernmental human rights bodies in Asia and the Pacific." In: *New directions in human rights.* Edited by E.L. Lutz, H. Hannum and K.J. Burke. University of Pennsylvania Press, Philadelphia.

Voipio, A. (ed). 1981. *The Baltic Sea.* Elsevier Oceanographic Series 30. Elsevier Scientific Publishing Company, Amsterdam.

Weeks, S.B. 1995. "Law and order at sea: Pacific co-operation in dealing with piracy, drugs, and illegal migration." Paper presented to the First Meeting of the CSCAP Working Group on Maritime Co-operation, Kuala Lumpur, June 1995.

World Journal. 1994. "China and Taiwan plan cooperative exploration of the South China Sea." *World Journal,* 17 January 1994:1.

Young, O.R. 1977. *Resource management at the international level: The case of the North Pacific.* F. Pinter, London and Nichols, New York. 22 pp.

Young, E. and P.H. Fricke. (eds). 1975. *Sea use planning.* Fabian Society, London.

CHAPTER 14

Building Vision, Awareness and Commitment: The PEMSEA Strategy for Strengthening Regional Cooperation in Coastal and Ocean Governance

Kem Lowry and Chua Thia-Eng

Introduction

Over the past 3 decades there has been substantial growth in coastal and ocean management regimes due mainly to the increasing awareness and understanding among nation-states that the gravity of coastal and ocean problems is more effectively addressed through collective action. While there has been progress in coastal governance, the relative success of these efforts has been undermined by lack of consensus about management priorities, inadequate laws, weak enforcement, and lack of management resources in some countries. Difficulties in monitoring country compliance with international agreements and reluctance of powerful countries to ratify major international conventions are also major issues confronting international coastal and ocean governance organizations.

Regional institutions have been developed to help forge consensus on national and regional coastal and ocean management priorities, provide technical assistance, and assist in developing institutions for stronger regional collaboration and effective resource management. In East and

Southeast Asia alone, more than 12 regional organizations have been organized during the past 3 decades to address one or more ocean or coastal issues [Tan, 2003]. Although numerous regional marine regimes designed to address marine environmental management have been operating in various parts of the world, the results in Asia and elsewhere have been uneven [Kullenberg et al., 2006; PEMSEA, 2002]. Ineffective frameworks for collective management, lack of resources, inadequate capacity, differences in national political and administrative cultures, and unsustainable political commitment are among the most often cited reasons for the inadequate performance of the institutions of regional coastal and ocean governance.

The Partnerships in Environmental Management for the Seas of East Asia (PEMSEA) is one of the most recent efforts to develop and sustain regional institutions for improved coastal and ocean governance in East and Southeast Asia. PEMSEA was initiated in 1993 as a regional effort designed to promote improved coastal management and to initiate a regional collaboration among participating countries. This regional collaboration was formalized by the Putrajaya Declaration signed by 12-member nations at the East Asian Seas Congress in 2003.[1] The Putrajaya Declaration signifies the region's commitment to establish cooperative efforts to tackle the transboundary issues of coastal and marine environment of the region. The Declaration also endorsed the Sustainable Development Strategy for the Seas of East Asia (SDS-SEA) which serves as the common framework in addressing the various issues besetting the coastal and marine environment of the region. Included in the issues highlighted by the Declaration is the lack of capacity and awareness [PEMSEA, 2003]:

> *"Although multilateral environmental agreements have attempted to address these problems (degradation and destruction of habitats, diminishing fisheries, pollution of coastal waters, red tide occurrences, invasive alien species, and general loss of biodiversity), there is a marked disparity among countries in the region in their capacity to respond to the challenges of sustainable development and to implement the relevant international conventions. The single sector or single issue approach, which is not uncommon in international instruments, has also failed to consider the interconnectivity between economic sectors, ecosystems, social development, and sustainable use of marine and coastal resources. As a consequence, the overall benefits to be derived*

[1] The 12 participating countries are: Brunei Darussalam, Cambodia, Democratic People's Republic of Korea, Indonesia, Japan, Malaysia, People's Republic of China, Philippines, Republic of Korea, Singapore, Thailand and Vietnam. Since the Haikou Partnership Agreement in 2006, Lao People's Democratic Republic and Timor-Leste have also joined PEMSEA.

from multilateral environmental agreements have not been fully captured in national development policies and implementation programmes."

PEMSEA has sought to address many of the problems associated with regional governance by building collaborative networks among nations of the region; among subregional grouping of nations focusing on specific issues (such as oil spills); and among agencies within countries. To maintain and strengthen these networks, PEMSEA has focused on three primary network-strengthening approaches: creating a common vision; building shared awareness; and nurturing political commitment. This chapter outlines the rationale for this emphasis on vision, awareness, and commitment; and the means used to implement them in the participating nations in the region.

Essential Elements of Regional Collaboration

A central feature of PEMSEA's approach to improve coastal and ocean management is its emphasis on the development of a regional collaborative network. This emphasis on collaborative approaches to natural resource management is part of an international trend. Over the past several decades there has been an increasing emphasis on the need for greater interagency, intergovernmental, and community interaction; participation; and coordination with regard to a wide variety of public policy issues, but with particular emphasis on natural resource management [Godschalk and Mills, 1966; Gray, 1989; Healey, 1992; Wondolleck and Yafee, 2000]. Indeed, collaborative management has been called the "new paradigm for natural resource management" [Margerum and Whitall, 2004]. Collaborative approaches to natural resource management go by a variety of names, including: partnerships [Wondolleck and Yaffee, 2000; Williams and Ellefson, 1997; Sabatier et al., 2005], consensus groups [Innes, 1999], community-based collaboratives [Christie and White, 1997], among others. Indeed, the notion of collaborative governance is, in principle, sufficiently "mainstream" that it is being promoted by the U.S. federal government [USIECR, 2004].

"Collaborative" coastal and ocean governance in the East Asian region is being promoted as a response to several major challenges to conventional policymaking and management. As is the case with other resource management issues, interagency and interorganizational collaborative management in ocean and coastal governance is viewed as a way to reduce conflict, promote political legitimacy, address transboundary issues, and improve resource management outcomes [Bernard and Young, 1997; Jones, 1996; Innes, 1996; Lowry et al., 1997; Innes and Booher, 1999; Susskind et al., 1999; Weber, 2000; Wondolleck and Yaffee, 2000; Booher, 2004; Sabatier et al., 2005].

Networks are "both a governance structure and a process of socialization through which disparate actors and organizations are connected in a coherent manner for mutual benefits and synergies" [Yeung, 2000]. Networks vary in their intentions and in the degree of formality and complexity. They are formed for a variety of purposes, including to keep professionals informed (for example, cancer specialists, fishery experts); and to link people with specific interests (for example, bird watching or *gamelan* music), projects or tasks (for example, community-based reef protection, curriculum development), or issues (for example, climate change). Most networks operate informally. Interested participants can attend meetings or register for an online listserve. A few networks are more formal with membership requirements, a specified domain, and a network governance arrangement. Finally, networks can be located on a complexity continuum depending on task specification (from well-defined to high-task uncertainty), number of participants, diversity of participants, commonality of goals and agenda, and mode of interaction (face-to-face or virtual) [Mankin and Cohen, 2004].

The collaborative networks or partnerships established by PEMSEA over the years at the local, subregional, and regional levels served as important factors in bringing about consensus among the member countries and other partners, and helped transform PEMSEA from a project-based arrangement to a regional collaborative mechanism.[2] This was made possible through a regional policy instrument, the 2006 Haikou Partnership Agreement. This regional mechanism established an East Asian Seas Partnership Council — a complex, formal network of representatives of the signatory nations to the Haikou Partnership Agreement on the Implementation of the SDS-SEA,[3] international organizations, nongovernmental organizations (NGOs), and private businesses.[4] The network was established to provide political and administrative support for a variety of regional initiatives to: *(1)* address transboundary issues such as oil spills, urban wastes, marine debris, and

[2] The regional collaborative mechanism is composed of four main components: an East Asian Seas Congress which includes a Ministerial Forum; an East Asian Seas Partnership Council; a PEMSEA Resource Facility; and a Regional Partnership Fund. Details and functions of said components are found in the Haikou Partnership Agreement and Partnership Operating Arrangements for the Implementation of the SDS-SEA. [See also Chua et al., in this volume; Tropical Coasts, 2006].

[3] Parties to the Agreement are: Cambodia, China, DPR Korea, Indonesia, Japan, Lao PDR, Philippines, RO Korea, Singapore, Timor-Leste, and Vietnam.

[4] Other non-State Partners signed the Partnership Operating Arrangements which serves as an annex to the Partnership Agreement. These others are: Conservation International, Coastal

similar issues; *(2)* support national coastal management initiatives; and *(3)* ultimately, provide guidance in the overall implementation of the SDS-SEA. The Partnership Council provides network governance while the PEMSEA Resource Facility — another component of the regional mechanism consisting of the Secretariat and Technical Services — manages the network activities and resources.

Developing the network and making it an active, effective institution to support regional management efforts requires several key tasks:

- Insure that members of the network share the same goals for the collaboration and the strategies for achieving those goals;
- Structure the collaboration by means of formal agreements about issues, tasks, and decisionmaking processes;
- Provide the means to learn from the individual and collective ocean and coastal management experiences;
- Develop and cultivate collaborative norms that encourage further sharing of information, resources, technical advice, and mutual assistance; and
- Provide incentives that encourage continued commitment to the network and its tasks.

A complex network requires a shared vision; communicative and collaborative activities that increase the commitment of the partners to the network; and a network "hub" or manager that provides the energy, resources, and communicative activities to keep the network functioning. These network characteristics are summarized in Table 1. These structural and process issues are discussed in more detail below.

Management Center, UNDP/GEF Small Grants Programme, Intergovernmental Oceanographic Commission/Subcommission for the Western Pacific (IOC/WESTPAC), Korea Ocean Research and Development Institute (KORDI), Korea Maritime Institute (KMI), Korea Environment Institute (KEI), Ocean Policy Research Foundation (OPRF) of Japan, Oil Spill Response Limited and East Asia Response Limited (OSRL/EARL), Plymouth Marine Laboratory, UNEP Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (UNEP/GPA), and UNDP/GEF Yellow Sea Project (YSLME). The Swedish Environmental Secretariat for Asia (SENSA) and the Northwest Pacific Action Plan (NOWPAP) have also become Partners to the Agreement.

Table 1: Characteristics and Intended Outcomes of Complex Network Structures

Characteristics of Network Structure	Process Requirements	Expected Outcomes
Common Vision	• Consultative processes that lead to recognition of common resource management or hazard problems • Recognition of need for collective action to address problems • Willingness to focus on common problems and set new management priorities • Sharing of common goals, objectives, and approaches	• Synergies developed among partners • Partners see points of convergence • Emphasis on commonalities rather than political or administrative differences • Agreements on priorities among common problems and strategic actions • Agreements on common vision and mission
Interdependence and Commitment of Partners to Network	• Establish regular, easy-to-use communication channels among partners • Attend to multiple national conceptions of priority management problems and needs • Organize workshops and meetings for partners • Organize trainings • Develop technical studies and assistance regarding specific resource use issues • Develop local management capacities • Develop consensus approaches to decisionmaking • Generate external resources to support management efforts	• Enhanced communication • Stronger relationships among partners • Mutual recognition of needs and priorities • Expanding networks of regional expertise • Reduction of potential management conflicts among partners • Agreements about management priorities • Willingness to engage in joint actions • Greater sharing of resources • Increased trust among partners and commitment to network initiatives
Network Manager/ Coordinator	• Organize and convene network meetings • Facilitate communications among partners • Organize technical analysis and training • Facilitate collaborative deliberative processes • Provide staff for key activities • Seek resources for network activities	• Meetings that are productive, civil, and efficient • Consensus processes • High quality agreements • Effective trainings and technical analysis • Scaling up and expansion of network activities

Source: Adapted from Keast et al. [2004]

Vision, Awareness, and Commitment as Key Principles of Network Organization

The role of a regional collaborative network is to bring about the convergence of the multiple objectives of different state and non-State actors into a shared vision; to provide them a platform for regular dialogue and information exchange; and to coordinate the various individual actions into a systematic, synergistic regional program of actions for them to work together towards achieving their common goals. Key network activities include: creating the shared vision among network partners; developing shared awareness of the short- and long-term consequences of current trends in resource conditions and resource use activities; and building commitment to collective activities designed to address these problems.

Vision

Vision can be defined as an image that expresses what an organization or a network wishes to attain and through which it provides not only a direction or goal, but also a means of accomplishing the desired end state or vision. Different national partners and agency representatives, NGOs, resource users, and other stakeholders within specific countries have their own agendas with regard to the development and use of the finite coastal and marine resources. They rarely consult each other in setting resource use agendas, often resulting in use conflicts among sectors and nations. In principle, creating a shared vision among key national actors about desired resource use conditions for the region is a key first step in designing collective actions and committing resources to achieve those outcomes. In practice, creating a shared vision usually requires extensive communication and consultation, mutual education, negotiation, and relationship-building.

Awareness

"Awareness," as used here, refers to several types of knowledge:

- knowledge about coastal and marine resources and their local and regional distribution and condition;
- knowledge about trends in resource conditions and resource uses;
- knowledge about the ecological consequences of current and projected patterns of resource uses and the cause-and-effect relationships linking resource uses with changes in resource conditions;

- knowledge about the types of regulations, subsidies, or other interventions that have proved effective in mitigating or eliminating adverse impacts of resource use activities — and the impacts of these interventions on resource users;
- knowledge about how to create the types of institutions necessary for effective planning and management; and
- knowledge about effective strategies for communicating resource use conditions, long term-impacts on resource conditions, and effective interventions for improving resource conditions.

In developing awareness on coastal and marine issues, the technical knowledge of a disciplinary specialist, such as an hydrologist, marine biologist, legal expert, oceanographer, or economist, is critical, but so is the detailed time and place information or "local knowledge" of the long-time fisher and other resource users. The challenge of "building awareness" involves developing consensus on what is known and unknown, developing strategies for filling knowledge gaps, and reducing technical uncertainties. Building awareness also involves insuring that knowledge is widely diffused and understood among those who can directly or indirectly act on it to improve management. This type of "awareness building" requires communication processes that include advocacy, social mobilization, and program communication. Advocacy refers to organizing information into an argument to be communicated through various channels with the intention of gaining political and social acceptance and support. Social mobilization, on the other hand, is the pooling of people and resources to increase people's awareness and demand for a particular issue, so that a critical mass is gathered for eventual action. Program communication involves identifying and segmenting specific groups or audiences with particular strategies and messages through various mass media and interpersonal channels.

Building upon different types of knowledge, key stakeholders can use their acquired knowledge to analyze their coastal and ocean environment and engage in deliberation and formulation of possible actions and solutions. Awareness and information dissemination can lead to effective action when effectively implemented.

Commitment

A commitment to act alone and collectively — to implement plans and programs to more effectively manage human activities adversely affecting resources and to prevent or reduce the risks of various types of hazards — is a third imperative for effective collaborative governance. Commitment has both psychological and behavioral dimensions. Individuals are motivated to make commitments on the basis of incentives (moral claims, political appeals, potential financial gain, appeals to idealism, promise of potential career advancement, and the like) or coercion (legal or administrative requirements, perceived threats to one's career, and the like). A psychological commitment has to be sufficient to induce the necessary collaborative behaviors, including: continued participation in network activities; commitment of time, effort, and expertise to network activities; careful attention to the perspectives and needs of other participants; and the like.

Encouraging and sustaining organizational commitment on the part of key national partners to the collaborative network requires a similar analysis of incentives and potentially "coercive" measures. The sustainability of commitment induced by coercive means is sometimes problematic [Tan, 2003]. Several factors shape the commitment of organizations [Margerum, 2001]:

Legislation or national mandates

Legislative or administrative mandates can be both a help and a hindrance to commitment. Some agencies cannot delegate administrative responsibility to a network or other actions for legal reasons. On the other hand, national legislatures or executives may sometimes encourage network collaboration by legislative or executive fiat.

Administrative resources

Some potential partner agencies see themselves as constrained by inadequate staff numbers, staff capacity, or inadequate discretionary resources for full participation in the network.

Organizational perception

Agency commitment usually requires that the agency sees itself as acting in ways that are consistent with its mission and that the problems being addressed are critically important.

Organizational guidance

Agency staff may not be familiar with what participation in a collaborative network requires of them. The quality of the leadership and guidance from other partners and the network managers can determine the degree and effectiveness of their participation.

Personal commitment

The degree of personal commitment of the agency representatives to the network can also be a critical factor in the commitment of the organization. Such personal commitment can be instrumental in encouraging the organization's commitment.

While gaining the commitment of individuals and organizations is important to effective collaborative networks, there is no template or formula for encouraging personal or organizational commitment. What works with some agencies may not work with others. For those engaged in developing sustainable collaborative networks, the challenge is to find those constraints or opportunities most relevant to each individual or organization.

Creation of the SDS-SEA Vision

The idea of a guiding vision for coastal and ocean management is not unique to PEMSEA. Several regional ocean management organizations developed strategic visioning mechanisms to address local and transboundary ocean and coastal problems. Visions are part of a larger planning process that includes formulating vision-mission statements, adopting a strategic action plan, and developing implementation and monitoring mechanisms. The relevance of the whole exercise is in creating a platform to build awareness, foster collective ownership, change perceptions, and influence reforms in policies and programs. The main goal of the process is to transform attitudes and behavior and create political commitment to reflect a different way of valuing and protecting coasts and oceans.

Much of the impetus for regional ocean management regimes came as a response to United Nations' efforts. The United Nations Convention on the Law of the Sea (UNCLOS) which was signed in 1982 and came into force in 1994, provided a legal foundation for new regimes for the governance of the oceans of the world [Koh, 1983]. The 1982 United Nations Conference on Environment and Development (UNCED) focused on issues related to emerging concerns regarding development and the environment. For those concerned about oceans and coasts, the primary output was Chapter 17 of Agenda 21 which calls for sustainable development at the oceans and coasts. The World Summit on Sustainable Development (WSSD) in 2002 was a further call to action stemming from the review of the implementation of Agenda 21. In response to such efforts, several regional ocean governance mechanisms were established. For example, Baltic 21 was the first regional initiative to adopt common regional goals for sustainable development in response to the framework of Agenda 21. The Med Strategy 2002 was adopted for the Mediterranean in response to the favorable political commitment arising from WSSD and a need for an overarching agenda for coordination, coherence, and synergies given the existence of several environmental cooperation programs. The Pacific Islands Regional Oceans Policy was ratified during the WSSD in 2002.

All these regional strategic visioning outputs emphasize mechanisms that are holistic, integrative, adaptive, and ecosystem-based. This approach is based on the awareness that knowledge about our dynamic and complex ecosystems remain limited while human activities continue to create tremendous impact on them. In most regions, rapid coastal development and more intensive uses of coastal and marine resources are creating transboundary impacts on ecosystems and stressing the ability of states to manage effectively.

"Vision statements" — and the plans of which they are a key part — can be prepared by consultants, technical teams, or a broad range of stakeholders. The PEMSEA planning effort combined rigorous analysis of international and regional ocean and coastal management treaties, plans, and other initiatives; and extensive consultation with policymakers, ocean experts, and other stakeholders in the East Asian Seas region.[5] One of PEMSEA's initial efforts was an extensive review of international treaties and other initiatives related to ocean governance, including: the Rio Declaration, Agenda 21, UNCLOS (1982), United Nations Framework Convention on Climate Change, Global Programme of Action for the Protection of the Marine Environment from Land-based Activities and seven other treaties and conventions.

A review of national efforts relating to Agenda 21 was specifically compiled to gather relevant information in the preparation of the SDS-SEA and the development of a national coastal and marine policy. The analysis was integrated into national profiles, which were reviewed by the Experts' Meeting on Strategies for Better Coastal and Ocean Governance (Kuala Lumpur, November 2002). The results of this effort were incorporated in the SDS-SEA.

The PEMSEA Regional Programme Office (RPO) also reviewed the experiences of different regional organizations and arrangements around the world.[6] The purpose was to examine experiences in regional environmental management of regional seas [Box 1] and apply those lessons to the Seas of East Asia region, through the implementation of international instruments.

Over the 4-year period during which this technical work was being conducted, PEMSEA staff organized numerous meetings with policymakers,

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[5] Further details on the consultation process undertaken in the development of the SDS-SEA can be found in PEMSEA [2005].

[6] The regional mechanisms were: The Helsinki Convention on the Protection of the Marine Environment of the Baltic Sea Area and the Baltic Marine Environment Protection Commission (HELCOM), the Convention on the Protection of the Black Sea Against Pollution and The Black Sea Environmental Programme (BSEP), the Danube River Protection Convention (DRPC) and the International Commission for the Protection of the Danube River (ICPDR), Convention for the Protection of the Marine Environment and the Coastal Region of the

ocean and coastal experts, national planning staff, and others in the East Asian region. These meetings and workshops were conducted to review national and regional ocean and coastal issues, organize technical studies on particular issues of interest, and to address specific issues of concern to participants. These meetings were part of the gradual development of

Box 1: Conclusions or Lessons Learned from the Desktop Study on Regional Mechanisms around the World

- Rigorous preparation in the form of conceptualization and planning is necessary for the success of the regional mechanism, taking into account the socioeconomic, cultural, and political situations of the countries and their needs and capacities.
- Consultation and coordination with all of the countries from the beginning of the process is very important.
- Economic concerns are a very strong motivation for or against the regional mechanism.
- Care must be taken not to allow political and historical concerns to distract parties from the goals and objectives of the organization.
- The failure to operationalize commitments and implement provisions are often due to lack of capacity, thus capacity building is a very important part of the mechanism.
- A legal instrument is not a prerequisite for the success of the regional mechanism. However, it may help to provide a definite framework for actions and rationale over the long-term.
- The clearer, more concrete and more realistic the goals and timetables of the mechanism, the better the chances of success.
- Viability of the regional mechanism is highly reliant on reliable financing mechanisms. These may include both traditional sources of funds as well as innovative ones.
- Monitoring is important because the impacts of the mechanism need to be known, otherwise support decreases.

Source: PEMSEA [2002]

Mediterranean (Barcelona Convention) and the Coordinating Unit of the Mediterranean Action Plan (UNEP/MEDU), Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR Convention) and the OSPAR Commission, the Great Lakes Basin Compact and the Great Lakes Commission, the Noumea, Apia and Waigani Conventions and the South Pacific Regional Environmental Programme (SPREP), the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region and the Regional Coordinating Unit for the Caribbean Environment Program, and the World Conservation Union (IUCN).

the collaborative governance network. The coastal and ocean management initiatives undertaken in these sessions helped develop the communication channels and the trust and legitimacy necessary for a more ambitious regional effort.

The SDS-SEA, which was adopted in December 2003, was the product of this multi-year process of analysis and consultation. The SDS-SEA identifies the collaborative's shared vision:

> *"The sustainable resource systems of the Seas of East Asia are a natural heritage for the people of the region, a medium of access to regional and global markets, and a safeguard for a healthy food supply, livelihood, economic prosperity and harmonious co-existence for present and future generations."*

To achieve this vision, the SDS-SEA identified six major strategies: Sustain, Preserve, Protect, Develop, Implement, and Communicate. It also outlined a variety of individual initiatives for each of the six major strategies. A total of 27 operational principles, 20 concrete objectives, 50 action programs, and 227 activities address local, national, and global environmental and sustainable development issues ranging from fisheries to climate change [PEMSEA, 2007].

Significantly, SDS-SEA also influenced the drafting of national coastal and ocean policies, for example, the Philippines Archipelagic Agenda, the Coastal Policy of Malaysia, Coastal Policy of the Philippines, the Ocean Policy of Japan, and the Thai Sea Policy. Across other East Asian countries, other structural and institutional reforms, such as the marine economic development policy of the People's Republic of China, reorganization in Indonesia and Republic of Korea through the establishment of new ministries on fisheries and marine affairs, bode well for the implementation of the region's shared vision.

Building Awareness[7]

Building awareness, as noted above, involves generating information about coastal resources, trends in resource conditions, and resource uses and threats. It also involves developing consensus about knowledge gaps, uncertainties, and research priorities among network participants and

[7] Much of the data for this section is drawn from PEMSEA [2006a], but the interpretation is that of the authors of this chapter.

others. The PEMSEA approach to this conception of building awareness involves developing capacities for standard environmental information gathering and analysis techniques at the local and subregional level; organizing special technical studies on specific issues; and developing institutions and technical procedures for information sharing, training and technical workshops, meetings of technical experts, and outreach procedures that provide for wide dissemination of information. Each of these mechanisms is briefly described below.

Environmental Profiles/Risk Assessments

Local integrated coastal management (ICM) projects require a variety of strategies and management tools. Research, advocacy, collaboration, infrastructure development, planning, awareness building, technical analysis, public-private partnerships, and regulation of coastal uses and activities are among the management strategies employed by PEMSEA in its ICM approach. The PEMSEA approach incorporates a wide variety of management tools for each basic management strategy. Technical analysis, for example, includes environmental profiles and risk assessment. While the strategies are similar from site to site, the importance of specific tools to support a strategy varies among the sites [PEMSEA, 2006a]. Coastal strategy documents, environmental profiles, and action plans are also among the repertoire of PEMSEA's integrated management tools. Because of PEMSEA's long experience with these and other tools of management, and because their use has been demonstrated at multiple sites, the PEMSEA office and site staff have multiple models of what these tools are, how they relate to specific coastal uses, and how they have been tailored to specific contexts [Chua et al., 2006; Chua, 2006]. The development and refinements of these models over the years is part of what makes PEMSEA successful at designing and implementing local ICM projects [PEMSEA, 2006a].

The PEMSEA approach to risk assessment begins as part of a training project for project staff and other key technical stakeholders. Participants are taught key concepts about risk assessment and methods of assessment and use them immediately in the development of a risk assessment for their area [PEMSEA, 2006a]. Trainees usually contact other agency staff involved in data collection and management. They share their knowledge of risk assessment and solicit data useful in developing the risk assessment document. The risk assessment plan is thus an applied learning — an end in itself as well as an important part of staff capacity building.

Training

PEMSEA has trained more than 1,935 coastal managers, national officials, and others; and assisted with the development of numerous environmental plans, risk assessments, action plans, and other strategies necessary for the effective functioning of local ICM projects. The training manuals, technical reports, environmental risk assessments, strategic plans and other documents, CDs, and videos constitute a substantial documentation of the knowledge gained about specific sites and ocean and coastal management in the region. They also serve as high quality models that can be used by governments and donor agencies in the region. The approach, training, and publications all provide a solid intellectual foundation for replication and scaling up [PEMSEA, 2006a]. They are a critical component of building awareness about coastal issues and management interventions that can effectively address those issues.

Network of Experts

PEMSEA has created networks of experts and local governments and regional task forces that, when taken together, firmly link the national ICM demonstration and parallel sites into a regional consortium and partnership. The regional networks of experts have provided a range of support services in coordination with the field activities. They are also an important mechanism for knowledge validation and transfer [PEMSEA, 2006a].

The networks have proved highly useful in providing specialized skills training, generating reviews, information exchange, and knowledge transfer. Effectiveness is shown when environmental monitoring and information networks are merged with the PEMSEA Network of Local Governments for Sustainable Coastal Development (or the PNLG, discussed further below), and the legal experts' network with the Regional Task Force. The networks have been used in making scientific advice available in packaged form; in obtaining advice and technical assistance in the context of verifications of priority issues and applications of risk assessments; and the development of related environmental monitoring programs. They have also assisted in the preparation of coastal strategies, development of coastal use zoning schemes, and in obtaining of experts for training and analyzing specific problems. These actions have helped link the available regional expertise and expose this community to management activities and needs.

Special Studies

PEMSEA policy research studies have promoted an increased understanding of the scientific dimensions and the complexity of key coastal and marine issues and have demonstrated the need for obtaining and utilizing scientific information in sensitive and critical management actions.

Policy research studies have been utilized in the context of building public-private partnerships (for example, on waste management in Batangas, Philippines) and promotion of opportunities for such efforts; public awareness creation and education on environmental management; mobilization of public participation; and formation of public sector corporations. The policy research has raised the need for obtaining and utilizing scientific information in management actions, including: creation of public and other user understanding of how the coastal environment functions on the basis of scientific facts; marine zoning schemes (for example, Xiamen sea use zoning); establishing proper institutional arrangements, adoption and integration of coastal policies, and creating legal regimes; and decentralization of decisionmaking. The studies have demonstrated the need to have the scientific community involved with the management team as a partner [PEMSEA, 2006a].

Integrated Information Management System (IIMS)

Improved ocean and coastal planning and management requires valid information about: resource locations and conditions, potential impacts of uses and activities on resources, jurisdictional boundaries, pollution sources, land use plans, and many other variables. In most countries, data collection for coastal management is, at best, incomplete and uneven. Even when there are data collection efforts, the information useful for effective coastal and marine management is most frequently collected and stored in multiple agencies in a variety of formats for different analytic and management purposes [PEMSEA, 2006a].

PEMSEA's information management strategy has been to "establish an IIMS for coastal and marine environmental assessment planning, monitoring, and management. This would enable the PEMSEA sites with an established IIMS to use IIMS in facilitating planning, management, and other activities. The availability of information in a format that can be used in these various activities will contribute to desired outcomes, which will then facilitate the attainment of the overall goal of PEMSEA" [PEMSEA, 2006a]. Project personnel and members of the IIMS task teams representing participating agencies at the sites were given two training programs: basic training on information management using IIMS and IIMS Query System, and linkage to geographic information system (GIS) and other external software. The original project goal was to train three staff at each site. To date, 201 participants have been trained at 11 sites [PEMSEA, 2006a].

Information Dissemination

PEMSEA has proven to be particularly adept at some of the conventional tools of outreach and knowledge dissemination. Printed reports are widely circulated in the region. Articles on PEMSEA activities appear in the local press. In addition, PEMSEA publishes a magazine, *Tropical Coasts*, with articles related to aspects of coastal management in the region. PEMSEA has also successfully supported the use of modern high technology communication tools, in establishing e-forums and building websites, including the PEMSEA website. The PEMSEA website is linked to a media resource center and a youth website. These links have contributed to a surge in hits, from about 6,000 in mid-2002 to over 235,000 in February 2004 [Chua and Lee, 2004]. The PEMSEA website thus clearly fills a need and is an active and valuable source of information for a variety of stakeholders, including: policymakers, resource managers, the private sector, civil society, and the academe. The ICM sites have their own websites, linked to an e-community network called Coastalinks. The aim of this is to establish a clearinghouse mechanism for ICM knowledge in the region. It will help disseminate lessons learned to all stakeholders throughout the region. Training workshops have been organized to help the ICM sites create operational websites.

Local plans, environmental profiles, training, networks of experts, information systems, and outreach are not the only tools PEMSEA uses for building awareness, but they are among the most prominent. The development, use, and adaptation of these tools over the past decade have done much to raise the level of awareness and understanding about resource conditions and the need for collective actions to address them.

Creating Commitment

Collaborative efforts are effective and sustainable over time to the extent that participants find them useful, contribute time, energy and other resources, and see the collaboration as contributing to the achievement of a shared vision. PEMSEA's efforts to strengthen the collaboration include a number of individual initiatives including, but not limited to: pilot projects, extensive regional consultation at all levels, promoting regional policy coherence, sustained effort, an infusion of supporting resources, and extensive outreach. Each of these initiatives is briefly outlined below.

Demonstration Projects

PEMSEA has pursued a strategy of testing, refining, and replicating local coastal management projects. During PEMSEA's first phase (1993–1999), ICM projects were launched at Xiamen, China and Batangas, Philippines. The success of these sites — and the lessons drawn from them — made it possible to create successful demonstration sites at Bali (Indonesia), Chonburi (Thailand), Danang (Vietnam), Nampho (DPR Korea), Port Klang (Malaysia), and Sihanoukville (Cambodia). These demonstration sites have contributed to replication sites at Bataan (Philippines), Shihwa (RO Korea), Sukabumi (Indonesia), Cavite (Philippines), and Quang Nam (Vietnam) as well as 10 sites in China and 3 additional sites in Bali.

Effective programs are based on an explicit set of assumptions about how program inputs and activities are designed to result in intended outcomes. One of the most salient features of the PEMSEA approach is the detail — and the care — with which the assumptions about the establishment of effective site level ICM projects have been tested and refined. The PEMSEA ICM design and implementation strategy includes:

- stakeholder consultations at each site concerning key environmental and socioeconomic issues, including land-based activities, and use and user conflicts affecting the coastal environments;
- the development of a Project Coordinating Committee (PCC) composed of personnel from key agencies with coastal management responsibilities;
- a heavy emphasis on building ICM skills and knowledge and strengthening organizations;
- crafting and adoption of a coastal strategy, with the shared vision and mission for sustainable coastal development, the strategies and action programs that would address the issues, and the roles and responsibilities of each key sector and agency;
- the preparation of a coastal environmental profile/coastal strategy and other technical studies, including risk assessment; and
- the identification and formation of key partnerships with businesses and NGOs.

The combination of the key ingredients of the PEMSEA approach, guidance, an orderly process, and continuing support has the effect of encouraging successful completion of the immediate project outputs such as workplans, technical reports, coordinating committees, issue-specific action plans, and new institutions. It also helps build understanding among key constituencies about the intentions and strategies of local ICM, technical credibility, and local political commitment. To varying degrees, these benefits can be found at most project sites. Moreover, these benefits are essential building blocks to sustainable resource management institutions and improved environmental outcomes. One key indicator of success is the degree to which other jurisdictions in the Philippines, Indonesia, Vietnam, and China are replicating PEMSEA's approach at other sites [PEMSEA, 2006a].

The local successes of most PEMSEA's ICM projects have helped establish its reputation in the region. PEMSEA's commitment to fitting general management principles to local situations, involving people in developing a local management agenda, funding research that is biased toward management, and prolonging their engagement at the site level are among the factors that have served to build understanding, trust and commitment at the local level. Over time, PEMSEA's technical credibility, flexibility, and willingness to help, built the sort of political legitimacy that is rare among projects regarded as donor projects [PEMSEA, 2006a].

Participation/Consultation

A basic part of the PEMSEA strategy is the development of a shared vision for change and sustainable development. Stakeholder participation is a key component in developing that shared vision and commitment. Research and experience demonstrate that stakeholder participation can have a significant impact on the commitment of participants to specific policy initiatives which they helped develop. Principle 10 of the Rio Declaration, Agenda 21, and the Aarhus Convention are among the international instruments emphasizing the promotion of information sharing, integration of environmental considerations in decisionmaking, and provision of rights to individuals to have a voice in the shaping of their present and future environment. In general, public participation is a process that can enable interested public(s) and affected stakeholders to: *(a)* access information or be informed on the substance and process of a decision or actions that will affect the environment; *(b)* provide substantive input into the development and implementation of proposed management initiatives; and *(c)* seek legal remedies or compensation when decisions violate environmental policies, produce environmental damages, or prevent legitimate external parties from accessing information or providing substantive input into a decision [Maurer et al., 2003].

Participation processes have been designed and implemented at the PEMSEA ICM sites and at the subregional and regional levels. At the

ICM site level, the consultation process begins with the designation of the Project Coordinating Committee (PCC) composed of representatives of local agencies with coastal responsibilities. The PCC sets the policy direction for the ICM site, helps set policy priorities, and addresses key coastal conflicts. At some sites there are also technical working groups to address scientific issues. Most sites hold community forums and workshops as routine components of their planning and program design activities. Each site also develops a public awareness plan that may include mail-outs about the project, poster-making contests, videos, special components in high school curricula, and many other elements.

The emphasis on local ICM projects that address local coastal issues has often generated active community participation resulting in the development of a shared vision and action programs for the sites. The success of the local ICM practices, particularly in Bali, Batangas, Danang, and Xiamen, has generated national interest. The ICM practices have been gradually incorporated into national development plans (for example, China) and legal systems (for example, China, Vietnam, Indonesia, Malaysia, and Republic of Korea) as part of governance.

Through partnership development, networking, institutional linkages, and active outreach, PEMSEA has also sought to increase the involvement and participation of national policymakers. Research institutions and universities have been linked to the local sites and to each country through regional networks. NGOs have participated at the local, national, and regional levels. PEMSEA has also sought to encourage stronger cooperation and coordination with other regional organizations such as the Yellow Sea and South China Sea Projects, International Waters: LEARN, Coordinating Body on the Seas of East Asia (COBSEA), Food and Agriculture Organization (FAO), United Nations Environment Programme-Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (UNEP-GPA), Coastal Management Center (CMC), Ocean Policy Research Foundation of Japan, Nippon Foundation as well as other ongoing projects/programs in the region [PEMSEA, 2006a].

Consultation and participation have also been important regional initiatives. The 2003 Putrajaya Declaration and the subsequent SDS-SEA as well as the Haikou Partnership Agreement and the Partnership Operating Arrangements are the products of years of formal and informal consultation in the region. They are the culmination of a sequence of meetings, workshops, and policy forums starting from the Regional Programme for the Prevention and Management of Marine Pollution in the East Asian Seas (1993–1999). Numerous face-to-face meetings among PEMSEA and local and national leaders and policymakers in the region also helped lay the foundations for a shared vision. The process of development mirrors the step-wise approach seen at global level efforts, from the 1972

Stockholm Conference, to the 1982 UNCLOS, to the 1992 UNCED, to the 2002 WSSD, and puts the political expressions into real policy.

Participation or consultation processes can be assessed in terms of the intentions of their designers, the frequency of consultations, the number of participants, and similar indicators. However, the ultimate test is the perceptions of participants that they have had ample opportunities to be heard, that they have genuinely shared planning and management authority, and the resulting plans and decisions reflect the best wisdom of the participants. Fair and genuinely open participation processes can do much to build commitment among participants.

Supporting Resources

One of the potential incentives for participation in collaborative network efforts is access to increased funding, technical assistance, and other resources. PEMSEA operated on core funding of USD 8 million for the first phase (1993–1999) and USD 16.2 million for the second phase (1999–2007), or USD 24.2 million over the last 14 years. This core funding provided for network coordination, co-funding for numerous training activities, technical analysis, and technical assistance to individual projects.

PEMSEA has sought to generate additional funding through a strategy of cost-sharing and co-financing. The program has succeeded in raising an additional USD 25 million in all [PEMSEA, 2007]. The largest counterpart support, about USD 22.7 million, has been provided for ICM projects by national and regional governments, municipalities, and other partners. For the subregional activities, Bohai Sea and Manila Bay in particular, an amount of USD 4.5 million has been leveraged. The other program components have received counterpart support of about USD 1.5 million in total, of which about half came from donors (SIDA/CMC, IMO and UNEP-GPA), the remaining from foundations, research centers, and government authorities.

Even more substantial are the resources from other sources and initiatives that have effectively been leveraged by PEMSEA's own initiatives. It was estimated that about USD 4.6 billion has been identified by countries for implementing activities within the framework of the SDS-SEA [PEMSEA, 2006b]. This estimate only includes cash commitments for implementation of national priority related to coastal/marine programs. Substantial in-kind resource contributions have also been provided or committed by various partners in the member countries with project sites, the value of which has not been calculated.

Organizational Commitment

As noted above, agency commitment usually requires that the agency sees itself as acting in ways that are consistent with its mission and that the problems being addressed are critically important. The PEMSEA approach to building personal and organizational commitment is to combine "top-down" and "bottom-up" initiatives.

Initiatives like ICM are most effective when there is an active champion who is able to inspire and mobilize action from the various partners in the endeavor. Usually it is the political leader in the area. He or she would be the logical and most effective person to play this role [PEMSEA, 2006a]. Good teamwork among staff is critical, but support from political leaders (that is, at the local and national levels) is crucial, and can be either an obstacle when lacking, or a significant boost when present.

The PEMSEA approach is based on the recognition that the decisions of political leaders and policymakers can make or unmake sound management of the seas and coasts of the region. The top-down pressure comes, in part, from the presence of a regional coordinating office (that is, PEMSEA's Regional Programme Office) that constantly monitors progress and assists in addressing possible implementation hurdles in the various project sites. Another key component of the top-down impetus is the mandates provided by the Putrajaya Declaration and the SDS-SEA, to which national governments have committed. Another important source of energy is provided by the PNLG which is particularly designed to encourage commitment and action by local executives. One clear manifestation of this is the way the new provincial governor of Bataan, Philippines, was convinced of the importance of the ICM initiative upon his attendance of the PNLG meeting in Bali in 2005. While his province's ICM parallel site was established under his predecessor, his own "buy-in" was confirmed upon meeting with his counterparts in the rest of the region in Bali and recognizing the much wider context of the initiatives in his province [PEMSEA, 2006a]. At the national level, the regular meetings of the Programme Steering Committee (PSC) provide a regular forum for national officials to share accomplishments and issues [PEMSEA, 2006a].

At the local level, the extensive training programs in which local staff are involved, the technical assistance provided by PEMSEA staff, and the collaborative efforts among staff from several agencies to prepare environmental profiles, risk assessments, and local action plans build a shared sense of both the need for local action to address coastal problems and the effectiveness of the PEMSEA local strategy. The teamwork, coordination, and integration of efforts at the technical and working levels also provide an effective impetus to the local political leaders. Local coastal management initiatives that are already working well and leading to substantive accomplishments encourage local political support. The former Governor of Batangas province, Philippines, for example, attests to how the drive, competence, and effectiveness of the Provincial Government's Environment and Natural Resources Office (PG-ENRO) and its effective coordination of the Batangas coastal management program has convinced him of the critical importance of the PEMSEA-initiated ICM project in the province. This has, in turn, won the Governor's full support for the program, which the PG-ENRO and the Project Management Office (PMO) recognize as very important for the continued progress of work in the Batangas ICM program [PEMSEA, 2006a].

Conclusions

Collaborative management may indeed be the new paradigm for natural resource management — as well as for social services and many other areas of governance in which multiple agencies seek to grapple with complex problems. At present, the enthusiasm for greater collaboration in natural resource management outpaces the research on existing collaborative efforts. In spite of emerging research and practice, some "collaborative efforts" exist only as episodic meetings or interagency communications with little or no impact on individual agency management practices or resource conditions. As multiagency collaboratives proliferate, it is prudent to examine the assumptions, the effectiveness, and the impacts of these efforts. Evaluations are appropriately focusing on collaborative structures (membership, representativeness of membership, size, and the like), processes (frequency of meetings, transparency, decisionmaking styles, perceptions of effectiveness, and the like), production of outputs (management plans, management rules) and their association with outcomes (changes in resource conditions, and the like). In the evaluation literature, there are still divisions both about the criteria used to assess effectiveness of collaborative efforts and appropriate methods [Conley and Moote, 2003]. Researchers and theorists are pointing to the need for more large-sample, comparative studies of collaborative management efforts focusing on outcomes [Lubell et al., 2005].

While we look to comparative analysis for generalizations that can enlarge our understanding of the attributes of effective collaborative structures and processes, we often turn to case studies for insight and experience, particularly with regard to the design and maintenance of successful collaborative efforts [Yin, 2002]. The theoretical literature notes the importance of "consensual decisionmaking processes" and "shared agendas" in collaborative management, but case studies can provide details of how visions or agendas were created in specific collaborative efforts. The analysis of practical mechanisms for strengthening specific collaborative networks do not provide a detailed template to be applied in other situations, but they can help enlarge our understanding of the range of initiatives for building and strengthening collaborative networks and how they were applied in specific contexts.

In building the PEMSEA regional network over the past dozen years, PEMSEA staff put particular emphasis on creating a shared vision, developing awareness of the causes and consequences of trends in resource conditions, and developing and nurturing personal and institutional commitment to specific regional management efforts. How can consultation be effectively organized and sustained? What are practical strategies for building and maintaining personal and organizational commitment? The PEMSEA experience offers some examples. This chapter catalogued some of the initiatives that were part of this network-strengthening program. The multiple outputs of local, national, and regional network activities (technical analysis, plans, information systems, new management mechanisms, and the like) have also been documented in PEMSEA reports and independent evaluations. What is more difficult to convey is both the style of implementation and how the interaction among these initiatives have shaped and strengthened the regional network.

References

Bernard, T. and J. Young. 1997. *The ecology of hope: Communities collaborate for sustainability*. New Society, Gabriola Island, BC. 233 pp.

Booher, D. 2004. "Collaborative governance practices and democracy." *National Civic Review*, 93(4):32–46.

Christie, P. and A. White. 1997. "Trends in development of coastal area management in tropical countries: From central to community orientation." *Coastal Management*, 25:155–181.

Chua, T.-E. 2006. *The dynamics of integrated coastal management: Practical applications in the sustainable coastal development in East Asia*. GEF/UNDP/IMO Regional Programme on Building Partnerships in Environmental Management for the Seas of East Asia, Quezon City, Philippines. 468 pp.

Chua, T.-E. and J. Lee. 2004. "Sharing intellectual wealth in coastal and ocean governance." *Tropical Coasts*, 11(1):60–67.

Chua, T.-E., D. Bonga and N. Bermas. 2006. "The dynamics of integrated coastal management: PEMSEA's experience." *Coastal Management*, 34(3):303–322.

Conley, A. and M.A. Moote. 2003. "Evaluating collaborative natural resource management." *Society and Natural Resources*, 16:371–386.

Godschalk, D.R. and W.E. Mills. 1966. "A collaborative approach to planning through urban activities." *Journal of the American Institute of Planners*, 32(2):86–95.

Gray, B. 1989. *Collaborating: Finding common ground for multiparty problems*. Jossey-Bass, San Francisco, CA. 329 pp.

Healey, P. 1992. "Planning through debate: The communicative turn in planning theory." *Town Planning Review*, 63(2):143–162.

Innes, J.E. 1996. "Planning through consensus building: A new view of the comprehensive planning ideal." *American Planning Association Journal*, 62(4):460–472.

Innes, J.E. 1999. "Evaluating consensus building," pp. 631–675. In: *The consensus building handbook: A comprehensive guide to reaching agreement*. Edited by L. Susskind, S. McKearnan and J. Thomas-Larmer. Sage, Thousand Oaks, CA.

Innes, J.E., and D.E. Booher. 1999. "Consensus building and complex adaptive systems: A framework for evaluating collaborative planning." *American Planning Association Journal*, 65(4):413–423.

Jones, L. 1996. "Howdy neighbor! As a last resort, westerners start talking to each other." *High Country News*, 28(9):1,6–8.

Keast, R., M.P. Mandell, K. Brown and G. Woolcock. 2004. "Network structures: Working differently and changing expectations." *Public Administration Review*, 64(3):363–371.

Koh, T.B. 1983. "A constitution for the oceans." In: *UN, The Law of the Sea – Official text of the United Nations Convention on the Law of the Sea*. United Nations, New York, USA.

Kullenberg, G., T.-E. Chua and M.C. San. 2006. "What drives regional cooperation in coastal and ocean governance?" *Tropical Coasts*, 13(1):4–9.

Lowry, K., P. Adler and N. Milner. 1997. "Participating the public: Group process, politics, and planning." *Journal of Planning Education and Research*, 16(3):177–187.

Lubell, M., P.A. Sabatier, W. Focht, M. Lubell, Z. Trachetenberg, A. Vedlitz, M. Matlock. 2005. "Conclusions and recommendations," pp. 261–296. In: *Swimming upstream: Collaborative approaches to watershed management*. MIT Press, Cambridge, MA.

Mankin, D.A. and S.G. Cohen. 2004. *Business without boundaries: An action framework for collaborating across time, distance, organization and culture*. Jossey-Bass, San Francisco, CA. 240 pp.

Margerum, R.D. 2001. "Organizational commitment to integrated and collaborative management: Matching strategies to constraints." *Environmental Management*, 28(4):421–431.

Margerum, R.D. and D. Whitall. 2004. "The challenges and implications of collaborative management on a river basin scale." *Journal of Environmental Planning and Management*, 47(3):407–427.

Maurer, C., S. Ehlers and A. Buchman. 2003. "Aligning commitments: Public participation, international decisionmaking and the environment." *WRI Issue Brief*, Washington D.C., May 2003. 23 pp.

PEMSEA. 2002. "Review of regional mechanisms for coastal and ocean governance around the world." Unpublished Report. GEF/UNDP/IMO Regional Programme on Building Partnerships in Environmental Management for the Seas of East Asia, Quezon City, Philippines. 29 pp.

PEMSEA. 2003. *Putrajaya Declaration of regional cooperation for the sustainable development of the Seas of East Asia: Sustainable Development Strategy for the Seas of East Asia: Regional implementation of the World Summit on Sustainable Development requirements for the coasts and oceans*. GEF/UNDP/IMO Regional Programme on Building Partnerships in Environmental Management for the Seas of East Asia, Quezon City, Philippines. 111 pp.

PEMSEA. 2005. *Consensus building for the formulation of the Sustainable Development Strategy for the Seas of East Asia*. PEMSEA Technical Information Report, No. 2005(3). GEF/UNDP/IMO Regional Programme on Building Partnerships in Environmental Management for the Seas of East Asia, Quezon City, Philippines. 24 pp.

PEMSEA. 2006a. *Performance evaluation. Building Partnerships in Environmental Management for the Seas of East Asia (PEMSEA)*. Terminal Evaluation Report. PEMSEA Information Series. GEF/UNDP/IMO Regional Programme on Building Partnerships in Environmental Management for the Seas of East Asia, Quezon City, Philippines. 177 pp.

PEMSEA. 2006b. *Proceedings of the 12th Programme Steering Committee Meeting, Davao City, Philippines, 1–4 August 2006*. PEMSEA Meeting Report No. 6. GEF/UNDP/IMO Regional Programme on Building Partnerships in Environmental Management for the Seas of East Asia, Quezon City, Philippines.

PEMSEA. 2007. *PEMSEA: Partnerships in Environmental Management for the Seas of East Asia (1994–2010): A mechanism facilitating sustainable environmental benefits in river basins, coasts, islands and seas*. PEMSEA IEC Material 2. GEF/UNDP/IMO Regional Programme on Building Partnerships in Environmental Management for the Seas of East Asia, Quezon City, Philippines. 80 pp.

Sabatier, P.A., W. Focht, M. Lubell, Z. Trachetenberg, A. Vedlitz and M. Matlock. 2005. *Swimming upstream: Collaborative approaches to watershed management*. MIT Press, Cambridge, MA. 327 pp.

Susskind, L., S. McKearnan and J. Thomas-Larmer. (eds). 1999. *The consensus building handbook: A comprehensive guide to reaching agreement*. Sage, Thousand Oaks, CA. 1147 pp.

Tan, A. 2003. "Review of regional mechanisms for coastal and ocean governance in the Seas of East Asia." Unpublished Report commissioned by PEMSEA. GEF/UNDP/IMO Regional Programme on Building Partnerships in Environmental Management for the Seas of East Asia, Quezon City, Philippines.

Tropical Coasts. 2006. "One Vision, One Ocean." *Tropical Coasts*, 13(2). 88 pp.

USIECR (US Institute for Environmental Conflict Resolution). 2004. *Interagency initiative to foster collaborative problem solving and environmental conflict resolution: Briefing handbook for federal leadership*. Tucson, Arizona. 103 pp.

Weber, E. 2000. "A new vanguard for the environment: Grass-roots ecosystem management as a new environmental movement." *Society and Natural Resources*, 13(3):237–259.

Williams, E. M. and P.V. Ellefson. 1997. "Going into partnership to manage a landscape." *Journal of Forestry*, 95(5):29–33.

Wondolleck, J.M. and S.L. Yaffee. 2000. *Making collaboration work: Lessons from innovation in natural resource management*. Island Press, Washington, DC. 277 pp.

Yeung, H.W-C. 2000. "Organizing 'the firm' in Industrial Geography 1: Networks, institutions, and regional development." *Progress in Human Geography*, 24(2):301–315.

Yin, R.K. 2002. *Case study research: Design and methods*. 3rd Edition. Sage, Thousand Oaks, CA. 200 pp.

CHAPTER 15

Coastal Governance: A Reflection of Integrated Coastal Management (ICM) Initiatives with Special Reference to the East Asian Seas Region

Chua Thia-Eng

Introduction

During the last 3 decades, various integrated management approaches to coastal governance had been actively advocated, experimented, and practiced in no less than a hundred countries throughout the world. These initiatives were undertaken in various forms and geographical or functional scales (for example, integrated coastal zone management [ICZM], integrated coastal management [ICM], coastal area management [CAM], integrated coastal area management [ICAM], coastal resource management [CRM], integrated coastal and ocean management [ICOM], integrated water resource management [IWRM], integrated river basin management [IRBM], large marine ecosystem [LME] management, marine protected areas [MPA], and community-based coastal resource management [CB-CRM]) [Haq et al., 1997; Clark, 1996; Chua, 2004, 2006]. All these initiatives emphasized the importance of some forms of policy and functional integration. While there were some successes in terms of impacts and sustainability of management programs on the ground (and also many failures in achieving the set objectives), confusion on the concept, mode of operation, and standard of practice continues [Chua, 2006].

This chapter presents a reflection of the application of the integrated management approach to the coastal and marine areas through a rethink of its relevance, concept, practices, policy and legislative supports, financing, capacity development, and scaling up of practices with special reference to the East Asian Seas region. It is hoped that the reflections might contribute to clearing up some of the conceptual and methodological confusions.

Relevance

The application of ICM may have to vary according to different local, national, and regional demographic, socioeconomic, and ecological conditions of the coasts. The administration of ICM is greatly influenced by population density, space availability for land- and sea-use, and level of economic development in the coastal areas. In most European coasts where population density is high and the coasts are heavily utilized, the ICM approach tends to focus on addressing competitive use of the limited coastal resources through careful spatial planning and zoning. On the other hand, with the exception of some urban cities, most U.S. and Australian coasts are comparatively thinly populated and with vast areas of coastal lowland; in these areas, the ICM approach tends to focus on habitat protection and conservation and on planning for future use. However, population is increasing and the American and Australian coasts will soon face the similar challenges as their European and Asian counterparts [Meadows et al., 1992; PEMSEA, 2003, 2005].

However, in the East Asian Seas region, where more than 60 percent of the approximately 2 billion people are living near the coasts; where the world's most active economic centers are found; and where severe environmental pollution and changing climatic conditions are the major threats, the application of ICM would have to focus on addressing pressing local and regional transboundary concerns [PEMSEA, 2003, 2005]. Coastal and marine management issues often involve a wide spectrum of stakeholders and governing agencies due to the nature of multiple uses of the coastal and marine resources, the exploitation of which often give rise to political, boundary, and legislative conflicts [Townsend-Gault, 2004; Chua and Scura, 1992; Chua, 2006; Valencia, in this volume].

Regardless of the above coastal conditions, there is no doubt of the need and usefulness of integrated management that will help in planning and managing the coastal areas. The need for effective integrated management however, has become more apparent with the increasing economic activities in coastal urban areas especially with the projected urbanization, globalization, and change of consumption and use patterns that are happening very fast in the region.

A paradigm shift in the approach of coastal management is essential particularly from heavy reliance on the conventional engineering approach or "hard approach" to the inclusion of "soft approaches" such as building an informed and committed public/stakeholders, use of incentives and disincentives, as well as education to change human behaviors.

With increased reliance of global trade on ocean transport and proliferation of megaports and increasing security threats, a more dynamic approach to coastal and ocean governance should be developed. This is needed even more in the East Asian Seas region where parts of a manufactured good are produced in different countries and assembled as a whole elsewhere in other parts of the region or globe [DeSombre, in this volume]. This requires larger and more efficient port facilities and safer maritime transportation for the growing maritime trade. To date, 13 of the world's 20 megaports are located in the region.

ICM is widely accepted and recognized as an international approach for coastal and marine management. It was recommended in several UN conferences/conventions and action plans (for example, UNCED, WSSD, UNICPOLOS, CBD, IPCC, Agenda 21, GPA) and adopted by IUCN, GEF, UNDP, UNEP, UNIDO and several other international and UN organizations as an effective governance approach for achieving sustainable development of the coastal areas especially in providing the relevant management framework for marine protected areas, conservation of biodiversity, and response to climate change. It was also recommended as the management framework in the implementation of the FAO Code of Conduct for Sustainable Fisheries [UNCED, 1992; CBD, 1995; IPCC, 2007; Cicin-Sain and Knecht, 1998; FAO, 1997; PEMSEA, 2003; WWF-Australia, 2006].

It is therefore desirable that the rhetoric of creating new acronyms — often the consequence of scientists' and donor agencies' propensity to differentiate one initiative from another or in justifying newly created projects — be reduced so as not to further confuse policymakers and coastal managers.

Concept

Definition, Goals, Principles, Priorities, and Practices

The concept of integrated coastal management has evolved over the years through more than hundreds of ICM programs around the world. Many useful lessons have been drawn from these practices. The integrated policymaking, planning, and management approach is well established in terms of definition, goals, principles, and practices [Chua, 2006; Meadows et al., 1992]. ICM is defined as "a natural resource and environmental management framework which employs an integrative, holistic management approach and an interactive planning process in addressing the complex management issues of the coastal area." The major goal is to attain sustainable coastal development including maintaining the functional integrity of ecosystems.

In recent years, there is an increasing advocacy for the adoption of an ecosystem approach (EA) or ecosystem-based management (EBM) as a "timely" concept for coastal and ocean governance. The EBM is often defined as a "strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way" [CBD, 2000]. A recent study further clarifies the term EBM or EA: "it applies current scientific understanding of ecosystem structure and processes to achieve more coordinated and effective management of society's multiple uses and interests; [however], EBM does not prescribe a particular outcome; instead, it acknowledges that changing the ecosystem can also change the services it provides" [National Research Council, 2007].

Despite the recent advocacy by scientists [COMPASS, 2005] and recommendations at the United Nations Open-ended Informal Consultative Process on Oceans and the Law of the Sea (UNICPOLOS), there are very little significant differences in terms of operational modality between ICM and EBM as both adopt an integrated and ecosystem-based approach to achieve sustainable use of living resources and protection of the ecosystem functions. For example, in recent years, and after several years of iterative meetings and forums, the fisheries community has shown its preference for the use of the term ecosystem approach to fisheries (EAF). However, practitioners in this sector recognize that EAF is a subset, if not a synonym, of integrated management [Garcia et al., 2003].

However, ICM and EBM might deviate in terms of priority, focus, outcome, and area coverage. In many deliberations, EBM or EA might assume greater priority or focus on ecosystem protection and management by taking on a management scope that cover the entire ecosystem(s) such as the management of LMEs [COMPASS, 2005; WWF-Australia, 2006]. Ecosystem research thus becomes an important part of EBM in order to better understand the ecological functions of the ecosystems.

On the other hand, ICM is process-oriented, interactive, and multi-disciplinary and promotes an incremental but holistic approach especially in resolving multiple resource use conflicts, protection of ecosystem functions, and food security as well as response to environmental changes in the coastal and marine areas. ICM may start with a smaller geographical scale within the administrative boundary of a local government and then gradually scale up its operation to cover the entire coastline or ecosystems within a geographical limit. Geographical and functional coverage of ICM is adequate to include the concerns of EA or EBM [Chua, 2006].

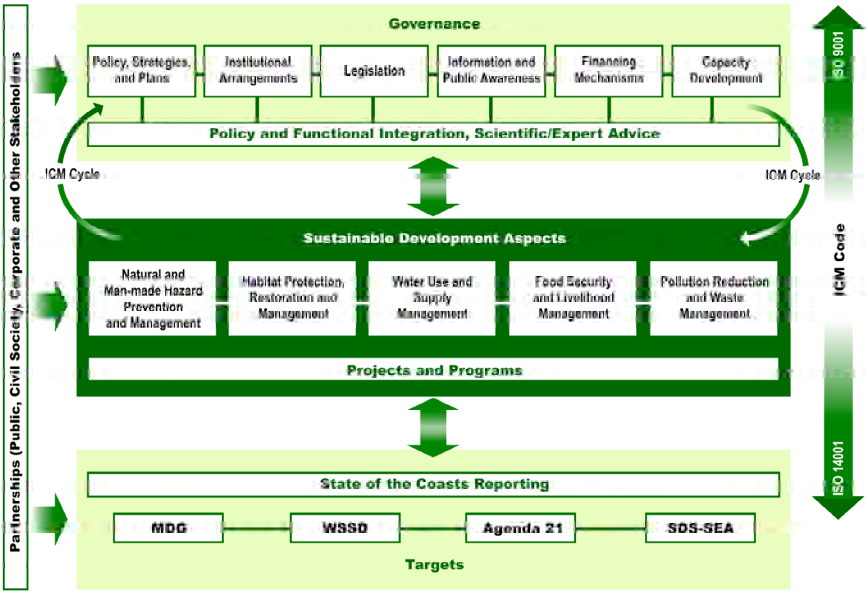
EBM is one of the four fundamental principles of sustainable development, in addition to: adaptive management, inter- and intra-generational equity, and the integration and interrelationship principles [Chua, 2006]. Based on these principles, ICM practitioners consider the objectives and concerns of EBM and give sufficient consideration to the priority of EBM when considering tradeoffs (for example, when decisions are needed to construct facilities within ecologically important habitats).

For the last 3 decades, the ICM concept has been limited to the confines of an integrated policymaking, planning, and management framework and a cyclical process from initiating an ICM program until its adoption, implementation, and monitoring of its strategies and action plans. Many inherent aspects of ICM practices ranging from governance to strategic action program implementation have yet to be standardized or codified so that the outputs and outcomes of ICM can become more predictable and measurable. Past initiatives — particularly in developing countries — tend to be fragmented and often respond to specific needs such as poverty eradication, small-scale fishery management, community-based MPA, and so on [National Research Council, 2007]. A comprehensive approach that includes both the governance in providing a broad legal framework and the sustainable development aspects in addressing the common environmental and sustainable production concerns of the coastal area has been wanting.

Framework for Sustainable Development of Coastal Areas

The recent work of the Partnerships in Environmental Management for the Seas of East Asia (PEMSEA) in providing a framework for Sustainable Development of Coastal Areas (SDCA) has effectively closed the conceptual loop of ICM [PEMSEA, 2007]. Under this expanded conceptual and operational approach, a complete ICM program will include [Figure 1]: *(a)* the application of the ICM program development and implementing cycle to plan and execute the various essential activities under the components for governance and strategic action programs; *(b)* a State of the Coasts Reporting (SOC) system to monitor existing conditions and response actions, measurable through process and impact indicators and targets; and *(c)* an ICM Code that adopts international standards (ISO) for quality management and sound environmental management.

Figure 1: Process-oriented Common Framework for Sustainable Development of Coastal Areas Thru ICM Implementation



Source: PEMSEA [2007]

The SDCA framework is an attempt to create an ICM system which is made up of key components of local governance and several important strategic action programs critical for achieving the goals of sustainable development, covering: natural and manmade hazard management; natural habitat and cultural heritage protection, restoration and management; water use and supply management; food and other living resources security and livelihoods management; and pollution prevention and waste management.

Governance

The governance component of the SDCA framework underscores the integration of policy and strategies in developing specific actions plans, in particular, in creating a policy environment for environmental financing, ecosystem protection, and capacity development. It promotes institutional arrangements that facilitate interagency, multisectoral cooperation and collaboration; develops appropriate legislation to ensure policy and functional integration; and provide a legal basis for their enforcement. It develops the appropriate financing mechanism to sustain and fund environmental management as well as creates an enabling environment for strengthening local coastal governance through capacity development.

Sustainable Development Aspects/Programs

The inclusion of the five major components of sustainable development aspects/programs, namely: hazard, habitat, water, food, and pollution, represents the common concerns of all local governments and communities in any given coastal area irrespective of geographical locations. The ability to address these common concerns coupled with appropriate integration of respective policy and functions of line agencies and the support of stakeholders and the public in general leads to resolution of multiple-use conflicts, improvement and preservation of environmental quality and biodiversity, effective response to climate change, conservation of water resources and effective water supply services, and improvement of the standard and quality of living through eradication of poverty and improvement of food security measures.

Natural and manmade disaster prevention, response, and management

While many countries have their own disaster management strategies or response systems, most are coordinated at the national level. However, as experienced in many developing nations of the world, response to natural or manmade disasters are usually much delayed and more often than not, poorly coordinated. The oil spill episode in 2006 near Guimaras Island (Philippines) is a case in point — resulting in delay of oil spill response and complete chaos in interagency coordination, leaving the local government with no clear direction for remedial actions [CBS News, 2006; WWF-UK, 2006]. Therefore an ICM program should assist the local government in developing a comprehensive and integrated natural and manmade disaster response and management program so that it can pool available resources to address a common threat regardless of the institutional mandates.

With the predicted threats of global warming such as a temperature rise between 1.8 and 4°C and sea level rise between 0.2 and 0.6 m [IPCC, 2007], local governments should make sufficient preparation to assess their level of vulnerability and undertake adaptive measures to increase social and ecosystem resilience; such will adequately prepare them for any eventual disasters be it arising from natural causes or by human activities. The ICM system is intended to prepare the local government and its stakeholders to respond to such disaster occurrence. While coordination with national authority is deemed necessary, it is in the interest of the people that local governments should take the initiative in preparing for such eventuality while maintaining close coordination with the concerned agencies.

Natural habitat and cultural heritage protection, restoration, and management

A local government unit should also play a stronger role in the protection, restoration, and management of habitats, and preservation of cultural heritage as these ecosystems and cultural sites are located within their administrative boundary and it is only proper that they play a key role in the coordination of planning and implementation of action programs. Local government should develop a comprehensive and coordinated program that integrate efforts on MPA, mangrove and seagrass replanting, legislation to protect ecosystem, and biodiversity as well as any other management measures so that habitat management is undertaken as part of the ICM program. In countries where central government play the pivotal role in the management of MPAs or cultural heritage, local government should still work closely with the central government as they are the immediate beneficiary of a well-preserved marine national parks, MPAs, or cultural heritage.

Water uses and supply management

With rapid coastal urbanization, freshwater shortage could seriously affect many existing coastal cities in the region and certainly other new ones. The standard of water management in most urban cities in the developing nations is far from what is desired. A large number of countries in the region and certainly a large number of them outside the region do not have safe drinking water. Most people depend on bottled water for their daily needs. This is a mockery of the 21st century indeed. Groundwater extraction has been rampant in many countries in the region and where control by government has been made, the pricing is far lower than that of tap water thus encouraging further extraction especially by industries. Land subsidence often occurs and in some cases, salination of groundwater has contaminated freshwater aquifers and affected crop production.

Water management especially water use, supply, reuse, and water resource management has become an inseparable part of sustainable development. Water management must form a major consideration in town and country planning especially with projected increase in urban population. Local government should include water management as one of the key sustainable development programs.

Food security and livelihood management

The coasts and oceans have served as the primary source of food and livelihood for a large part of the approximately 2 billion people living along the coasts of the Seas of East Asia. Despite the rapid economic development in the region — such as in China and Vietnam where GDP growth has been maintained at fairly high levels of about 10 percent per year — there are still a substantial number of people in the region earning

USD 1 a day. While the income level of coastal population in most countries are relatively economically better off than their counterparts in the landward interior, there are still a substantial number of the poor coastal population including marginal fisherfolks who depend on subsistence fishing for their livelihood.

Fish is an important source of protein in this part of the world where per capita consumption is among the highest in the world. The region produces about 40 percent of world fish production and more than 80 percent from aquaculture. A large part of fish production is being consumed locally. Fisheries and aquaculture therefore play a significant role in food security of the region. In many coastal cities — and as they increasingly become more urbanized — the role of fisheries diminishes due to the competition for limited water space. Thus the role of fisheries needs to be reassessed in urban versus rural areas. Fishers might be replaced as a result of coastal urbanization and it is essential to ensure that alternative livelihoods are in place. A comprehensive sustainable fisheries management plan needs to be developed following the FAO Code of Conduct for Responsible Fisheries [FAO, 1997]. The plan should take also into consideration the sustainable use of other marine living resources and the ecosystems that produce them.

Pollution reduction and waste management

Pollution is one of the major challenges in coastal governance. Most of the pollutants come from land-based sources including industries, households, and agriculture while comparatively lesser amount comes from ships and sea exploration and harvesting activities. Pollution of the coastal waters is rather serious in many nations of the world and particularly in the Seas of East Asian region due to the predominance of human population. All local governments have to address issues about treatment of solid wastes, sewage, hazardous wastes, introduction of exotic species, and so on. To a large extent, air pollution in coastal areas is closely related to the fuel emission from cars, industries, and burning of wastes. Air and water quality management form an important part of sustainable coastal city development. A local government should put in place a comprehensive and integrated air and water quality management plans.

Most line agencies at national or local levels are already doing some aspects described above. However, the strength of ICM is to coordinate the delivery of these programs in a manner that they are mutually reinforcing and cost-effective. An ICM program should not be seen competing for resources with line agencies or other programs but as one that can add value and even resources to enhance their work. In essence, the role of ICM is to facilitate the integration of various line agencies in undertaking the key component programs.

State of the Coasts (SOC) Reporting

The two other components of SDCA, the SOC and the ICM code, are equally significant. The SOC serves as a scorecard with respect to meeting international and regional agreements. The SOC provides an up-to-date baseline information pertaining to the demographic and socioeconomic conditions of the concerned coastal area (province/state/prefecture, regency/municipality, district/county, villages) based on available information. It also provides information on the outputs of activities related to the governance of the local authority, in particular the availability of coastal or ocean policy, sectoral policies, coordinating mechanism, relevant legislation, financing, public consultation processes, capacity development efforts, and so on.

The SOC document provides information on the up-to-date condition of management actions that have been put in place and outcomes (such as water quality). The SOC then provides an opportunity for the local government to identify areas that will need to be undertaken, the outputs and outcomes of which will be assessed during the next reporting cycle.

The SOC is presented in three parts: Part I provides the general basic information on demography, socioeconomic, and environmental status of the target area. Part II summarizes targets and the progress made in meeting the targets using appropriate indicators. This part of the SOC contains information meant for the local policymakers and leaders of concerned agencies. Part III, on the other hand, contains specific details of the conditions, responses, and achievements made over the reporting period. This part is meant for coastal managers and other users.

The usefulness of the SOC is that the information contained therein is cumulative over the startup phase and frequently enriched through each reporting cycle.

ICM Code

The ICM Code is built upon the broad framework of ISO 9001 (quality management) and ISO 14001 (environmental management) which effectively transforms ICM from a loosely coordinated, poorly documented, and highly experience-dependent management approach to a process-oriented, well-documented, institutionalized management system.

The ICM Code provides the rule of practice in integrated coastal management system by matching ISO 9001 quality management framework and requirements for the governance component and ISO 14001 environmental management framework and requirements for the sustainable development aspects (or programs).

The Code will enable the local governments to undertake an ICM program following a standard planning and management framework and a set of procedures in streamlining and integrating policy, strategies, and resources for undertaking specific action programs.

The ICM Code also specifies basic requirements that need to be fulfilled and provides the needed guidelines on how to accomplish them.

Refinement of the ICM Development and Implementing Cycle

Although the basic steps of the ICM development and implementing cycle are essentially the same [Chua, 2006], the key activities under each steps are further modified and refined sequentially in accordance with the pertinent steps of the cycle, as well as incorporating the key elements of the SDCA framework. The refined ICM cycle [Figure 2] takes into consideration the requirements of the ICM Code as well as the SOC reporting. It also ensures a systematic approach in the application of the ICM system.

The Preparing stage is initiated once an ICM site has been officially accepted after completing site selection procedures and analysis [Chua, 2006]. An important consideration in site selection that needs further emphasis is the identification and use of available political opportunity that could contribute to the success of an ICM initiative. The term "political opportunity" denotes the political climate that might be favorable for investing in an ICM program.

During the Initiating and Developing stages, key activities are focused on identifying and prioritizing the problems (both environmental and management-related), defining and undertaking the types and level of social and scientific analysis (such as risk analysis, ecosystem analysis, water quality analysis, social analysis) which provide expert advice to policy, institutional, legal, financing, and management interventions. These two stages are most time consuming as they literally cover the development of comprehensive strategies and workplans following the requirements of the ICM Code.

The Adoption process might be relatively short but the need to prepare the lawmakers at local level to agree to the proposed plan of actions will certainly require intensive public awareness campaigns and political will. However, lengthy legislative procedures might be a cause of delay if formal legislative support is deemed necessary. Thus target-oriented communication plans need to be adequately put in place at the initiating and developing stages to prepare the lawmakers towards supporting the proposed legislation. On the other hand, the Implementing phase demands the availability of manpower, financial resources as well as the commitment to implement the action plans. Monitoring, documenting, and reporting

Figure 2: The ICM Development and Implementing Cycle (Revised 2007)

are the three major activities that have to go hand in hand in developing major action programs as well as providing the basis for refinement and preparation for the activities of the next cycle.

Scientific Assessment and Experts' Advice

Appropriate interdisciplinary scientific research and assessment is necessary to generate reliable information needed for the implementation of the various components of the SDCA framework. Reliable scientific information should be communicated to the decisionmakers to help them make the right policy and management decisions. Scientific assessment in the ICM program cuts across various components of the SDCA. Scientific efforts should be directed to address management concerns that require scientific evaluations and interpretation including long-term monitoring of the State of the Coasts, the carrying capacity of the ecosystems, and assessment of human, ecosystem, and societal risks arising from loss of ecosystem services.

A major challenge of most local governments is the lack of qualified technical and management experts. The resource for technical and management expertise could be developed through vertical and horizontal learning by being involved in the planning and implementation of the ICM program. This approach is different from past capacity building practices which imported such expertise from national research institutions and universities or from abroad. However, it is always advisable to mobilize local technical research institutions or universities to participate in coastal governance programs. This could help in mobilizing local technical expertise and enhancing their skills through the learning process. Some ICM programs set up an interdisciplinary expert group to provide technical advice to local governments and this has proven to be a very useful and cost-effective exercise [PEMSEA, 2005].

Performance Evaluation and Indicators

The application of the ICM Code shall enable the local government implementing an ICM program to document the process, the outputs, and outcomes of planned activities in a systematic manner and be evaluated periodically in accordance with the set indicators which are generally classified into various categories. A recent manual of IOC [2006] grouped the various indicators into three categories, namely: governance performance indicators, ecological indicators, and socioeconomic indicators. GEF on the other hand proposed the following for its International Waters projects: process indicators, stress reduction indicators, and environmental status indicators [Duda, 2002]. Whatever indicators are used, it is essential to clearly define what each indicator measures.

In the State of the Coasts reporting, both the indicators proposed by IOC and GEF are integrated and used in relation to the international targets of MDG, WSSD, and Agenda 21. For example, the governance indicators are largely covered under the evaluation of the governance components of the SDCA while the socioeconomic indicators are linked with the international targets. The ecological indicators on the other hand can be applied to measure the performance of the sustainable development aspects/programs. The three indicators of GEF: process, stress, and status are very useful for measuring progress, outputs, and outcomes.

Validation of the Expanded Concept

In essence, the concept of ICM has evolved over time and many progresses have been made. The challenge is how to transform the concept into successful practices.

The expanded concept of ICM requires further verification and evaluation in terms of replicability, cost-effectiveness, and acceptability by coastal practitioners. Despite the attempt to codify ICM practices, adaptive management remains a fundamental principle of ICM due to scientific uncertainties, management complexity, and the scale of environmental changes [Holling, 1978; Imperial and Hennessey, 1993; Chua, 2006].

Practices

Historical Development and ICM Transformation

Coastal management practices began in the early 1970s in Australia and the United States largely for the protection and conservation of habitats and marine resources [Clark, 1996]. The practices have been expanded to address multiple-use conflicts arising from the increasing resource competition by various users. Coastal resource management projects were initiated in the early 1980s in Southeast Asia and Latin America as well as in the 1990s in Africa, largely through donor initiatives [Chua and Scura, 1992; Haq et al., 1997].

The transformation of coastal management approach from donor initiatives to government-funded programs took time to materialize. While the principle of integration and coordination is generally accepted, management approaches did vary to a large extent. The community-based management or co-management approach emphasizes the dominant role of community in the management of the coastal/marine resources they have been dependent upon [Raymundo, 2002]. There are some successes in such initiatives especially in areas where management authority has been devolved to the local government. The challenge to this approach is its inability to address externality such as the impacts of other sectors on the resources and political pressures, or in securing a broader stakeholder support or government budgetary allocation. However, such approach is effective when it is operated within a broader integrated management legal framework so that community-based management activities become an inseparable part of the ICM framework [National Research Council, 2007]. In Japan, while fisheries cooperatives are given the exclusive rights in the management of fisheries resources within a given area of the coastal waters, this mechanism could also in some way impose difficulties in harmonizing the activities with other users.

The involvement of local government is thus very essential to provide the needed legitimacy and to ensure that coastal management initiatives are mainstreamed into its economic development agenda.

Application of ICM

It is interesting to note that in most developing countries, ICM is more easily accepted and implemented as they are introduced. This might be due to many reasons. One obvious reason is that the resolution of problems in multiple-use and policy conflicts and overlapping functions of line agencies make ICM attractive. The other reason is that the implementation of the new concept comes with external funding while at the same time builds the needed local capacity for achieving sustainable coastal development.

On the other hand, ICM is still not well received in some developed nations such as Japan, and in some degree, RO Korea and Singapore. One possible reason is that there are no major, visible, and urgent cross-sectoral environmental or sustainable development issues that warrant line agencies to work together in an integrated manner. Moreover, central line agencies play a critical role in sectoral management and there are sufficient dialogues between various line agencies and therefore there is no imminent need for an ICM program. With readily available funds and strict implementation of specific environment-related laws, line agencies in these countries are able to function effectively. Although there are cross-sectoral issues, these are not considered a priority requirement for policy and functional integration. Another possible explanation is that the bureaucratic machineries in these countries are so rigid and cannot be easily changed.

However, the above views are changing. RO Korea enacted the first Asian Integrated Coastal Management Act in 1999 and established the Ministry of Fisheries and Marine Affairs (MOMAF) to address many of the functional overlaps between line agencies and to achieve policy integration. Japan recently enacted the Basic Ocean Law in July 2007 which promotes integrated management in coastal and ocean governance. In fact, the establishment of the Ministry of Land, Infrastructure and Transport (MLIT) effectively integrates the management of land resources with a large extent of the coastal waters (about 70 percent). At the same time there is also a growing recognition of the validity and need for integrated coastal management among developed nations in Europe and North America.

Despite the wide application of ICM in most parts of the world, majority are donor-driven. A large majority of donor- and consultant-driven projects were not able to continue when the external funding ended. The lack of ownership is often given as the main reason for the failure of sustainability. The inability of these projects to develop the needed local capacity and a stronger buy-in from the local governments are among the possible causes.

National ICM Efforts

There are increasing national efforts to implement ICM. Some countries such as China, Indonesia, Philippines, Thailand, RO Korea, and Vietnam are among the countries in East Asia in the forefront of adopting and implementing coastal management in different forms and scales.

The ICM approach has been tested in different social systems in the East Asian region. The experience of PEMSEA shows that ICM can be readily accepted and incorporated into the management system in socialist systems such as China, DPR Korea, and Vietnam where centrally-controlled, top-down approach is still the norm of governance [PEMSEA, 2006, 2007]. The challenge here is to encourage a greater degree of stakeholder consultation and participation in the ICM process. On the other hand, it usually takes a much longer time to implement an effective ICM program in countries where the system of governance and protocol require intensive stakeholders' consultative process to facilitate their buy-in. In these countries such as Philippines, Indonesia, and Thailand, where substantive decentralization of governance has already taken place, a bottom-up approach is normally adopted to ensure adequate community participation. In such cases, the challenge is to ensure sufficient buy-in from the central and subnational governments so that national objectives in coastal development could also be met. Irrespective of the social systems, the ICM approach can be applied. The challenge is how to use top-down and bottom-up approaches in such a manner that strikes a balance between them [PEMSEA, 2007].

Coordination and Integration

Coordination and integration are two key elements of ICM practices that contribute substantially to the success and effectiveness of any integrated management program. These elements pose the most significant challenge as evidenced by various degrees of successes. The coordinating capacity of the local lead agency is essential to coordinate, facilitate, and mobilize interagency platforms to address common issues. Policy conflicts between line agencies are not uncommon and these need to be adequately resolved or harmonized through establishing common vision, mission, and policy in the use of the coastal resources. Similarly, duplication of efforts and ineffective use of human and financial resources among agencies could be reduced through appropriate functional integration. These could only be done through an effective coordinating mechanism. Interagency collaboration which builds on sharing of project funding — sourced from other sources only — often fails to prosper.

To a larger extent, the weakness in coordination can be attributed to the design of the ICM programs. Most ICM initiatives in the past were initiated through environmental agencies or through environmental consultants largely because ICM was and still is linked with environmental management. In most countries, an environmental agency is the latest entry into a government administrative structure and more often than not is one of the weakest in terms of financial resources and priority. In some cases, ICM projects were coordinated by a science and technology agency. In both cases interagency coordination has been difficult.

Placing the coordinating mechanism under a neutral agency such as an agency for development and economic planning or town and country planning might be more effective in facilitating interagency cooperation while the environmental agency can serve as a lead implementing agency.

The establishment of an interagency, multisectoral coordinating committee or a council such as the Sustainable Development Committee of Danang, the Marine Management Committee of Xiamen, or the Batangas Bay Resource Management Council of Batangas Bay region, can help in promoting interagency cooperation and reduce interagency conflicts. PEMSEA encourages local governments to establish a sustainable development committee under the direct supervision of the head of the local administration in order to command cooperation and support from all line agencies and sectors of the community.

Building stakeholders support is another essential coastal management practice. Involving credible local or community-based NGOs often facilitates closer communication with the community in securing their support and participation during the planning and implementing processes as well as in preparing them to possible policy and management interventions.

The outputs and outcomes of ICM practices vary considerably with how the ICM program is being developed and implemented. Very often it depends on the dynamics and interplay of the essential elements of the ICM system.

One should recognize the management complexity in the coastal and marine areas and the need for management competency including strong skills in governance and the technical knowledge for executing ICM programs.

Policy and Legislative Supports

National support in terms of coastal or ocean policy, ICM or ICM-related legislations, technical support, and financial allocation will certainly facilitate the consolidation of ICM approach in a country, as well as promote its replication and scaling up. The past 3 decades of donor-driven ICM practices in the region shows that national support is far from what is desired. In many countries, ICM has not been accepted fully as an essential effective coastal management tool of local government but instead viewed as more of an experiment. Some countries are happy to see that ICM is being externally funded and there is no pressure or urgency in their part to adopt it despite being recommended by several international environmental and sustainable development conventions. On the other hand, some national governments were attracted to the credit facilities of multilateral banking institutions for implementing coastal resources management or community-based management programs with specific sectoral focus such as fisheries. In many cases, despite millions of dollars borrowed, these efforts did not achieve the objectives of ICM nor were there sufficient local expertise developed. The biggest beneficiaries in such cases are the international and local consultants and their associated companies. However, this is changing in recent years with several countries in the region taking a more proactive role.

In the last decade or so, several countries in the East Asian Seas region have developed, improved, or enacted ocean/coastal policy and coastal-/ocean-related legislations which reinforce the existing efforts in strengthening coastal and ocean governance [Tropical Coasts, 2000, 2006; Chua, 2006]. National efforts such as the Ocean Agenda 21 of China (1996) and RO Korea (2000), the Coastal Management Act of RO Korea (1999), the Sea Area Use Management Law of PR China (1997) [Jiao et al., 2000], the ICM Act of Indonesia enacted in July 2007, the Basic Law of Japan (2007) and the Executive Order 533 (2006) making ICM a national policy of the Philippines, are some of the very recent developments which have strong impacts on coastal and ocean governance in the region [Chua, 2006]. Armed with such national policy and legislation, the concerned countries will be more effective in the utilization of financial resources for achieving the goals of sustainable coastal and ocean development.

In Europe, after undertaking and evaluating 35 ICZM project demonstrations during the period 1996–1999, the European Union has developed the European Community (EC) Directives and a regional ICZM strategy to be implemented by the EC nations.[1]

There is increasing awareness of the importance to sustain the benefits obtained from the coasts and oceans as well as the rising concerns of climate change [PEMSEA, 2005]. Increased public awareness and concerns of the impacts of sea level rise on lives and properties coupled with intensive competition for oil resources in the East and South China Seas and the rising maritime trade and transportation across the Seas of East Asia, have prompted many nations to place greater policy direction on

[1] This can be accessed at http:ec.europa.eu/environment/ICZM.

maritime matters. Climate change has become a major subject of policy decision during the recently concluded 2007 APEC Summit in Australia, signifying that governments are now more serious about the impacts of environmental changes.

Maritime security has also become a key issue of the region in addition to the conventional boundary disputes in the East and South China Seas [Townsend-Gault, 2004]. The threat of losing the valuable marine ecosystems and cultural assets still remain, while recent political commitments in response to climate change appear to send a wave of optimism. Governments around the Seas of East Asia should play pivotal roles not only for ensuring the sustainable use of the coastal and ocean resources but also maintain peace and order in order to secure the ocean for sustaining their common benefits as manifested in various regional declarations, agreements, and plans of actions, such as: the Putrajaya Declaration (2003), the Tokyo Declaration (2004), the APEC Bali Plan of Action (2005), and the Haikou Agreement (2006).

Financing

Although financing is a critical need for the development and implementation of an ICM program, it is however, not the limiting factor for initiating and developing ICM at the local level. An ICM program can be initiated within the limits of existing financial resources using available line agency budgets of the local government, although external or extra budgetary contributions will greatly facilitate and probably enhance ICM program development. The lead agency or the municipal or provincial government should be able to allocate the seed funds for the initiation of an ICM program. The key is to ensure strong support and participation of the relevant agencies because benefits are accrued from such participation. In particular, line agencies with mandate in disaster, water, habitat, pollution, and fisheries management are able to benefit from the ICM approach: it provides an opportunity to pool interagency resources — an important step towards securing the needed financing — for achieving common objectives and implementing plans of action.

Initiation of an ICM program with complete funding from an external source should not be encouraged. Experiences in Asia, Europe, Africa and Latin America showed that most ICM initiatives undertaken through external financing often stopped when such financing eventually dried up. The lack of local ownership of the program makes it difficult to sustain such initiatives. Thus it is critical that at least a co-financing from the concerned local government should be required. Co-financing from private sector to support ICM initiatives is a good practice; PEMSEA's experience in the provinces of Batangas and Bataan in the Philippines illustrated the effectiveness of public-private sector partnership in moving the ICM initiatives forward [PEMSEA, 2007].

A large part of the strategic action programs will need substantial financial resources to construct environmental improvement facilities and to provide basic services such as water supply and sanitation service, habitat restoration and management of capture and culture fisheries, conservation of biological diversity and marine protected areas, and so on. Such funding will definitely have to be secured from a government budget, bank loans, or through other financing system, such as: direct private sector investment, or a public-private sector investment arrangement [Pantillano, in this volume; Spergel and Moye, 2004].

Other financing mechanisms can also be developed by imposing a user fee system, permit system, and taxation for water, sanitation, and other environmental services.

A long-term sustainable financing mechanism may need to be developed in order to carry out the implementation of the strategic action programs in a stepwise, incremental manner. The SDCA Framework in fact provides a common framework and a unique platform to allow the pooling of different sources of financing either directly from government agencies or from donors or other external sources. Sufficient funding to support the coordinating mechanism should be guaranteed so as to ensure the integrity of its coordinating functions. A local government will eventually find out that it is in its own best interest to sustain such coordinating mechanism through its own budget. Experience has shown that most coordinating mechanisms established under the local governments for ICM implementation remain intact — after the completion of external support — if the source of self-financing has been arranged.

Mainstreaming ICM as part of a local government's regular program is the only way to ensure financial sustainability for the coordinating mechanism so that it will have the mandate and resources to coordinate the implementation of the strategic action programs by concerned line agencies.

Capacity Development

Capacity development is a process which is instrumental to ICM success. Unlike capacity building which is defined as "the sum of efforts needed to nurture, enhance, and utilize the skills and capabilities of people and the institutions at all levels" [National Research Council, 2002], capacity development focuses on developing the skills and capabilities through a coordinated process and activities. It strengthens the knowledge, skills, experiences, values, and relationships that enable stakeholder organizations and individual or group of stakeholders to achieve their goals or objectives through improvement of institution, rules and regulations, and management systems. The outcome of capacity development in ICM is the consolidation of changed behavior of the informed stakeholders and visible improvements in the performance of coastal governance.

Tacit knowledge and management skills can be secured through hands-on experience in actual ICM operation. PEMSEA adopts a vertical and horizontal learning strategy and long-term approach in developing the needed human resources to implement ICM programs throughout the region [PEMSEA, 2007]. This approach is different from past capacity building practices of many externally funded projects in the region which are usually fragmented, short-term, and narrowly focused on specific sectors (for example, fisheries and coastal communities).

Through the implementation of an ICM program, all stakeholders could learn from each other by sharing their own knowledge and experience among themselves. Interdisciplinary experts can strengthen their technical skills in economic valuation, risk assessment, integrated information management, geographical information system, expert system, surveys, social and political analysis, project monitoring and management, and the like, by being involved in various technical- and management-related activities. The coastal managers and planners can learn and benefit from the holistic planning and management approach and the interagency and multisector coordinating mechanism. Mayors, governors, and other local leaders can strengthen their policy, organizational, and legal arrangements, at the same time politicians can feel the pulse of the stakeholders with respect to the use of the coasts and seas. The private sector and NGOs, on the other hand, can benefit from each other using their own expertise and skills that add value to the overall management of the coastal area.

Specific skills training is also beneficial to augment technical and management deficiencies. The learning process allows an incremental accumulation of knowledge and experience among all stakeholders concerned.

A critical mass of human resources must be available at the local level or available within reach of an ICM initiative. A successful ICM program is built on the local capacity to plan and manage the coastal and marine areas. Therefore, efforts should be made to build a critical mass of expertise within the vicinity of the area concerned. One good practice is to closely link an ICM program with local universities or research institutions whose staff could be further developed and their knowledge and skills improved so that they will be capable and effective in providing the needed technical support to concerned local governments.

The need for coastal planners and managers trained in integrated planning and management become apparent with scaling up of ICM practices. There is a greater need for managerial professionals equipped with a sound knowledge of governance, integrated land- and sea-use planning, and technical knowledge related to ecosystems management and sustainable development concepts. Such professional training should be undertaken at a postgraduate level. Considering that at least one coastal municipality should have one qualified coastal planner/manager, the demand in the Philippines, for instance, will be at least more than 800 as there are more than 822 coastal municipalities in the country. It would take more than a few decades to produce the needed human resources in the Philippines alone. In view of the large number of coastal municipalities in the region, the potential demand for such human resources will be enormous.

The market demand for coastal planners and managers are expected to be on the increase as a result of new national coastal and ocean policy, legislation, and the impacts of climate change. In addition to the individual needs of the coastal nations, many international programs and multilateral lending institutions (such as ADB and World Bank) will require the governance framework of ICM which can facilitate effective implementation of their action programs related to adaptation to sea level rise, natural and manmade hazards, marine protected areas, land-based pollution, fishery and coastal aquaculture management, and so on. The lack of well-trained ICM specialists has become a major constraint in the implementation of many of these activities.

It is timely for the academic institutions in the region to review the effectiveness of existing postgraduate programs on Marine Affairs and consider the inclusion of ICM in its core curriculum. There might be a need to make ICM a core course under the academic framework of rural and urban planning, public administration, or local governance. Graduates with ICM training under such academic framework could take advantage of the known career path as a planner or a local administrator. This will greatly facilitate graduates with ICM training to secure a job with a local government.

A standard ICM curriculum to be used by a network of academic institutions in the region could be explored to provide appropriate ICM training based on the revised ICM approach or system mentioned above. Efforts should be explored to develop such a network of academic institutions from countries which have already a clear coastal or ocean policy, ICM legislation or coastal and ocean programs. To start with, academic institutions from China, Japan, Philippines, Indonesia, RO Korea, and Vietnam should form a functional network to supply the needed manpower needs in the respective countries and the region at large.

Another form of human resource development is the establishment of a critical mass of young multidisciplinary experts at national and regional levels to provide technical expertise in support of local and national efforts in developing or scaling up ICM practices. These regional or national task forces are being developed by PEMSEA in preparation for the scaling up of ICM practices in 20 percent of the regional coastline by 2015. To achieve this, PEMSEA will promote national and regional training of such expertise so that they can be mobilized to support ICM efforts at local and national levels. Through this effort, a critical mass of expertise will be developed, mobilized, and upgraded. The impacts of their contribution will be far-reaching and effective in view of the thorough knowledge of local conditions, no language barriers, and the availability of standardized approaches and methodologies.

Scaling Up

ICM scaling up is the only viable approach to propagate ICM practices throughout the national coastline. As political, socioeconomic and environmental conditions vary from coasts to coasts, extension of ICM practices will be facilitated through replication of those working models by local governments whose conditions are similar or close to those successful ICM sites. Scaling up of ICM practices will lead to horizontal and vertical management measures across administrative boundaries and levels of administration.

ICM scaling up can be achieved through various approaches. One approach that is practiced in the United States is through providing financing incentives for those coastal States that develop and implement coastal management programs. This was facilitated through the U.S. Coastal Zone Management Act in 1972. Making ICM a national policy (such as in the case of the Philippines) or legislation (such as in Indonesia and RO Korea) also facilitates ICM scaling up. Another approach in ICM scaling up is undertaken through a functional expansion of integrated management to cover the related ecosystems such as the expansion of ICM practices throughout the watershed around the Batangas Bay in the Philippines. The expansion of ICM practices in Manila Bay to include Pasig River and the Laguna de Bay is another example. In Xiamen (China), which is located downstream of the Juilongjiang River, ICM practices were expanded to cover the concerned municipalities located upstream. Their discharges and activities greatly affect the coastal water quality of Xiamen.

The European Directives on Integrated Coastal Management is another form of promoting the scaling up of ICM practices in the European

Community. The EU provides its members appropriate policy and technical advice for undertaking ICM programs. In East Asia, the Sustainable Development Strategy for the Seas of East Asia (SDS-SEA) promote ICM scaling up and set targets for countries in the region to achieve 20 percent of the regional coastline under ICM practices by 2015.

The initial phase of ICM scaling up is not going to be simple as local governments need to be convinced of the added benefits over what they are getting from sectoral management. The expansion would be accelerated once it reaches the tipping point. A 20 percent of coastline practicing ICM is considered to be the tipping point for ICM rapid expansion [PEMSEA, 2007] premised on two arguments: *(1)* the 80/20 Principle of the Law of the Few [Gladwell, 2000] — which states that 80 percent of the work involved in changing perceptions and behaviors is done by 20 percent of the participants; and *(2)* the Critical Mass Theory [Marwell and Oliver, 1993] — which states that once 10–30 percent of the targeted population has adopted a particular behavior, the behavioral transformation snowballs and becomes self-reinforcing. Existing coastline under ICM in the region is estimated to be lower than 2 percent. Therefore it is essential that greater efforts be made to achieve the 20 percent target.

Conclusions and Recommendations

The author draws some key conclusions from the above reflections on ICM practices primarily in the East Asian Sea region with the hope that these conclusions could help in strengthening the conceptual approach, practice, and scaling up of ICM in the Seas of East Asia and other parts of the world.

1. The concept of ICM is well defined with clear sustainable development principles, targets, priority, implementation approach, and methodology

Information and knowledge generated over the last few decades have strengthened the concept of ICM, its definition, supporting principles, defined targets, priority and verified implementation approaches, and methodologies. ICM implementation should go beyond the current rhetoric of terminologies (for example, ICZM, CRM, ICOM, IWRN, and so on). Past and existing efforts on coastal management are useful in one way or another but the collective efforts could be streamlined so as to move the concept and practice towards achieving the sustainable development goals.

Perhaps the ecosystem-based management or ecosystem approach deserve special attention in view of the large-scale devastation of marine ecosystems that require greater emphasis for management interventions. However, the concept did not add much new dimension apart from the explicit or implicit emphasis on ecosystem primacy while recognizing the similarity with integrated coastal management in terms of objectives, principles, approach, and implementation modality.

The objective of integrated coastal zone management in the U.S. was, and still is, primarily for conservation of ecosystems and natural resource management [Clark, 1992, 1996]. Hence, it is about time that scientists refrain from unnecessary creation of new terminologies or acronyms which more often than not confuse policymakers, the donor communities, and coastal practitioners.

What are needed are more actions on the ground by combining efforts to step up ICM practices throughout entire coastlines. Sustainable development of the coastal area can only be realized if more ICM programs are being executed throughout the coastal nations.

2. Capacity development is the key to ICM successes

The capacity of the local government to plan and manage the coastal areas depends on the availability of multidisciplinary technical and managerial competencies within the local governments. Therefore priority efforts should be placed during the process of ICM development and implementation cycle, on promoting horizontal and vertical learning throughout the project cycle so as to create a critical mass of qualified and experienced coastal experts, a pool of local champions, and an enabling environment to carry on the processes for developing and implementing ICM programs.

Investing in developing local capacity is the best strategy for achieving sustainable coastal development. A coordinated national program to train managerial and planning professionals in ICM is required to ensure a systematic increase in ICM scaling up initiatives, quality management, and effective implementation of the strategic action programs.

3. National coastal/ocean policy and institutional coordinating arrangements strengthen ICM practices

Although local governments need not wait for the development of national coastal/ocean policy to provide the necessary mandates, central government of coastal nations should seriously consider the need to establish one. The need for national coastal/ocean policy in the region is even greater in light of the strong relationship between climate change and the coasts and ocean, frequency of boundary disputes, greater reliance in maritime transport for import and export of products, and the increasing recognition of the importance of coasts and oceans to the ecological and biological economies of the coastal nations.

A greater degree of policy and functional integration within governmental institutions at national and local levels is not only a matter of needs but a matter of urgency given the complexity of coastal and ocean governance issues. Interagency conflicts are common in government bureaucracy particularly at the national level. Such conflicts could be more easily harmonized at the local level as local agencies could have stronger appreciation for interagency cooperation and collaboration towards clearly defined common goals. Thus an interagency coordinating mechanism is generally more effective at the local level. Local successes (often from ICM demonstration sites) serve as a strong basis in promoting or contributing to national government policy development and institutional arrangements.

National policy can certainly facilitate ICM scaling up and national investments in terms of capacity development, environmental improvement facilities, and commitment of national budgets.

4. Codification allows standardization of ICM practices

The development of ICM Code paves the way for standardizing ICM operational approaches and methodologies so that ICM management practices meet international ISO standards. After 30 years of global ICM initiatives, ICM codification is indeed a major step forward despite the fact that the initial ICM Code still requires further refinement. This effort hopefully will bring various coastal management approaches and initiatives into a standardized framework and processes as well as reporting format. This will ensure monitoring effectiveness, targets and impacts through the State of the Coasts Reporting. Although very few local governments have secured ISO certifications for their environmental management efforts, the ICM Code will certainly facilitate future endeavors.

5. ICM facilitates implementation of international instruments and agreements

The governance and strategic action programs — two key components of the refined ICM approach or system — and driven by the ICM development and implementing cycle, provide the necessary strategic management framework and processes to implement several marine and environment related international instruments and agreements including those on climate change, biodiversity, land- and sea-based pollution, fisheries, and so on. This is particularly significant in recent years with the obvious impacts of climate change.

ICM enables the implementation of relevant international instruments at the ground level. Through the five strategic action programs of the SDCA (hazard, water, food, pollution, habitats), ICM can effectively address the requirements of several international instruments within its program cycle. For example, the response plans on natural hazards tackle the adaptation aspect of climate change related to sea level rise, typhoons, and tsunami while the response plan for oil spills addresses the requirements of OPRC, Fund, and CLC conventions. Similarly, the pollution prevention and management plans deal with the requirements of GPA, while those pertaining to land-based pollution and sanitation services address WSSD. The strengthening of ICM efforts therefore intensifies responses to many of these international challenges.

6. Monitoring, documenting, and reporting is absolutely essential to take stock of progress

One weak point of ICM in past initiatives is the inadequacy of monitoring progress and impacts, insufficient or absence of documentation of the processes, and poor reporting of outputs and outcomes. Appropriate indicators should be developed during the program development stage so as to enable the monitoring of processes, outputs, and outcomes. There is a need to ensure diligent documentation of processes, responses, outputs, and outcomes in a timely manner.

The lack of a standardized reporting format also resulted in an array of reports in different formats and level of details. The State of the Coasts Reporting developed by PEMSEA is intended to provide a unified reporting system using measurable indicators set under the MDG, WSSD and other international conventions and/or regional agreements. It helps government to develop and maintain a meta-database on coastal and ocean governance at the local and national levels.

7. ICM good practices help ICM replication and scaling up

Despite the numerous ICM initiatives implemented worldwide over the last 30 years, very few ICM good practices have been documented. There is no doubt of the existence of many good practices and successful stories of ICM which have yet to be identified, distilled, and reported. These good practices need to be documented and highlighted to facilitate

ICM replication and scaling up. ICM good practices help modify and refine ICM approaches, strategies, and processes. Therefore special efforts need to be allocated to collect and document good practices in coastal management around the world.

8. Regional and national networks of ICM practices ensure sustainable coastal development

Regional and national ICM networks are important vehicles for achieving sustainable coastal development in the region as the positive impacts of ICM can only be felt if more local governments are implementing ICM programs. In this connection, PEMSEA's Network of Local Governments for Sustainable Coastal Development (PNLG) has become a good vehicle to promote mutual exchange of information and experience among local governments and more importantly mutual mentoring through annual workshops and study visits.

As ICM practices accelerate within a country, setting up of a national ICM network will accelerate the process of scaling up. National networks resolve the barrier of language often found in regional or international networks.

9. The impact of ICM diminishes when it functions as a sector

The ICM approach is cross-sectoral and its main function is to coordinate interagency and multisectoral efforts to achieve the common sustainable development goals. Experience has shown that the impact of ICM begins to wane when the coordinating functions of the ICM coordinating office diminishes. This happens when it begins to compete with other agencies for funds and human resources such as competing for user fees, permit collections, and so on. The challenge to ICM practitioners is how to maintain its overarching influence and coordinating and facilitating roles so as to support and mobilize relevant line agencies and members of other sectors to work together. Placing the coordinating functions to a more neutral agency might be a possible option in the future.

10. Stepwise, cyclical, incremental approach through ICM implementation is the way to achieving sustainable coastal development

ICM needs to take a holistic and ecosystem approach in the design of long-term plans but must adopt a stepwise, cyclical, and incremental approach in achieving its set targets. This is important because sustainable development of the coastal areas requires a long-term implementation of ICM program cycles, building up of a critical mass of expertise within the local governments, securing of adequate financing to implement environmental improvement projects, and maintaining of policy consistency to provide a stable environment for attracting investment in environmental improvement facilities and for operation of coordinated strategic management action programs.

Looking back at the past coastal management practices in East Asia and other parts of the world, ICM has made significant advances with clear definition, objectives, principles, priority, and operational modality. It is ready for a paradigm shift to a more systematic and standardized approach measurable by international standards (ISO). ICM has now evolved from the eras of trial and error to a new era of standardized approach and well-documented management practice. Notwithstanding the progress made, adaptive management and the leadership of coastal managers continue to play a major role in ICM practices in the years to come.

References

CBD (Convention on Biological Diversity). 1995. Conference of the Parties, Decision II/10.

CBD (Convention on Biological Diversity). 2000. Conference of the Parties, Decision V/6.

CBS News. 2006. "Calamity over Philippine oil spills." *CBS News*, October 2006. Available at http:/www.cbsnews.com/stories/2006/08/15. [Accessed 28 October 2007]

Chua, T.-E. 2004. "Integrated coastal management in transformation." *Tropical Coasts*, 11(1):4–11.

Chua, T.-E. 2006. *The dynamics of integrated coastal management: Practical applications in the sustainable coastal development in East Asia*. GEF/UNDP/IMO Regional Programme for Building Partnerships for the Seas of East Asia (PEMSEA), Quezon City, Philippines. 468 pp.

Chua, T.-E. and L.F. Scura. (eds). 1992. *Integrative framework and methods for coastal area management*. International Center for Living Aquatic Resource Management Conference Proceedings No. 37. ICLARM, Manila, Philippines.

Cicin-Sain, B. and R.W. Knecht. 1998. *Integrated coastal and ocean management: Concepts and practices*. Island Press, Washington, DC. 517 pp.

Clark, J.R. 1992. *Integrated management of coastal zones*. FAO Technical Paper No. 327. FAO, Rome, Italy.

Clark, J.R. 1996. *Coastal zone management handbook*. CRC Press, Inc., Boca Raton, Florida, USA. 694 pp.

COMPASS (Communication Partnership for Science and the Seas). 2005. "Scientific Consensus Statement on Marine Ecosystem-based Management." 25 March 2005.

Duda, A.M. 2002. *Monitoring and evaluation indicators for GEF International Waters Projects*. Monitoring and Evaluation Working Paper 10. Global Environment Facility, Washington, DC.

FAO. 1997. *Fisheries management*. FAO Technical Guidelines for Responsible Fisheries No. 4. FAO, Rome. 82 pp.

Garcia, S.M., A. Zerbi, C. Aliaume, T. Do Chi and G. Lasserre. 2003. *The ecosystem approach to fisheries. Issues, terminology, principles, institutional foundations, implementation and outlook*. FAO Fisheries Technical Paper No. 443. FAO, Rome. 71 pp.

Gladwell, M. 2000. *The tipping point: How little things can make a big difference*. Little, Brown and Company, Boston, USA. 280 pp.

Haq, B.U., S.M. Haq, G. Kullenberg and J.H. Stel. (eds). 1997. *Coastal zone management: Imperative for maritime developing nations*. Kluwer Academic Publishers, Dordrecht, The Netherlands. 392 pp.

Holling, C.S. (ed). 1978. *Adaptive environmental assessment and management*. John Wiley and Sons, New York, New York.

IPCC (Intergovernmental Panel on Climate Change). 2007. "Climate change 2007: The physical science basis — summary for policymakers." pp. 2–18.

Imperial, M. and T. Hennessey. 1993. "The evolution of adaptive management for estuarine ecosystems: The National Estuary Program and its precursors." *Ocean and Coastal Management*, 20:147–180.

IOC (Intergovernmental Oceanographic Commission). 2006. *A handbook for measuring the progress and outcomes of the integrated coastal and ocean management*. IOC Manual and Guides No. 46/ICSM Dossier No. 2. UNESCO, Paris.

Jiao, J.K., C.L. Ruan and H. Yu. 2000. "The new Marine Environmental Protection Law of the People's Republic of China." *Tropical Coasts,* 7(2):24–31.

Marwell, G. and P. Oliver. 1993. *The critical mass in collective action: A micro social theory.* Cambridge University Press, Cambridge, UK.

Meadows, D.H., D.L. Meadows, J. Randers and J. Tinbergen. 1992. *Beyond the limits.* Earthscan Publication Ltd., London. 320 pp.

National Research Council. 2002. *The drama of the commons.* National Academy Press, Washington, DC.

National Research Council. 2007. *Increasing capacity for stewardship of oceans and coasts: A priority for the 21st century.* Pre-publication copy. National Academy Press, Washington, DC. 120 pp.

PEMSEA. 2003. *Sustainable development strategy for the Seas of East Asia.* GEF/UNDP/IMO Regional Programme on Building Partnerships in Environmental Management for the Seas of East Asia, Quezon City, Philippines.

PEMSEA. 2005. *Sustaining benefits.* GEF/UNDP/IMO Regional Programme on Building Partnerships in Environmental Management for the Seas of East Asia, Quezon City, Philippines. 36 pp.

PEMSEA. 2006. *Xiamen: An ICM journey.* PEMSEA Technical Report No. 18. GEF/UNDP/IMO Regional Programme on Building Partnerships in Environmental Management for the Seas of East Asia, Quezon City, Philippines. 93 pp.

PEMSEA. 2007. *PEMSEA (Partnership in Environmental Management for the Seas of East Asia): A regional mechanism facilitating sustainable environmental benefits in river basins, coasts and seas.* PEMSEA IEC Material 2. GEF/UNDP/IMO Regional Programme on Building Partnerships in Environmental Management for the Seas of East Asia, Quezon City, Philippines. 80 pp.

Raymundo, L.J. 2002. "Community-based coastal resource management of Apo Island, Negros Oriental, Philippines: History and lessons learned." Report from the First ICRAN Regional Workshop on Experience Sharing Between Demonstration and Target Sites in the East Asian Seas, 26–27 August 2002. United Nations Environmental Programme, Bangkok, Thailand.

Spergel, B. and M. Moye. 2004. *Financing marine conservation: A menu of options.* World Wildlife Fund, Center for Conservation Finance, Washington, DC.

Townsend-Gault, I. 2004. "A cooperative approach to the South China Sea." *Tropical Coasts*: 7(2): 4–11.

Tropical Coasts. 2000. "Coastal and marine policymaking in East Asia." *Tropical Coasts,* 7(2). 78 pp.

Tropical Coasts. 2006. "One vision, one ocean." *Tropical Coasts,* 13(2). 88 pp.

UNCED. 1992. Rio Declaration on Environment and Development, 1992.

United Nations. 2006a. *Report of the 7th United Nations Open-ended Informal Consultative Process on Oceans and the Law of the Sea (UNICPOLOS)*. 19 pp.

United Nations. 2006b. *Report of the Secretary-General on Oceans and the Law of the Seas: Ecosystem approaches and oceans*. pp. 31–58.

WWF-Australia. 2006. "Policy proposals and operational guidance for ecosystem-based management of marine capture fisheries." WWF. 80 pp.

WWF-UK. 2006. "Largest Philippine oil spill might take years to clean up." Available at http:// www.org.uk/news. [Accessed 28 October 2007].

Drying fish products along China Beach in Danang, Vietnam; an old lady selling souvenirs at the World Cultural Heritage Site in Hoi An, Vietnam (Photos: CHUA THIA-ENG)

CHAPTER 16

The East Asian Region: Environmental Problems, Opportunities and Financial Instruments

Rodolfo Antonio Pantillano

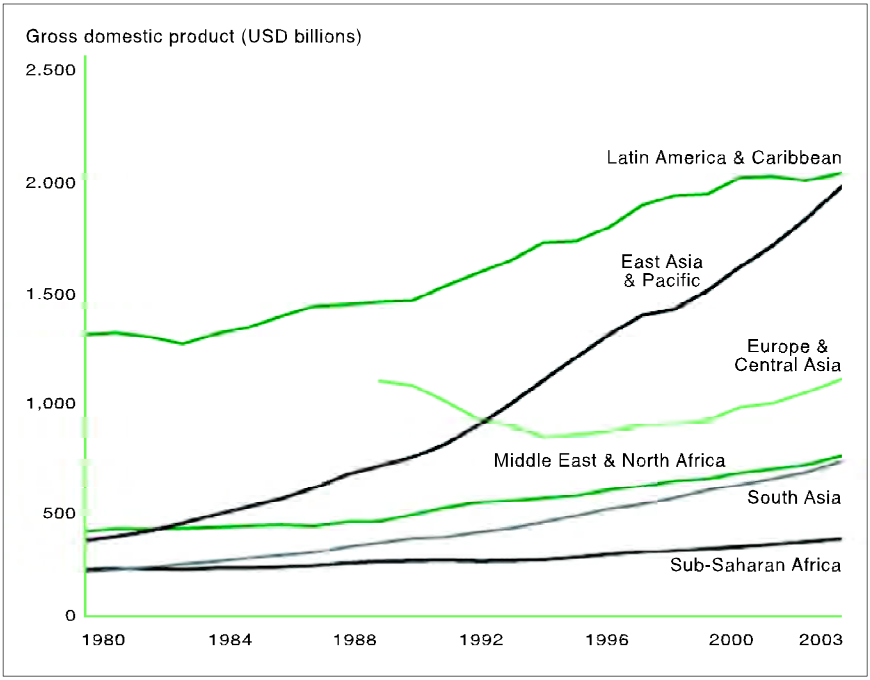
Introduction

Rapid economic growth in the East Asian region is continuing to take its toll on the natural environment. Home to rich forests and marine ecosystems where biodiversity thrives, it is also where the fastest growth has been achieved in recent decades [Figure 1]. The conflict between ecosystem and commerce is more evident in poorer countries in the form of degraded forests and corals, polluted atmosphere, and contaminated water amid rising urban population and increasing affluence. As private actors go on with their daily lives, their actions may produce negative impacts on their environment and the public. Moreover, a local action produces unintended effects, both negative and positive, on the welfare of people in other regions.

In order to minimize the impact of growth on the environment, governments must consider the value of the environment in their decisionmaking. Market mechanisms must be used to modify polluting behaviors. Financing instruments must be available to fund environment-friendly activities as well. Given that pollution crosses jurisdictional boundaries, the sharing of its benefits and costs must be also viewed across boundaries.

This chapter will attempt to provide an overview of the environmental problems in East Asia and some of the alternative financing instruments that are available to address them. The phrase *financial instrument* is used here on a broader context, referring to the mechanism and structure by which the government and the private sector can mobilize resources to address ecological concerns. This chapter is divided into four parts. First, it will review how the environment can be valued and the role of institutions in addressing environmental issues. Second, it will provide an overview of the present urban environmental problems paying particular attention to land-based pollution sources. Third, it will review possible financial mechanisms to address them. Finally, the conclusion provides a summary on the practical applications of the financial instruments in the East Asian region.

Figure 1: In recent decades, the countries in East Asia have been the fastest rising economies in the world. The output of the region is now comparable to that of the Latin American and Caribbean regions.



Source: World Bank [2005b]

Environmental Valuation

The Value of Our Environment: Back to Basics

Ecosystem goods and services

The ecosystem produces goods and services that are of economic value to us [Table 1]. It provides food, medicine, recreation, water, and fuel among others. Less apparent but equally important is its function in filtering and storing water, treating of toxins, and cycling of nutrients. If water supply is disrupted, it leads to health problems and loss of incomes. If recreational activities are halted because of contamination of the beaches, it results to the loss of enjoyment from recreation. If the trees in the forest are cut, it results to floods and landslides during rainy season. Thus, what we regard vaguely as *nature* has in fact, a *direct* and *monetary impact* on our lives.

The total economic value (TEV) of ecosystems

It seems like a fairly abstract idea but economists have developed methods to value our environment. We derive two types of values from the ecosystem: use values and non-use values. Use values are defined as those associated with current or future (potential) use of a resource, say mining, while non-use values are those that arise from the continued existence of a resource and are unrelated to use [Table 2]. Use values involve some human "interaction" with the resource, while non-use values do not. Non-use refer to the enjoyment people may experience simply by knowing such a resource exists even if they never expect to use that resource directly themselves [NRC, 2004]. Even if we do not actually see the whales, their loss will have an impact on many people, hence the concept of non-use, *existence values*.

The total economic value (TEV) of an ecosystem is equal to the sum of its use and non-use values. It is a way of putting monetary values into the goods and services that the ecosystem provides. For example, we measure the direct value of food that the sea provides by looking at the value of fishes and seaweeds in the market. We also measure the enjoyment of tourists who visit the beach by asking them how much they are *willing to pay* to see it.

Willingness to pay and willingness to accept

Methods have been developed in order to measure ecosystem values. Table 3 summarizes these methods. In general, these methods measure the demand for a good or service by a consumer's willingness to pay (WTP) or willingness to accept (WTA) compensation for a loss in the ecosystem

Table 1: Biological Characteristics and Importance of East Asian Marine Ecosystems

	Importance	Ecosystem Services
Coral Reefs	• One fourth of world's charted reefs is located in this region. • Southeast Asian region is recognized as the global center of biodiversity for coral reefs. • Species diversity is highest at around 450 species in the equatorial central Indo-Pacific defined by Sumatra and Java, Sabah, and Philippines.	• Nursery and breeding grounds for marine species. • Reef fisheries account for 30–40 percent of catches. • Tourism attraction. • Carbon sequestration.
Mangroves	• 40 percent of the world's mangroves is located in this region. • Highest biodiversity of mangroves with 39 species. • Indonesia has the widest coverage in the world with 4.25 million hectares.	• Nursery and breeding grounds for commercial and environmentally significant marine organisms. • Roosting and feeding grounds for migratory birds. • Products for human use. • Buffer against strong waves. • Reduce effects of land-based discharges.
Seagrass	• Harbors second highest number of seagrass species at 20 of the 50 recorded species worldwide.	• Nutrient cycling. • Critical habitat & feeding ground for marine animals. • Shoreline protection for coastal areas.

Source: Sien and Kirkman [2000]

Table 2: Classification and Examples of Total Economic Values (TEV) for Aquatic Ecosystem Services

USE VALUES		NON-USE VALUES
Direct	Indirect	Existence and Bequest Values
• Commercial and recreational fishing • Aquaculture • Transportation • Wild resources • Potable water • Recreation • Genetic material • Scientific and educational opportunities	• Nutrient retention and cycling • Flood control • Storm protection • Habitat function • Shoreline stabilization	• Cultural heritage • Resources for future generations • Existence of charismatic species • Existence of wild places

Source: Barbier et al. [1997]

Table 3: Main Economic Valuation Techniques

Methodology	Approach	Applications	Data Requirements	Limitations
REVEALED PREFERENCE METHODS				
Production Function (or known as the "change in productivity method")	Trace impact of change in ecosystem services on produced goods	Any impact that affects produced goods	Change in service; impact on production; net value of produced goods	Data on change in service and consequent impact on production often lacking.
Cost of Illness, Human Capital	Trace impact of change in ecosystem services on morbidity and mortality	Any impact that affects health (e.g., air or water pollution)	Change in service; impact on health (dose-response functions); cost of illness or value of life	Dose-response functions linking environmental conditions to health often lacking; underestimates, as it omits preferences for health; value of life cannot be estimated easily.
Replacement Cost (and variants such as relocation cost)	Use cost of replacing the lost good or service	Any loss of goods and services	Extent of loss of goods or services, cost of replacing them	Tends to overestimate actual value; should be used with caution.
Travel Cost	Derive demand curve from data on actual travel costs	Recreation	Survey to collect monetary and time costs of travel to destination, distance traveled	Limited to recreational benefits; hard to use when trips are to multiple destinations.
Hedonic Pricing	Extract effect of environmental factors on price of goods that include those factors	Air quality, scenic beauty, cultural benefits	Prices and characteristics of goods	Requires vast quantities of data; very sensitive to specification.

Table 3: (continued)

STATED PREFERENCE METHODS				
Contigent Valuation	Ask respondents directly their willingness to pay (WTP) for a specified service	Any service	Survey that presents scenario and elicits WTP for specified service	Many potential sources of bias in responses; guidelines exist for reliable application.
Choice Modeling	Ask respondents to choose their preferred options from a set of alternatives with particular attributes	Any service	Survey of respondents	Similar to those of CV; analysis of the data generated is complex.
OTHER METHODS				
Benefits Transfer	Use results obtained in one context in a different context	Any for which suitable comparison studies are available	Valuation exercises at another, similar site	Can be very inaccurate, as many factors vary, even when contexts seem "similar;" should be used with extreme caution.

Source: Pagiola et al. [2004]

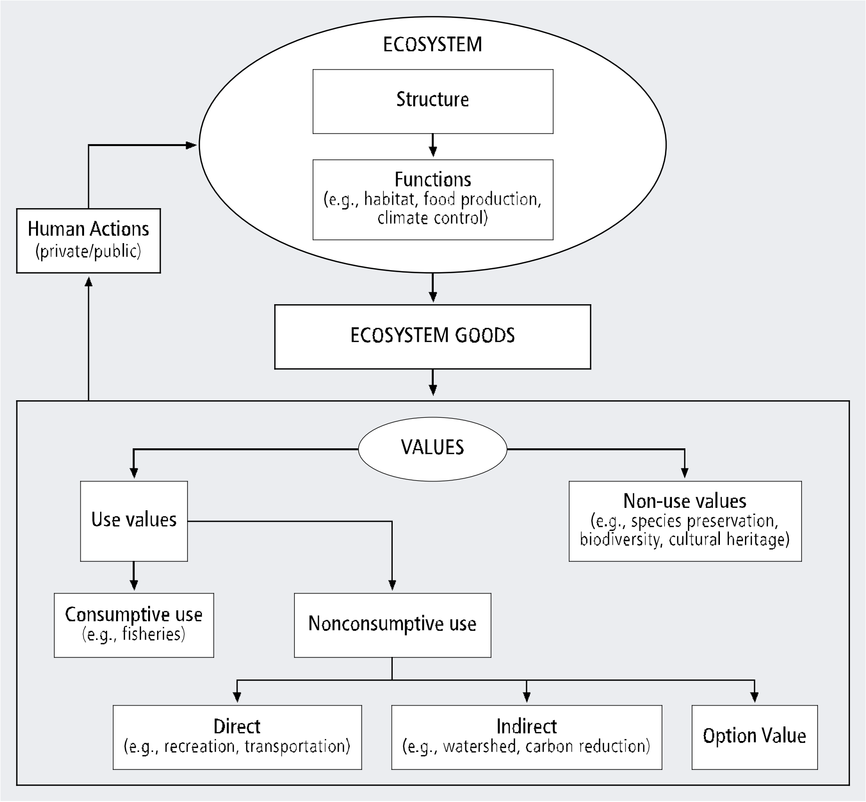
service. For instance, we can measure the value of shoreline protection provided by mangroves by asking how much people are willing to pay for this kind of service.

Figure 2 shows the interaction of ecosystem, ecosystem goods, ecosystem values, and the private and public actors. What is important to note is the feedback that we give to the ecosystem. If this is harmful to the ecosystem, it can lead to the unsustainability of the production of goods and values. Table 4 shows a comprehensive listing of the goods and services that are derived from the environment.

Costs and Benefit Approach

We illustrate here the concept of marginal cost and marginal benefit in the case of a marine conservation project [Figure 3]. If a marine area is declared a protected area, it will have some *set up costs* (for example, information, community training, and producing the legal papers) plus

Figure 2: Dynamics of Ecosystem and Human Activities



recurring costs (for example, monitoring costs like fuel and salaries). The conservation project will also have an *opportunity cost* such as the benefits forgone from a commercial activity which declines over time. Meanwhile, it will have benefits in having increased fishery revenues, higher tourism, and enhanced biodiversity (which at some point stabilizes at a *natural rate*). For the conservation intervention to be "viable," the net present value of the costs and benefits should be positive. At the margin or over the long term, the marginal cost is targeted so that it is equal to the marginal benefits of conservation.

The early stage of the conservation project, where the net benefit is negative, can be interpreted as the *rehabilitation phase*. As benefits are realized, the incremental flow of benefits declines over time due to cap on the potential benefits from conservation. The latter phase, where the marginal benefit of conservation is equal to the cost, can be viewed as the

Table 4: Functions, Goods, and Services of Natural and Semi-natural Ecosystems

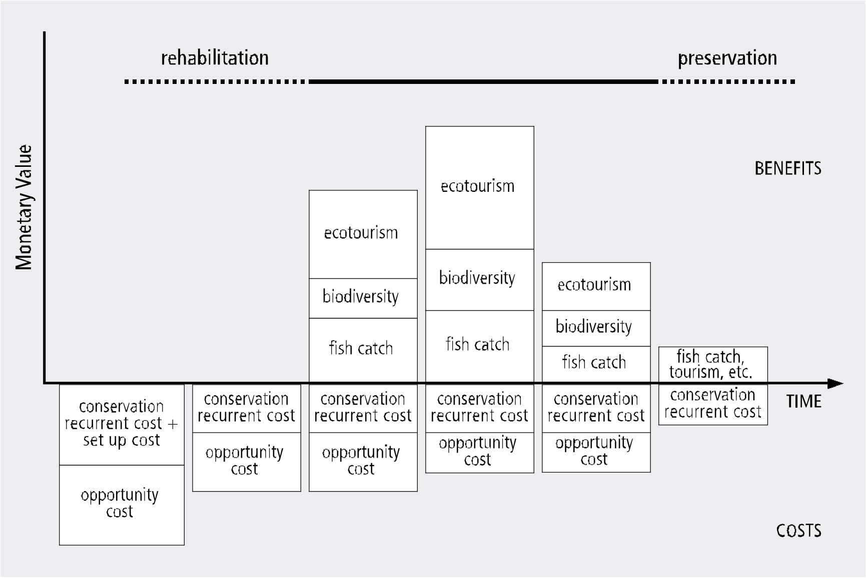
Functions	Ecosystem Processes and Components	Goods and Services
I. Regulation: Maintenance of essential ecological processes and life-support systems		
Gas Regulation	Role of ecosystems in biogeochemical cycles	• Ultraviolet B protection • Maintenance of air quality • Influence on climate
Climate Regulation	Influence of land cover and biologically mediated processes	• Maintenance of temperature, precipitation
Disturbance Protection	Influence of system structure on dampening environmental disturbance	• Storm protection • Flood control
Water Regulation	Role of land cover in regulating runoff and river discharge	• Drainage and natural irrigation • Medium of transport
Water Supply	Filtering, retention, and storage of freshwater (e.g., aquifers)	• Provision of water for consumptive use
Soil Retention	Weathering of rock, accumulation of organic matter	• Maintenance of arable land • Prevention of damage from erosion and siltation
Nutrient Regulation	Role of biota in storage and recycling of nutrients	• Maintenance of productive ecosystems
Waste Treatment	Role of vegetation and biota in removal or breakdown of xenic nutrients and compounds	• Pollution control and detoxification
Pollination	Role of biota in movement of floral gametes	• Pollination of wild plant species
Biological Control	Population control through trophic-dynamic relations	• Control of pests and diseases
II. Habitat: Providing habitat for wild plants and animals		
Refugium	Suitable living space for wild plants and animals	• Maintenance of biological and genetic diversity
Nursery	Suitable reproductive habitat	• Hunting: gathering of fish, game, fruit, etc. • Aquaculture
III. Production: Provision of natural resources		
Food	Conversion of solar energy into edible plants and animals	• Building and manufacturing • Fuel and energy • Feeds and fertilizer
Raw Materials	Conversion of solar energy into biomass for human construction and other uses	

Table 4: (continued)

Genetic Resources	Genetic material and evolution in wild plants and animals	• Drugs and pharmaceuticals • Chemical models and tools • Test and analysis of organisms
Medicinal Resources	Variety of (bio) chemical substances in and other medicinal uses of natural biota	
Ornamental Resources	Variety of biota in natural ecosystems with potential ornamental use	• Resources for fashion, handicraft, worship, decoration, etc.
IV. Information: Providing opportunities for cognitive development		
Aesthetic	Attractive landscape features	• Enjoyment of scenery
Recreation	Variety in landscapes with (potential) recreational uses	• Ecotourism
Cultural and Artistic	Variety in natural features with cultural and artistic values	• Inspiration for creative activities
Spiritual and Historic	Variety in natural features with spiritual and historic value	• Use of nature for religious or historic purposes
Science and Education	Variety in nature with scientific and educational value	• Use of nature for education and research

Source: Adapted from de Groot et al. [2002]

Figure 3: Incremental Costs and Benefits of a Conservation Activity



preservation phase. If there is a high probability that the benefits may not be realized, then the project may not be considered "viable." The important thing to highlight is that the values pertain to *incremental flows of the TEV* and not the TEV itself.

Who Pays, Who Benefits: Nonexcludability and Incentives

There is a problem in the provision of ecosystem goods and services since the agent who pays to maintain it, say the government, is not capturing all the benefits of its investments. In public economics, this is called the problem of *nonexcludability*. Put simply, *nonexcludability* is the condition where one cannot prevent another party from enjoying or benefiting from the fruits of one's efforts. In the example above, the country does not actually capture much of the "biodiversity value" as the knowledge and enjoyment of having many species also benefits other countries. Left to its own devices, the government may not have much incentive at all to invest in the conservation project.

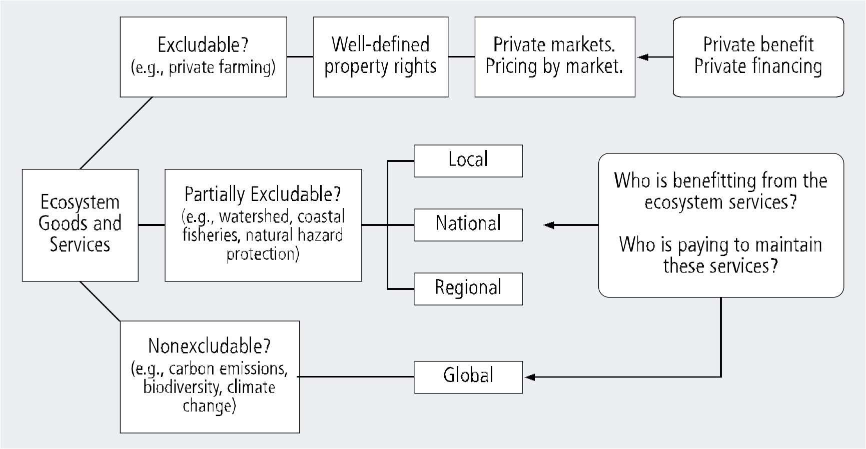
Figure 4 shows that the *nonexcludability* can exist in varying degrees and that it can span from local and national to regional and global in scope. For instance, private farming may have mostly excludable benefits. On the other hand, the benefits from coastal fisheries such as natural flood control systems can be *partially excludable* in that one can roughly identify who benefits. Meanwhile, some ecosystem services such as biodiversity and carbon sequestration are global in scope, in that any effort by one entity benefits everyone in the planet [Gardiner and Le Goulven, 2002].

Rivalry in Benefits

A further complication arises when the benefits from the ecosystem is characterized by *rivalry* in consumption (in public economics, a *"rival good"*), in that one's consumption of a good limits the amount of consumption of another [Box 1]. An example is a body of water, say, a bay, shared by two municipalities where the number of fish caught by one municipality reduces the catch of the other. In this situation, there will be *no incentive* for either party to pay for the cost of maintaining the bay, since either party can "free ride" on the other one's efforts. One possible result is for one municipality to deplete the fishes at the expense of the other while hoping that the other one will do the task of conservation.

Another example of rivalry is when the ocean is non-excludable but *rival*. For example, the *rivalry* to use it has led to its contamination from land-based and atmospheric pollution sources [Gardiner and Le Goulven, 2002].

Figure 4: Ecosystem Services: Problem of Excludability



Box 1: The Cucumber Conflict: An Example of Rivalry in Consumption

At the beginning of the 1990s, fishers in the Galápagos Islands began collecting sea cucumbers from the waters around their islands to meet ongoing demand for these aphrodisiac "earthworms of the sea" in Southeast Asia. Others intent on taking advantage of this commercial opportunity began to arrive from the Ecuadorian mainland by the hundreds. In 1998, Ecuador's president signed the Special Law of the Galápagos, which created the Galápagos Marine Reserve, protecting its waters from commercial fishing and imposed restrictions on domestic immigration. But by then, too many were already intent on reaping the financial rewards the sea cucumber promised them: by the end of the decade, a single sea cucumber could fetch nearly USD 2. Conservation biologists at the Charles Darwin Research Station on the central island of Santa Cruz worked out levels of fishing that might be sustainable. In 1999, the first season in which sea cucumber fisheries were monitored and regulated — nearly 800 fishers collected more than 4 million animals worth more than USD 3.4 million in a short 2-month window. In January 2000, fishers protesting the closure of the fishery took over offices of the Galápagos National Park Service and Charles Darwin Research Station, holding humans and animals hostage.

Source: Nicholls [2004]

An Example of Valuation: Malacca Straits and Samoa

Valuing the Malacca Straits

The 1,641-km Malacca Straits traverses Indonesia, Malaysia, and Singapore. It boasts of 83,259 ha of mangroves from the Indonesian side and 264,180 ha from the Malaysian coastline. Moreover it has more than 35,800 ha of mudflats, 236,000 ha of beaches, and 523,000 ha of coral reefs. It is a valuable strait as it is a shorter route to East Asia for ships coming from the Middle East and South Africa. The amount of savings for ships passing through Malacca is USD 600 million. Total gross revenues from fisheries and aquaculture from the areas amount to USD 1.9 billion annually (fisheries alone amount to USD 1.1 billion). Tourist revenues amount to USD 466 million annually.

Using the TEV approach, the value of the Straits was estimated at USD 5.131 billion [MPP-EAS, 1999]. From the estimated values, it can be shown that the direct use (that is, fisheries, tourism, and transportation) accounts for only 13.5 percent of its TEV. Less apparent but equally important is its carbon sequestration role (14.5 percent), and control of coastal erosion (15.9 percent) [Table 5]. The benefits from Malacca Straits can be either *partially excludable* (such as coastal erosion and fisheries) or *nonexcludable* (such as biodiversity and carbon sequestration). From this example it is clear that cost of the maintenance of a healthy marine ecosystem should be shared among the three affected countries.

Valuing marine and forest resources: The case of Samoa

Samoa is a small island country in the South Pacific, midway between Hawaii and New Zealand. It has 100 million ha of territorial sea and 150 million ha of exclusive economic zone. To evaluate its marine and forest resources, the Samoan Government working in partnership with World Wide Fund for Nature, commissioned a study to compute the TEV of its forest and marine resources. Special focus was given on the value of ecological services that Samoa gives to the rest of the world in terms of climate regulation services (that is, as a carbon sink), effluent sink and nutrient cycling, biological control, coastal damage regulation, waste treatment, and habitat/refugia for fisheries.

Based on the study by Mohd-Shahwahid and McNally [2001], the value of its forest and marine assets was only WST 21 million (Western Samoan Tala, its local currency) or 2.7 percent of its gross domestic product (GDP), 91 percent of this is attributed to direct use. However, when the ecological services were priced, TEV was computed at WST 232 million or 29.9 percent of its GDP [Table 6]. Although the study made extensive use of the benefits transfer method (using price obtained elsewhere to value ecosystem services) which is often criticized as inaccurate, this study nonetheless highlights the fact that the magnitude

Table 5: The Economic Value of Malacca Straits (USD million)

		%
Direct Use (fisheries, tourism, transportation)	692.79	13.5
Other Direct Use	757.68	14.8
Carbon Sequestration	742.30	14.5
Control of Coastal Erosion	816.50	15.9
Shipping Lane	600.00	11.7
Option Value: Biodiversity	13.40	0.3
Existence Value	1,508.63	29.4
TOTAL	5,131.30	100.0

Source: MPP-EAS [1999]

Table 6: Total Economic Values (TEV) of Forestry and Marine Resources of Samoa (WST '000)

	Value accrued to Samoans	%	Value accrued to Samoans and the rest of the world	%
FORESTRY				
Direct Use	2,123	10.1	2,123	0.9
Timber	482		482	
Raw Materials	1,138		1,138	
Food	157		157	
Recreation	347		347	
Indirect and Option Use	323	1.5	4,343	1.9
Ecological Functions	323		4,343	
Cultural Values	26	0.1	26	0
subtotal	2,472		6,492	
MARINE				
Direct Use	16,996	80.9	16,996	7.3
Fishery	15,597		15,597	
Raw materials	8		8	
Recreation	1,390		1,390	
Indirect and Option Use	277	1.3	207,726	89.4
Ecological Functions	277		207,726	
Cultural Values	1,260	6.0	1,260	0.5
subtotal	18,533		225,982	
Total Forestry and Marine Resources	21,005		232,474	

Source: Mohd-Shahwahid and McNally [2001] of benefits accruing to the rest of the world could be substantial, relative to the benefits the people of Samoa receive from its ecosystem.

Ecosystem Goods as Public Goods: A Framework

The previous discussion shows that ecosystem goods are what economists would call *public goods* or goods that have *nonexcludability (one cannot exclude nonpayers)* and *nonrivalry (one cannot monitor amount of consumption)* characteristics. Public goods are the opposite of private goods as the latter have excludable and rivalry properties. To be able to consume a private good (such as eating a donut), one has to pay the price and one's bill is equivalent to the price times the quantity consumed. Clean air is a public good since one cannot be prevented from consuming it, much less to be charged for the amount of air taken in.

The Benefit Principle and the supply of public goods

An important principle in economics is that consumers of a good must pay their marginal willingness to pay (MWTP) or the value of their marginal benefit from consuming the good. If each consumer pays his MWTP, and if the sum of the MWTP collected is equated to the marginal cost of providing the good, then an optimal level of provision of the good is achieved.

In the case of public goods like clean air, people do not normally reveal their MWTP, thus making the marginal cost difficult to implement. The failure of the provider to exclude nonpayers and monitor consumption of each user means that *it is difficult to device a scheme by which he can collect and provide the public good on a sustainable basis*.

Another consideration is where the public good is "impure" in the sense of having some *partial excludability* and/or *partial rivalry*. For instance, a public beach can have excludability and nonrivalry if one puts a fence and charge entrance fees to users. Moreover, there are some activities in which both private and public benefits are derived. An example is the case of the Samoan economy where, clearly, the public (or global) benefits are much larger than the private or in this case "national" benefits. Table 7 provides a list of examples and implications.

Types of Public Goods

Given the variation of characteristics in nonexcludability and nonrivalry aspects, five possible types of public goods have been identified [Sandler, 2001, 2005]:

1. **Pure Public (Nonexcludable and Nonrival).** An example of this is the reduction of greenhouse gases which benefits everyone in the planet.

2. **Impure Public (Nonexcludable, with some rivalry).** Ocean fishery is an example where one nation cannot prevent other nations from using it and there is some rivalry in terms of extraction.
3. **Impure Public (Nonrival, with some exclusion).** An example of this type of arrangement is the missile defense system, where the beneficiaries can be identified and excluded, but the "enjoyment" of the benefit is nonrival.
4. **Club Good.** If the cost of exclusion is small, and use of the good can be monitored and users can be charged a fee, then the users can form a club and provide themselves with the shared good. For this to function there must be an exclusion device. An example is the maintenance of waterways (such as canals, straits) where there is a natural exclusion device and where one can possibly charge user fees.
5. **Joint Products.** These are activities that simultaneously yield two or more outputs that may vary in their degree of "publicness." An example is the rainforest whose preservation generates purely public benefits globally in terms of carbon sequestration and biodiversity. Moreover, it can also benefit the local host country and neighboring countries in terms of erosion control, localized climate effects, watershed protection, and ecotourism.

Table 7: International Public Goods: Types and Financing Possibilities

	Examples	Financing Possibilities	Remarks
Nonexcludable and Nonrival	•Curbing global warming •Augmenting ozone shield •Limiting spread of disease	Must rely on some kind of public sector push based on an *ability to pay charge*. Financing coordinated by a supranational organization using some international taxation or fee arrangement. A leader nation or nations might exist if sufficient net benefits can be derived.	Voluntary contributions will be crowded out by collective contributions. Partial cooperation faces free riding offsets unless there is sufficient participation. *Enforcement mechanism is necessary.*
Some Rivalry but No Excludability	•Ocean fisheries •Controlling pests •Alleviating acid rain	*Must again rely on supranational organization and some international collection arrangement.* Rivalry may motivate more independent behavior in contrast to purely public goods.	*More private incentives to contribute.* Rivalry lessens neutrality concerns, but a push from the public sector is required.

Table 7: (continued)

Some Excludability, Nonrivalry	• Information dissemination • Disaster relief • Extension services	*Exclusion promotes voluntary financing and club-like structures*. For these goods, the public sector may be needed for coaxing and facilitating eventual private sector provision. There may be an entrepreneurial or leader nation to market the good.	Since exclusion is not complete, some sub-optimality would remain. Does this suboptimality warrant intervention or inducements?
Club Good	• Transnational parks, canals, waterways	Charge each use according to crowding that results. Nonpayers are excluded. Toll per use is equal to marginal crowding costs. Nations with a greater demand visit more often and pay more than those with smaller demand.	Can result in an efficient outcome. Clubs limit transaction costs. Full financing is dependent on scale economies and other considerations. *No public coaxing is needed.*
Joint Products	• Tropical forests	As nation-specific private benefits and club good benefits become more prevalent among joint products markets, club arrangements can be used to finance the good with greater efficiency. *As the share of excludable benefits increases, payments can be increasingly based on benefits received.*	*Ratio of excludable to total benefit is the essential consideration*. As ratio approaches one, markets and clubs work more fully. Institutional arrangements can foster these excludable benefits.

Source: Modified from Sandler [2001, 2005]

Financing Public Goods

An important question is: "How to allocate the costs of providing public goods among a number of beneficiaries and how to collect fees?" As pointed out earlier, without an adequate mechanism to charge and collect fees, there will be an under-provision of public goods like ecosystem services. Sandler [2001, 2005] developed a framework for analyzing the institutional arrangements needed to finance public goods; Sandler [2001] further posited four types of "aggregation technology" [Table 8]:

Table 8: Aggregation Technology and Implications

Aggregation Technology	Definition	Examples	Strategic Consideration	Institutional Implications
Summation	Overall level of goods equals sum of individual contribution	• Curbing air pollution • Reducing global warming • Cataloging species	Characterized by Prisoner's dilemma or chicken game. In the former, there are strong incentives to free ride; in the latter, there is an incentive on behalf of the richest to inhibit dire consequences.	In an assistance context, there is a need for a multilateral organization or a rich nation to assume leadership. Cannot typically rely on voluntary action on a national level.
Weighted Sum	Overall level of goods equals a weighted sum of countries' contribution. Each country's contribution has a different additive impact.	• Clean up of sulfur emissions • Monitoring the planet from different vantages • Controlling a pest	Implies some participants receive greater private benefits and thus have greater inducements to contribute.	Multilateral organizations need to support efforts among those nations with less country specific benefits. Collect and provide information on the weight matrix to encourage independent financing.
Weakest Link	Smallest contribution determines the good's aggregate level	• Containing river blindness • Vaccination to prevent contagious diseases	Assurances games where matching behavior characterizes the stable outcome. Actions and/or contracts are self-enforcing. Well-endowed players have an incentive to assist those less well-off.	Multilateral agencies can channel funds to raise good to acceptable standards. Capacity building required in poor countries. Rich countries contribute directly.

Table 8: (continued)

Best Shot	Largest contribution determines the good's aggregate level	• Finding a cure for AIDS • Neutralizing a pest	Coordination games where only a single provider is required. Problem lies in identifying this agent if there are two or more candidates — coordination needed. Problems arise when best endowed nation derives little benefit from the action.	Put supply efforts where the prospects and resources are the greatest for success. Multilateral organization or a leader nation can serve to coalesce and focus resources.

Source: Modified from Sandler [2001]

1. **Summation** — The supply of the good is the sum of individual contributions. An example of this technology is greenhouse gas reduction, where everyone's effort determines the "total supply" of greenhouse gases. Given that there is a strong incentive to "free ride," government must not rely on voluntary action. Hence there is a need for leadership or political will to pressure everyone to provide financing for the good.
2. **Weighted Sum** — Each country's contribution can have a different additive impact on total supply of goods. In this case, one's effort has a substantially bigger impact than other's actions. An example of this is the effort by countries with rich biodiversity, whose conservation efforts will have a weightier impact on a global scale. Here some weighting matrix must be established for the costs and benefits. Higher allocation of financing must go to the country whose efforts will benefit a wider coverage.
3. **Weakest Link** — Only the smallest effort determines the total supply of goods. Thus, the supply of the good is dependent on the action of the smallest player. An example of this is vaccination to prevent the spread of common diseases. Here, the provision of the good (elimination of the disease) is dependent on the simple action of the smallest player.

4. Best Shot — Only the largest effort determines the total supply of goods. Best shot is where the largest effort determines total supply. In this case, the conservation of a locality-specific endangered species is dependent on a specific country, hence, the "best shot." Multilateral organizations or a leader nation can serve to coalesce and focus resources and efforts.

Waste and the Environment in East Asia

In this chapter, we provide an overview of the trends in land-based pollution that affects the East Asian Seas. The aim is to give a snapshot of current and emerging problems as well as opportunities in environmental management. As we shall see, strong and innovative interventions from the government and private sectors are needed in order to address the environmental problems.

Trends in Solid Waste Management

Waste as a price of increasing affluence

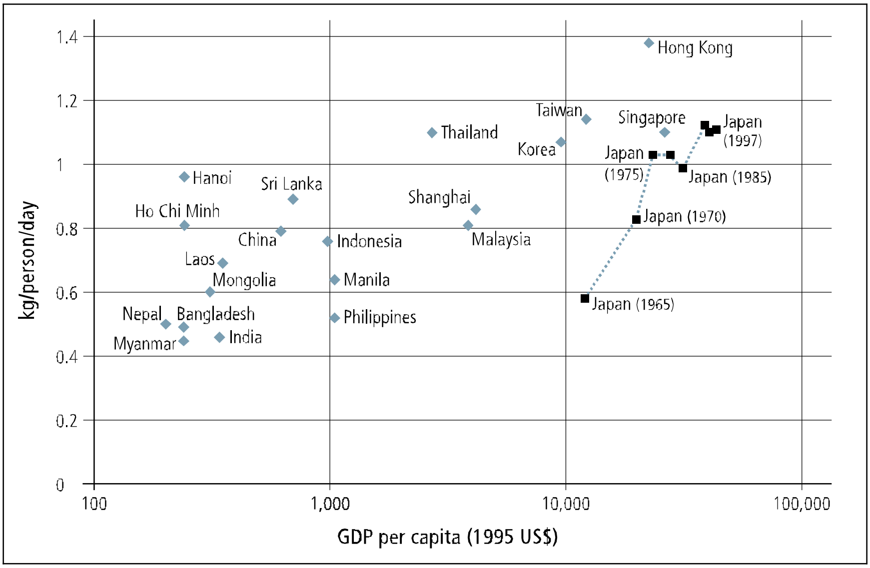
Among the identifiable factors driving waste, two factors stand out: rising incomes and urbanization. Increasing wealth enables Asian households to move up to more packaging-intensive, western-style manufactured consumer goods. Figure 5 shows the direct relationship between municipal waste generated and per capita income. Low- to middle-income countries generate between 0.5 kg to around 1.1 kg per day. The number rises with higher affluence as evidenced in Hong Kong, Singapore, Taiwan, RO Korea, and Japan.

East Asia… at the tidal wave of garbage

The countries in the East Asian region generate 316.2 million tons of municipal waste annually from its urban population. China now produces 186 million tons of urban waste each year, already comparable to the 209 million tons that the United States generates. In a few years, China will surpass the U.S. in terms of waste production [World Bank, 2005a]. Meanwhile, Japan now produces 53 million tons while RO Korea generates 23 million tons. Other significant generators are Indonesia (21.1 million), Philippines (8.4 million), and Thailand (5.0 million) [Tables 9 and 10].

Waste is an urban phenomenon as the city-based individuals produce 2–3 times more than those in the rural countryside. In China, a country

Figure 5: Relationship between Income and Waste Generation



Source: Adapted from Mendes et al. [2004]

with an urban population of 536 million, an individual generates an average of 1.0 kg of waste per day [Table 11; World Bank, 2005a].

Waste and governance issues

It is often cited that municipal governments in poorer countries do not have the management capacity to deal with the waste problem. Lack of environmental awareness and low financial and human resources are also being cited as reasons. Some cite a lack of transparency in some municipalities leading to corrupt practices. Table 11 summarizes the key waste management issues in Asian cities. Waste collection rate is very low in poorer countries at less than 70 percent despite the fact that waste-related expenses already account from 15 to 40 percent of the municipal budgets. In middle-income countries, collection rate is between 80 and 95 percent.

Lack of a financially sustainable waste policy

What is very evident is the fact that municipal governments are not collecting much to pay for waste handling and disposal [Table 12]. In other words, waste generation is being subsidized and encouraged. In many cities, collection revenues could barely cover the recurring collecting expenses. In Thailand, under-recoveries and subsidies to finance capital

Table 9: Urban Population and Waste Generation in East Asian Seas

		Total Population (million)[a]	Urban Population 2003 (million)[b]	Waste per capita per day (kg)	Million tonnes per year
Low Income					
Vietnam		81.3	16.9	0.55	3.4
Cambodia		13.4	2.7	0.45	0.4
China		1,288.4	536.0	0.95	185.8
	subtotal	1,383.1	**555.5**		**189.7**
Middle Income					
Indonesia		214.7	76.0	0.76	21.1
Philippines		81.5	44.2	0.52	8.4
Thailand		62.0	12.4	1.10	5.0
Malaysia		24.8	13.3	0.81	3.9
	subtotal	83.0	**145.9**		**38.4**
High Income					
Korea, Republic of		47.9	38.9	1.59	22.6
Hong Kong		6.8	5.8	5.07	10.7
Singapore		4.3	4.3	1.10	1.7
Japan		127.6	99.0	1.47	53.1
	subtotal	186.6	**148.0**		**88.2**
	TOTAL	1,952.7	**849.5**		**316.2**

[a] Source: World Development Indicators World Bank [2005b]
[b] Estimated using 2003 population figures

Table 10: Waste Characteristics in Urban Settings (%)

	Biodegradable	Paper	Plastic	Glass	Metal	Textile/ Leather	Inerts (ash, etc.)
Indonesia	74.0	10.0	8.0	2.0	2.0	2.0	2.0
Dhaka	70.0	4.3	4.7	0.3	0.1	4.6	16.0
Kathmandu	68.1	8.8	11.4	1.6	0.9	3.9	5.3
Bangkok	53.0	9.0	19.0	3.0	1.0	7.0	8.0
Hanoi	50.1	4.2	5.5		2.5		37.7
Manila	49.0	19.0	17.0		6.0		9.0
India	42.0	6.0	4.0	2.0	2.0	4.0	40.0
Karachi	39.0	10.0	7.0	2.0	1.0	9.0	32.0

Source: Adapted from Mendes et al. [2004]

Table 11: Overall Municipal Solid Waste Management Issues in Asian Cities

	Low-income Country	Middle-income Country	High-income Country
GNI-PPP[a] Per Capita 2002	Less than 2,000	2,000–15,000	More than 15,000
Barriers	Poverty Financial constraints Poor management capacity	Urban growth Low management capacity	Excess of waste Varied waste composition Land scarcity
Waste Characteristics	High bulk density High organic content	Evolving or changing characteristics	Low bulk density High plastic content
Waste Management	Priority to collection and transportation	Gradual improvement in final disposal	Advanced treatment Appropriate and well-monitored final disposal
MSW Collection Rate	Less than 70 percent	80–95 percent	95–100 percent
Rate of Expenditure to Total Municipal Budget	15–40 percent	5–25 percent	1–5 percent
Waste Per Capita (kg/person/day)	0.3–0.7	0.5–1.5	More than 1.0
Recycling	Informal	Formal + Informal	Formal
Examples	Dhaka, Kathmandu, Karachi, Phnom Penh	Beijing, Shanghai, Guangzhou, Bangkok, Kuala Lumpur, Manila	Tokyo, Taipei, Seoul, Hong Kong, Macau, Singapore

[a] GNI-PPP per capita is the gross national income in purchasing power parity.

Source: Mendes and Imura [2004]

Table 12: Fees Collected as Percentage of Total Waste Collection Expenses[a] in Asian Cities

Municipality/City	%
Olongapo City, Philippines[b]	35
Hue, Vietnam[b]	7
Nam Dinh, Vietnam[b]	11
Bangkok, Thailand[c]	3
Indonesia (Bandung, Medan, Surabaya, Jakarta)[b]	35–70
Shanghai, China[d]	39
Chonqing, China[d]	30
Kunming, China[d]	73

[a] Fees collected as a percentage of recurrent expenses on waste collection by municipalities
[b] Cointreau-Levine and Coad [2000]
[c] World Bank [2003b]
[d] World Bank [2005a]

Box 2: User Charges in Developing Countries

Collection of User Charges in Ecuador

Municipalities in Ecuador raise their solid waste revenues largely by a 10–12 percent surcharge on the electricity bill paid by each household. Quito municipality raises all of the money it needs to cover its existing level of recurrent expenditures and even to finance capital expenditures equivalent to 6 percent of its total costs. To obtain these revenues, it pays a 4.5 percent commission to the municipal electrical company for revenue collection. In Guayaquil municipality, all costs required to pay for the private sector to collect, transfer, and properly landfill solid wastes are covered through the user charge added to the bills of the municipal electrical company. Because Guayaquil has a significant industrial base for revenue generation, a commission of only 1.5 percent is charged by the electricity company.

Waste Tariffs in Indonesia

In its national strategy in 1988, Indonesia set a policy that municipalities should implement cost recovery through direct user charges, recommending tariffs averaging at 1 percent of household income. Several Indonesian cities (notably Bandung, Medan, Surabaya, and Jakarta) have been successful in implementing the strategy and have been recovering from 35 to 70 percent of total collecting expenses.

expenditures have led to the steady draining of its Thailand Environmental Fund for the past several years [World Bank, 2000, 2003b]. In areas where user charges are applied, such as in Olongapo City, Philippines, the fees collected cover only roughly a third of the total cost of collection [Cointreau-Levine and Coad, 2000]. In other developing countries it is possible to collect fees and even post margins for capital expenditures [Box 2].

Open Dumping Is Rampant

The manner by which wastes are disposed of in the poorer countries in Asia poses a serious concern. China, now the world's biggest producer of urban waste, dumps half of its 190 million tons of waste in the open. In Indonesia, Philippines, and Vietnam, open dumping accounts for 60–75 percent of total wastes disposed [Table 13]. This has resulted to reported cases of contamination of surrounding water as well as water- and air-borne diseases.

Table 13: Municipal Solid Waste Disposal Methods (%)

	Landfilling	Open Dumping	Composting	Incineration	Others*
Australia	80	0	10	5	5
Korea	60	20	5	5	10
Malaysia	30	50	10	5	5
China	30	50	10	2	8
India	15	60	10	5	10
Indonesia	10	60	15	2	13
Philippines	10	75	10	0	5
Pakistan	5	80	5	1	10
Vietnam		70	10	2	20
Sri Lanka		85	5	3	10

* Includes animal feeding, dumping in water, ploughing into soil and open burning.

Source: Adapted from UN-ESCAP/ADB, State of Environment in Asia and the Pacific

An example is the Philippines where contaminated drinking water is one of the most prevalent causes of illnesses [World Bank, 2004]. Avoidable annual health costs related to drinking water are estimated at USD 60 million, roughly the size of the budget for waste collection in the National Capital Region. The overall cost of water pollution, in terms of lost fisheries, public health, and lost tourism is estimated to be at USD 1.3 billion, roughly 1.5 percent of GDP.

The prevalence of open dumping reflects the fact that true cost of properly disposing waste is not reflected in the price collected by municipal governments. Again, this indicates either failure or lack of awareness of its true cost to the environment.

How much does it cost to handle and dispose waste properly?

Based on the model developed by Cointreau-Levine and Coad [2000], the cost of a good integrated solid waste management with sanitary landfill, using data from 40 countries, is estimated to hover between USD 16 and USD 48 per capita per year (or 0.7 percent and 2.6 percent of GNP for a low-income country) and USD 43–100 per capita per year (from 0.5 to 1.3 percent of GNP for a middle-income country). This ratio falls to less than 1 percent for richer countries [Tables 14 and 15]. While the range is wide for poorer countries, *the cost of a good waste strategy is not so high compared to health and environmental costs brought about by improper handling and disposal*. As pointed out in the previous section, the health and environmental costs could be higher if countries do not pay for proper waste technologies.

Table 14: Integrated Sanitary Landfill Cost Breakdown and Per Capita Income[a]

	Units	Low-income Country	Middle-income Country	High-income Country
Average Waste Generation	tonnes/cap/yr	0.2	0.03	0.6
Average Income from GNP	USD/cap/yr	370	2,400	22,000
Collection Cost	USD/tonne	10–30	30–70	70–120
Transfer Cost	USD/tonne	3–8	5–15	15–20
Sanitary Landfill Cost	USD/tonne	3–10	8–15	20–50
Total Cost without Transfer[b]	USD/tonne	13–40	38–85	90–170
Total Cost with Transfer[b]	USD/tonne	16–48	43–100	105–190
Total Cost as % of GNP		0.7–2.6	0.5–1.3	0.2–0.5

[a] The study used cost in 1995 US dollar.
[b] If a sanitary landfill can be located within an economic haul distance, so that direct haul in collection vehicles is economical, the cost of transfer can be avoided. An economic haul time for a small truck carrying 2–6 tonnes is typically 30 minutes from the collection area to the unloading point. Depending on traffic conditions, in 30 minutes a distance of 15–30 km can be covered. The maximum economic haul distance for larger trucks is typically 30–50 km one-way.

Source: Cointreau-Levine and Coad [2000]

Table 15: Technologies on Municipal Solid Waste Management

	Low-income Country	Middle-income Country	High-income Country
Current Status	Low technology Low costs	Intermediate situation Tendency to adopt higher cost technology	Waste minimization and recycling
Waste Treatment Technology	Open dumps Community based or yard decomposting	Open dumps Composting Semi-engineered landfill Sanitary landfill Incineration	Landfilling Gas extraction from landfill
Recycling	Low technology Low costs Collection by informal sector		

Source: Modified from Mendes et al. [2004]

Using Tables 14 and 15, one can estimate that low- and middle-income countries in East Asia will have to spend at the least (*using low cost technology*) USD 7.3 billion annually for integrated solid waste management expenses. Rich countries will spend some USD 20.3 billion annually at the minimum.

Hazardous Waste Disposal: Dangerous Early Learning Stages

There is not much data on hazardous waste owing to poor capacity of governments to identify and monitor sources. Indonesia, a country which produces 1 million tons of toxic waste, has only one hazardous waste treatment facility handling 35,000 tons per year. Here monitoring is poor and there are many anecdotal evidences that significant amount of wastes are being dumped into the river [World Bank, 2003a].

Another fear is that hazardous wastes are being disposed with municipal solid wastes posing serious threats to waste workers and causing groundwater contamination due to lack of sanitary landfilling [Box 3].

Table 16 shows the estimated volumes of hazardous waste and prevailing practice in Indonesia, Philippines, and Thailand. In these three countries, the evidence is high that toxic wastes are being discharged indiscriminately. Developing a functioning hazardous waste treatment and disposal system is a major challenge for the governments.

Probst and Beirle [1999] studied the experience of 4 developed countries and 4 developing countries in hazardous waste management. They concluded that:

1. It takes a long time, at least 10–15 years, to develop a fully operational hazardous waste regulatory system. It took a while before countries like U.S. and Germany — "rule of law countries" — to develop laws, institutions, and procedures.
2. Developing a culture of compliance is the crucial element of an effective hazardous waste management system. Government must have enough credibility and real enforcement powers to ensure compliance.
3. Clear lines in regulation increases the chances of successful implementation of a new regulatory system. Simply having good laws and regulations are not enough.
4. There are important consequences to the decision not to harmonize policy at the national level. Decentralization resulted in differences in the quality and effectiveness of toxic waste programs.

In terms of financing hazardous waste facilities, they reached the following conclusions:

1. There is no single proper approach to hazardous waste management facility financing (that is, private, public or a mix) that will work in every country. Each country has different circumstances in terms of industrial profile, geography, resources, and capacity [Table 17].
2. In countries where there is not yet a "culture of compliance," the financing approach matters. In early years, subsidies were necessary to attract waste generators to properly manage their waste. It is more effective in encouraging change in behavior.
3. Disposal fee subsidies are a viable transitional strategy for encouraging proper waste disposal. Market pricing can be phased over time once the waste generators have gotten the habit of compliance.

Box 3: Cancer-causing Dioxins Found in Breast Milk of Mothers from Payatas, Quezon City, Philippines

According to the 1999 study by Maricar Prudente and Socorro Aguja of the Science Education Department of the De La Salle University in Manila, Philippines and Tatsuya Kunisue and Shinsuke Tanabe of Japan's Ehime University, human breast milk samples collected from Filipino women living in *Barangay* Payatas tested positive for dioxins.

Barangay Payatas is an open dumpsite for municipal or even hazardous wastes, according to Greenpeace Philippines.

"Human breast milk samples collected from *Barangay* Payatas, near the Payatas open dumpsite in Quezon City, were analyzed to elucidate the levels of persistent organochlorides such as polychlorinated biphenyls (PCBs), hexachlorocyclohexane (HCHs), chlordanes (CHLs), dichlorodiethyltrichloroethane (DDTs), and hexachlorobenzene (HCB)," the study's abstract said.

"Concentrations of polychlorinated dibenzodioxins (PCDDs), polychlorinated dibenzofurans (PCDFs) and individual PCB congeners were likewise determined. Residual concentrations observed in human milk samples indicate health significance related to post-natal intake of human milk among infants. Therefore, continued and enhanced efforts should be directed towards identifying and controlling environmental sources of these substances."

Dioxins are widely recognized as one of the 12 particularly toxic persistent organic pollutants (POPs). They have no useful purpose, and are produced as unwanted byproducts of industrial processes, including: vinyl and polyvinyl chloride (PVC) plastic manufacturing; medical waste, garbage, and hazardous waste incineration; home, building, and vehicle fires; copper, lead, and iron smelting; chemical manufacturing; paper mills; and pesticides.

Source: Prudente et al. [2002]; Tanabe and Kunisue [2007]

Table 16: Hazardous Waste Practices in Indonesia, Philippines, and Thailand

	Volume (m tons)	Capacity and Disposal	Concerns
Indonesia[a]	1.000	There is only one hazardous waste treatment plant treating around 35,000 tons of waste per year. Environment Ministry issued 219 licenses to waste generators to treat their own waste.	Monitoring is poor. Anecdotal evidences suggest significant amount of toxic wastes are dumped in uncontrolled landfills and rivers. Treatment charges perceived as high.
Philippines[b,c]	1.680	Although there are 28 registered hazardous waste treatment facilities, there are concerns on the lack of facility to treat waste acids, alkalis, oils, and sludge containing heavy metals. Treated waste amounts to only 70,900 tons per year. No landfill facilities for hazardous wastes.	Volume figures include 18,500 tons of hospital waste. Half of this is incinerated while half is disposed of improperly. Incineration is prohibited by the Clean Air Act.
Thailand[d]	1.340	Only 24 percent of the hazardous waste in Bangkok vicinity is treated by licensed centralized facilities; the remaining is treated using lower cost and often less regulated practices. 14 percent of hazardous waste is managed offsite through disposal by other unlicensed treatment and disposal operators, waste buyers and recyclers. GENCO, the government facility, can handle 250,000 tons per year.	Illegal disposal of toxic wastes were reported. Little regulatory oversight on waste haulers and buyers. Fines amount to only 2,000 baht. Figure does not include 10,000 tons of hospital waste disposed with municipal solid waste directly deposited to sewers or dumped indiscriminately. Waste treatment recently liberalized to allow private operators.

[a] World Bank [2003a]
[b] World Bank [2001]
[c] Figure includes wastes coming from registered companies (280,000 tons/year) and estimated 1.4 million tons/year from nonregistered companies.
[d] World Bank [2003b]

Table 17: Public and Private Financing of Hazardous Waste Facilities

Country	Sector
Germany	public/private
Denmark	public
U.S.	private
Canada	public/private
Malaysia	private
Hong Kong	public/private
Thailand	public/private
Indonesia	private

Water Supply and Sanitation Issues

Municipal wastewater discharges are one of the most important threats to coastal ecosystems. Their effects are localized but they contaminate regional waters [UNEP, 2002]. In general, availability of sanitation has a direct relation to wastewater generation. The lesser the number of sanitation connections the greater the chance of the wastewater being discharged into coastal and marine environment. Presence of sanitation indicates better treatment facilities and thus lesser discharge in the coastal environment.

Table 18 shows the water and sanitation coverage of population in the East Asian Seas region. Coverage is defined as population with reasonable access to an adequate amount of water including treated surface water and untreated but uncontaminated water such as springs, sanitary wells, and protected boreholes. In urban areas, the source may be a public fountain or standpipe located not more than 200 m away. Meanwhile, sanitation is defined as the population with at least adequate excreta disposal facilities that can effectively prevent human, animal, and insect contact with excreta.

Table 18: Water Supply and Sanitation Coverage in East Asian Seas

	1990 (million)	2000 (million)
With water supply	665	883
Without water supply	283	276
% of total population without water supply	**29.8**	**24.9**
With sanitation	412	594
Without sanitation	536	514
% of total population without sanitation	**56.5**	**46.4**
TOTAL	**948**	**1,109**

Source: United Nations Environment Programme [2002]

There are at least 276 million people without access to water and 514 million without adequate sanitation in the East Asian Seas region. Aside from its impact on the fresh and marine waters, low water and sanitation has important implication on public health (for example, raising the incidences of diarrhea and other preventable illnesses). As pointed out earlier, the cost of water pollution in terms of health, loss of revenues in fisheries, and loss in tourism could be huge (as much as 1.5 percent of GNP, in the recent case of the Philippines).

It is clear that water and sanitation will be one of the biggest challenges given that water infrastructure projects involve large sums of funding and long recovery rates. It is here that bold moves and financial innovation are needed in terms of adoption of new market mechanisms and credit support. Given that better water and sanitation does not only benefit the home country, but the rest of the region as well (in terms of lower damage on marine ecosystems), it must also be seen from the point of view of regional cooperation.

Costs of higher water and sanitation coverage

According to a recent study by Yepes [2004], the developing countries of the East Asian region will have to spend around USD 14.816 billion (0.6 percent of East Asian GDP) in investment and maintenance costs annually between 2006 and 2010. This is broken down into: water (USD 7.799 billion) and sanitation (USD 7.017 billion). China will account for a huge chunk of the expenses, at USD 6.187 billion per year for water and USD 4.474 billion for sanitation [Table 19].

Investment expenditures are defined as the increment in stock values over time while annual maintenance costs are assumed to be a fixed percentage (that is, *3 percent of stock values*). Annual investment on water is estimated to reach USD 5.5 billion and maintenance at USD 9.358 billion. These expenditures are expected to bring down households without access to water and sanitation to around 26 percent of total households.

Financial Instruments for Environmental Projects

Financial mechanisms have been developed over the years to finance projects that are directly or indirectly related to the environment. Different environmental projects require different financial structure and funding schemes. For conservation activities that require relatively small but sustained flow of resources, trust funds have been the identified choice. For projects that require significant capital injection, private

Table 19: Annual Investment and Maintenance Expenditures in Water and Sanitation between 2006–2010 (in USD billion)[a]

	Investment (I)	Maintenance (M)	Total (I+M)
China			
Water	2.097	4.090	6.187
Sanitation	1.830	2.644	4.474
subtotal	3.927	6.734	10.661
Middle Income East Asia[b]			
Water	0.160	0.413	0.573
Sanitation	0.417	0.731	1.148
subtotal	0.577	1.144	1.721
Low Income East Asia			
Water	0.314	0.725	1.039
Sanitation	0.640	0.755	1.395
subtotal	0.954	1.480	2.434
Total			
Water	2.571	5.228	7.799
Sanitation	2.887	4.130	7.017
TOTAL	5.458	9.358	14.816

[a] Countries include China, Indonesia, Lao PDR, Malaysia, Mongolia, Papua New Guinea, the Philippines, and Thailand.
[b] Without China

Source: Yepes [2004]

participation via debt or direct equity has been the common source of finance. Other forms of funding such as environmental venture capital, biodiversity offset, and direct payments for ecological services have also surfaced in recent years.

Private Equity Participation in Public Sector Projects (PPP)

There are four main types of private equity participation, namely: service contracting, build-operate-transfer (BOT), concessions, and joint venture. The characteristics, advantages, and disadvantages are discussed in Table 20.

The literature on this subject suggests there is no one financial arrangement that works best [Cointreau-Levine and Coad, 2000; Probst and Beirle, 1999]. It is important to consider that in partnering with the government, the private sector is faced with numerous risks. These risks include commercial, financial, and sovereign risks:

1. Commercial risks are related to construction delays, overshooting of budgets, and risks that volumes may not materialize or fees may not be collected.
2. Financial risks are those associated with interest and exchange rate fluctuation that raises the cost of capital.
3. Sovereign risks are those that pertain to possibilities that contracts may be reneged/or not honored or revoked by the government. It also refers to those associated with currency convertibility if the investor is a foreigner.

In addition, the project's rate of return is compared with other investment alternatives available elsewhere. As shown in Box 4, the perception of high risk and low returns has made major players shy away from developing countries.

Credit enhancements and supports

An important role of the government is to lessen the risks faced by private investors on essentially public sector concerns (that is, providing water and sanitation). Due to the problem of non-excludability and non-rivalry on public goods, the private sector is expected to face several operational and financial constraints. For example, it may have difficulty charging tariffs in the initial phase of its operations. Moreover, in cases where the payback of the project is long, the private investor may find it difficult to source funding. Furthermore, if the project will require a new technology, the investor may be faced with construction and operational risks. In these instances, the government may use credit enhancements and other financial supports to make the project attractive to private investors. Financial schemes like performance-based grants and refinancing guarantees were developed in the context of large infrastructure projects with long gestation period.

Performance-based grants

Performance-based grants are payments made by the government to partly cover costs of the private firms engaged in public services goods. There are two important considerations about this scheme. First, *the project's social benefits should be shown to exceed the public's WTP tariffs*. Second, *the WTP tariffs are more than enough to cover costs and meet the required private sector return*. In the case where the setting of the tariff *is not feasible in the short run due to political considerations*, then the public sector may give a grant, *subject to the compliance* of the concession arrangement.

Table 20: Public-Private Partnership Types and Structure

	Characteristics	Financing Structure
I. Service Contract	Private sector is hired for specific tasks and services, usually for 5–7 years.	Government pays a pre-determined fee; can be a one time fee or unit costs.
	Private sector performs services at agreed upon cost subject to certain standards. Use of competitive bidding to award contracts. Contractor usually does not have a direct relationship with customer.	Sometimes cost plus fee formula, where costs are fixed
Advantages	Low risk for private contractor. Very competitive.	
Disadvantages	Pricing becomes a political issue. Capital investments on the government.	
II. Build-Operate-Transfer (BOT)	Private sector finances, builds and operates according to specified standards.	Government agrees to purchase a minimum amount of output.
	Private sector usually allowed to recover costs and make a profit, in 10–20 years. Government retains ownership of facilities and is both customer and regulator.	
Advantages	Capital expenditure is on the private sector. Lower risk cause some demand is guaranteed.	
Disadvantages	Demand might be overestimated, which could bring huge contingent liabilities for the government; becomes a political issue.	
III. Concessions	Government awards private sector full responsibility for delivery of services.	Private sector responsible for all (or part of) capital and operating costs.
	Private sector responsible for operation, maintenance, collection and management. Government is regulator of price and quantity.	Operator collects tariffs directly from subscribers.

Table 20: (continued)

Advantages	Capital cost is on the private sector. Strong incentive for operator to innovate.	
Disadvantages	Large concessions are a political issue. Contracts difficult to design because of length of concession, usually 25 years or more. Monopoly issues usually raised by subscribers.	
IV. Joint Venture	Joint ownership of a company; assumption of co-responsibility to provide services.	Both private and public infused equity. Profits are shared.
Advantage	Both public and private have shared interest to provide public goods.	
Disadvantage	In reality, politics and profits mix; political interference on operations always a possibility leading to conflicts.	

Box 4: International Private Sector Participation in Solid Waste

There are 11 leading companies in the world that handle more than a quarter of the worldwide solid waste market. (This covers all collection services and treatment related to domestic, commercial, and industrial waste as well as urban and industrial cleansing). These companies are American or European and mainly operate in those markets.

It can be seen from the table below that four companies are active in emerging countries/markets. Onyx, the company with the largest presence, has significant operations in China, Egypt, Morocco, Tunisia, India, Thailand, Philippines, Brazil, Mexico, Colombia, Argentina, Venezuela, and Central and Eastern European Countries (CEEC). Sita operates in CEEC, Brazil and Argentina. RWE Umwelt operates in CEEC and Turkey, and Rethman operates in CEEC. In addition to these four, two smaller companies, Lobbe (Germany) and Saubermacher (Austria) have an emerging market presence only in CEEC.

Box 4: (continued)

Waste Management Companies' Estimated Emerging Market Sales

		2002 Sales Turnover (million Euros)	Estimated Emerging Market Turnover
North America	Waste Management	12,100	--
	Allied Waste	5,800	--
	Safety Kleen	--	--
	Republic Services	2,300	--
England	Cleanaway	1,400	--
	Shanks	800	--
	Biffa	700	--
France	Sita (Suez subsidiary)	5,800	200
	Onyx (Veolia subsidiary)	6,100	250
Germany	Rethmann	900	70
	RWE Umwelt	2,100	70

Source: Prunier, G. [2004] cited in World Bank [2005a]

In general, international private operators are disengaging from emerging countries, mainly due to low profitability, and high levels of financial risk. For instance, Clima, Sita's subsidiary in Argentina, claims that it lost 30 percent of the municipal solid waste (MSW) volume it was collecting before the country's economic crisis. In addition, the collapse of local currencies in the Philippines and Indonesia, coupled with refusal of contracting parties to uphold their commitments (particularly on rate adjustments) has made Sita highly risk averse and now favors organic growth over acquisitions in developing countries.

Similarly, RWE and Seche are extremely cautious and tending towards disengagement in emerging countries. RWE had active strategy of development abroad but has dropped it because of financial problems due to global recession. Seche is being extremely careful as well, preferring to engage only in stable localities with similar legislation, culture, and geography to that of France.

Onyx stands out from its competitors by still investing widely in emerging markets. Onyx is growing its market share, especially in China, although emerging markets still account for less than 3 percent of Onyx's revenues. Despite major growth potential in emerging countries, the general trend among large international private investors is disengagement and a high aversion to risk. It should be noted that it may be easier to attract smaller international private operators in emerging countries especially those who are not subject to financial market fluctuations. These smaller operators are usually more opportunistic. For this reason, they may be better suited to higher risk environments like those in emerging countries.

Source: World Bank [2005a]

In order to minimize government liability, the scheme should be structured in a way that it is reduced or lifted if benchmarks on profitability are exceeded at some time in the future or if the firm is already showing *excessive profits*. Alternatively, it can be reduced if the project fails to meet certain government standards or that the market perceives the quality of its services to be poor thereby affecting the project's ability to charge tariffs.

A main problem with this instrument is that *the evaluation of performance versus a certain standard* may become a contentious issue. Also it becomes problematic if the evaluation of the service in question requires technical knowledge. In this case, both the private and public may agree to hire the service of a third party evaluator [Box 5].

Box 5: Contracting Out Regulatory Functions

Contracting out regulatory functions is a well-established practice in infrastructure sectors of developing and industrial countries. Regulators can outsource technical tasks, specific regulatory decisions, or the whole regulatory process. Contracting out arrangements can be built into the institutional framework, as it is often the case when contracted out recommendations are binding or pursued on an ad hoc basis. The external contracted agency may consist of individual consultants, government agencies (at the national or regional level), or nongovernmental organizations.

The rationale for seeking external advice or contracting out regulatory decisions varies, to a significant extent, according to the local context and the stage of the life of the regulatory agency. Experienced regulators tend to outsource specific regulatory functions albeit retaining decisionmaking responsibilities, to reduce costs and bridge the information asymmetry between the regulator and the service providers. For example, the energy regulator in the United Kingdom, Ofgem, employs contractors to conduct independent audits of regulated companies and monitor their compliance with quality targets. Nascent regulators may decide to contract out binding regulatory functions to leverage the international expertise required to gain regulatory credibility relative to private operators. For example, in 1998, the newly established Bucharest Agency for Water and Sewerage Regulation appointed a panel of experts to conduct the tariff review; in 1996, the Palestinian Water Authority relied on a third party technical and financial audit to review on an annual basis, the performance-based management fee for the first water utility contract in Gaza. The practice of contracting out is more widespread in the water sector (in which most regulators are set up at the local level and have limited regulatory capacity), and in the telecommunications sector (in which regulators need to be kept abreast of a rapidly evolving environment).

Box 5: (continued)

The practice of contracting out regulatory decisionmaking to regional institutions can yield significant benefits for very small countries, where scarcity of technical skills may make it efficient to limit the number of regulatory agencies. In such a context, a regional regulatory agency might be in a better position than national regulatory bodies to build critical mass of regulatory capacity required to endure legitimacy of regulatory decisions. For example, the Eastern Caribbean Telecommunication Authority (ECTEL) serves the member countries of the Organization of the Eastern Caribbean States as a shared regulatory body. ECTEL's mandate is to coordinate regional telecommunication policies in addition to providing advice and support to national regulatory agencies.

Similarly, there is merit in adopting a regional regulatory approach when infrastructure regulation affects inter- and intraregional trade resulting in additional transaction costs for operators. For example, national transportation safety regulations may conflict with each other and, hence, limit or distort opportunities for trade. In such a context, there is a clear economic argument for national regulators to relinquish partially their regulatory jurisdiction to supernational entities better placed to promote standard harmonization.

However, several challenges arise when regulatory decisionmaking is contracted out. Contracting out regulatory decisions can weaken the accountability of the regulator relative to the consumer constituency. To avoid loss of accountability, national regulators need to maintain sufficient in-house regulatory capacity to monitor the contract performance and ensure the transparency of the contracting out process. Contracting out core regulatory decisions is often a politically sensitive decision, because governments may be reluctant to surrender their sovereign regulatory authority on contentious issues such as tariff reviews.

Overall, contracting out regulatory functions to third party agencies appears to be an effective instrument to strengthen the legitimacy and capacity of nascent regulators as well as to promote standard harmonization and regional coordination among national regulatory bodies, provided that it is accompanied by transparency and accountability mechanisms and there is enough political commitment to move forward with infrastructure reforms.

Sources: Environmental Resource Management, Ltd. [2004] and Castalia [2004b].
Adapted from Asian Development Bank [2005].

Refinancing and maturity extension guarantees

Refinancing guarantees are assurances that the government will provide liquidity to the project in question at a given interest rate at some time in the future. This is intended to *protect the project from financial market disruptions* at the time of scheduled refinancing (for example, bond redemption at a time of volatile interest rates). Guarantees are ways for the government to enhance the attractiveness of the project to lenders.

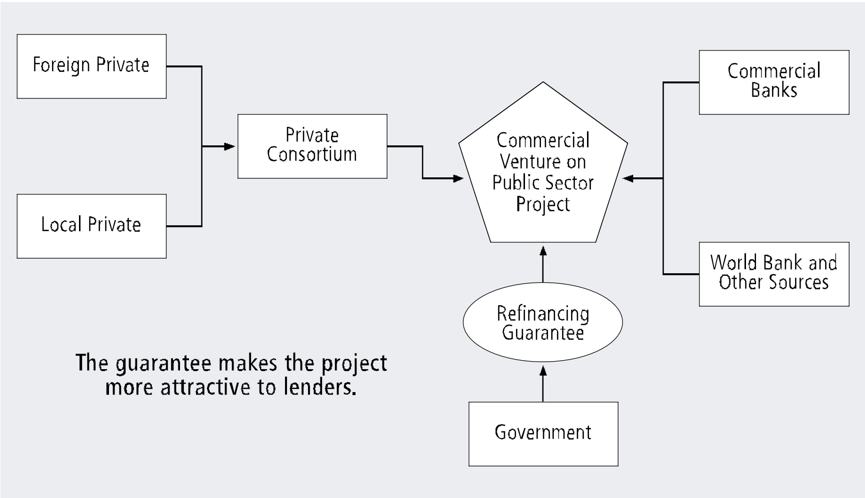
Guarantees should be flexible so as to limit the liability of the government. For instance, guarantees should be "callable," subject to certain compliance of conditions or some financial criteria. Moreover, provision for renegotiation/cancellation of the guarantee should be considered if the risk profile of the project improves at some time in the future [Figure 6].

Contingent lines of credits

Contingent lines of credits are used for infrastructure projects with major construction works and long construction periods. As most commercial banks do not normally assume the construction risks of these projects, banks require comprehensive completion guarantees by sponsors and construction companies.

Under these contexts, the government may look to mitigate risks via certain contingent credit support mechanisms. However, this support should be considered as an option only if it: *(1)* serves to tap private funding which otherwise would not be available; *(2)* can be precisely limited in scope; *(3)* does not subordinate government to other debt holders; and *(4)* is under

Figure 6: Government Loan Guarantee on a Private Sector Project



commercial terms and conditions. Moreover, the government should provide mechanisms to discourage its use. For example, the government can use this as points against those bidders who intend to use this facility. The government can also charge commercial fees and interest rates.

Partially subordinated debts

In the case where private funding is really limited over the short to medium term, the sponsor of a project may approach the government for equity or subordinated debts. Under subordinated debts, the government is not treated on an equal basis, that is, not *pari passu*, with other creditors. Given that the government is exposed to project risks, this funding option should be a last resort.

The government can use some trigger mechanisms in order to limit liability under partially subordinated debts. For instance, in cases where loss on a project is due to contractor's inability to comply with the concession agreement, then the government may be treated on a *pari passu* with other lenders.

Environmental Trust Funds

A trust fund is a legal structure by which money or other property is held, invested, and spent by a board of trustees or board of directors exclusively for a specific charitable purpose as defined in a charter or deed of trust [Norriss, 1999].

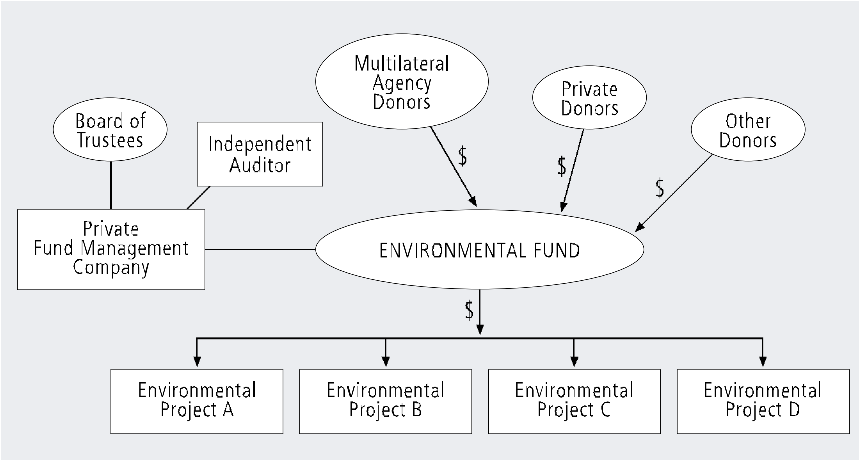
Environmental trust funds (EFs) are set up in order to address a specific or set of environmental concerns. It is structured as endowment, sinking, or revolving funds, or a combination of these:

1. Endowment fund is a fund that spends only the income from its capital, preserving the capital itself as a permanent asset.
2. Sinking fund is a fund that disburses its entire principal and investment income over a fixed period of time, usually a relatively long period (for example, 10 years).
3. Revolving fund is a fund that receives new income on a regular basis, such as proceeds from special taxes, user fees, among others, to replenish or augment the original capital.

Figure 7 shows the structure of an environment trust fund.

A number of EFs have been setup to provide long-term financing for biodiversity and other environmental activities. They are usually created and managed by private organizations and are capitalized by grants from governments and donor agencies, proceeds from debt-for-nature swaps and from taxes and fees specifically designated for conservation. EFs that

Figure 7: Environmental Trust Fund Structure



function as private institutions offer an opportunity to have a businesslike system of financial management and controls while maintaining transparency and accountability to contributors and other stakeholders [Table 21].

EFs are appropriate when existing agencies cannot effectively manage the amount of funds and type of activities needed to address the problem. They are useful when there is a need for new procedures or new kind of institution, accountable to and counting on the participation of its stakeholders.

Some requirements for an effective EF are [Norris, 1999]:

1. There should be a community of organizations who will implement the range of activities needed to achieve the objective.
2. EFs cannot succeed without active government support and broad-based participation from a community of agencies and organizations who can work together.
3. EFs can only operate in an environment of rigorous record keeping, transparency, and reliable systems of contracts, banking and auditing.

Private Venture Capital

Venture capital is a fund raising technique for firms willing to exchange equity in their company in return for money to grow or expand their business. It can be raised for all types of business, both technology and nontechnology businesses. Venture capital also invests across stages, that is, from the early stage seed venture to later stage mezzanine financing.

Venture capital firms usually require a high rate of return on their investment such as 20 percent plus per annum. Finance provided to the business is typically in the range of USD 500,000 to many millions of dollars.

In the context of the environment, there are several venture capital firms that have incorporated environmental concerns in their investment philosophy in return for a lower return on investment. An example is the Asian Conservation Company of the Philippines (ACC), a private equity holding firm. It was established in 2001 with an initial capital of

Table 21: Environmental Trust Funds: Fact Sheet

Trust Funds	A legal structure by which assets are held, invested, and spent by a board of trustees or directors for a specific purpose. Common law imposes a fiduciary responsibility on trustees for prudently managing the money that they hold in trust and for ensuring that the money is used for the designated beneficiary or purpose. Beneficiaries can sue the trustees for failure to invest prudently or for using any assets for purposes other than those specified in the legal document that established the trust.
Legal Structure	In common law countries, either a perpetual endowment or a sinking fund is established by a deed of trust or charter. In civil law countries, there is generally no legal foundation to establish a trust fund per se, but foundations or associations can manage EFs and trusts can be set up by government decree.
Environmental Trust Funds	These are funds set aside for a specific environmental purpose. Appropriate when the issue being addressed requires a long-term response. EFs are not the solution when an issue in question faces major urgent threats requiring significant amount of funds in a short time.
Types	Endowment, sinking, revolving or a combination of these.
Key Issues in Setting up EFs	What is the nature of the environmental threat being addressed? What are the types and time horizon of conservation activities that are needed to address those threats? Are they conducive to the programs that the EFs can support? What other organizations are presently addressing these threats? What are their strengths and weaknesses? Is there a need for, and what value would be provided by, creating a new mechanism for governmental and nongovernmental organizations to work together to address conservation issues? How committed are government and other key players to support an EF and participate in its work? Are the country's legal and financial practices and supporting institutions reliable and do they inspire confidence domestically and abroad?

Table 21: (continued)

Some Examples	World Wildlife Fund: Established in 1961 as a foundation under Article 80 of the Swiss Civil Code. Seychelles Island Foundation: Operating as a revolving fund on annual receipts from the Valley de Mai National Park. Fundacion VIDA, Honduras: Granted a legal status on 2 April 1992 by Presidential Resolution. Foundation for the Philippine Environment: Established by USAID. Supported debt-for-nature swap. Fondo Integrado Pro Naturaleza, Dominican Republic: Operates as a sinking fund. Legally established as an association by Decree. Indonesian Biodiversity Foundation: Foundations have a long history in the country and can enter into contracts. Fundacion Natura, Panama: Private nonprofit organization.

Source: Norriss [1999]

USD 12 million sourced from venture philanthropists and private foundations. It is called the "world's first biodiversity holding company." Unlike private equity funds that have corporate lives of 10–12 years, it has a corporate life of 50 years.

Currently, it has two companies in its portfolio, namely: *(1)* Ten Knots Group, owner of El Nido Resorts in Palawan, and *(2)* Stellar Fisheries, the Philippines' second largest processor of blue crabs [Table 22].

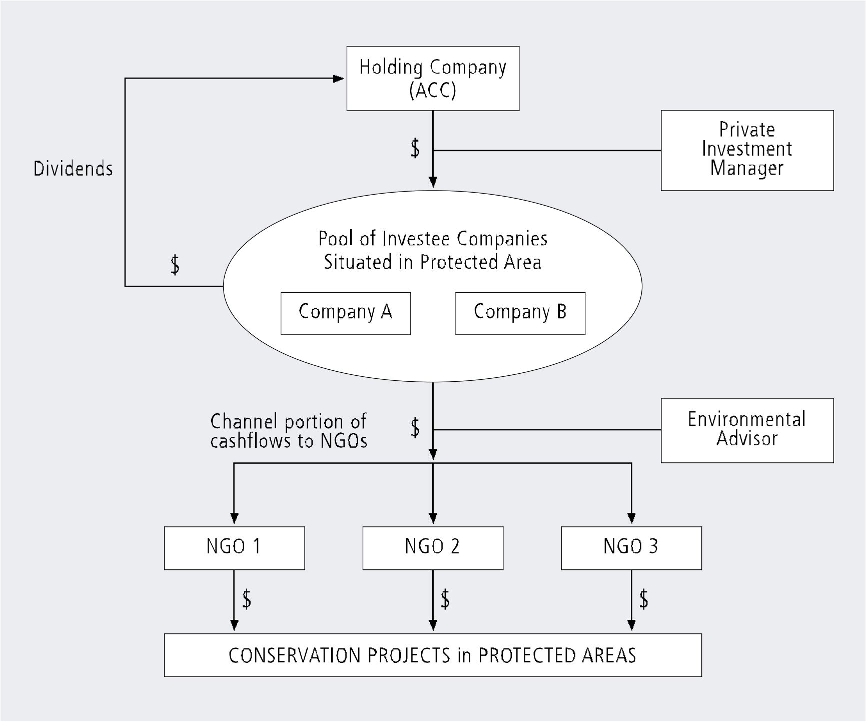
The company promotes biodiversity and other environmental projects by channeling tourism-related fees, that is, bed, landing, or dive fee and user fee per catch to environmental impact mitigation and biodiversity conservation in its area of presence. According to the company, its ultimate goal is to oversee transfer ownership of conservation programs to the local communities and multistakeholder teams.

Table 22: Asian Conservation Company of the Philippines Portfolio

Investee Company	Investment	Nature of Business	Associated Conservation Sites
Ten Knots/ El Nido Resorts	USD 8.5 million (53 percent equity stake)*	Resorts	Bacuit Bay, El Nido, Palawan
Stellar Fisheries	USD 0.8 million	Blue crab processing	Sagay, Negros Occidental; North Guimaras Strait; Bantayan Island, Cebu; Estancia and Concepcion, Iloilo

*Targeted investment in the company is USD 15 million.

Figure 8: Asian Conservation Company: A Venture Capital Firm



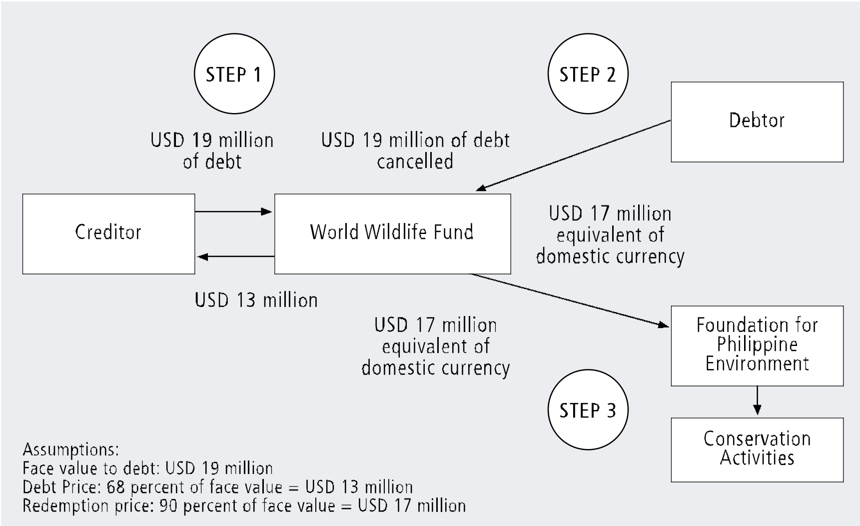
As Figure 8 shows, the company achieves twin objectives in achieving a rate of return for its owners as well as promoting conservation activities in its area of operation.

Debt-for-nature Swaps

Debt-for-nature swaps have been undertaken to finance environmental projects. This scheme is limited to those countries which are highly indebted, such as the Philippines. Most of the swaps so far have been used for conservation purposes and not urban environmental projects.

Debt-for-nature swaps are essentially a mechanism by which debts of a developing country are cancelled in return for a promise from the debtor government to pay a discounted amount of the original debt in local currency for use in conservation activities. There are two types of debt-for-nature swap arrangement: either a three-party debt swap or a bilateral debt swap.

Figure 9: Three-party Public Debt Swap: The Philippine Case



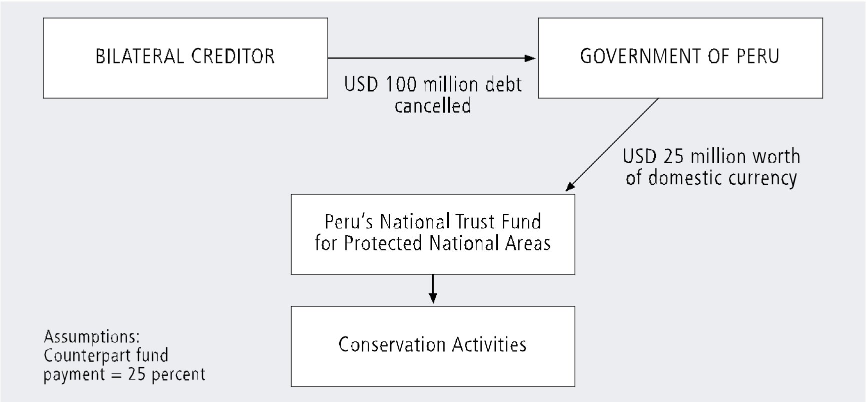
Three-party debt swap

The trigger mechanism is for a conservation group to raise funds to be able to buy debts at the secondary market or solicit debt papers from creditors. After buying the debt, the conservation group negotiates with the debtor government a promise to pay at a pre-agreed price in local currency with the understanding that the said local currency proceeds will be used for conservation efforts. In the case of the Philippines, a debt swap resulted in a "trading gain" as the original amount raised — USD 13 million — was able to trigger the release of more financial resources, that is, USD 17 million in local currency [Figure 9].

Bilateral debt conversions

In a bilateral debt conversion of official development aid (ODA) debt, a creditor government cancels debt owed by a debtor government in exchange for setting aside an agreed amount of local currency counterpart funds for development and/or environmental programs. Many of Latin American EFs were capitalized through bilateral conversions. The important point is whether the debt in question is available for conversion and whether the debtor government is interested in implementing a swap. In the case of Peru [Figure 10], the government was able to negotiate for the cancellation of USD 100 million debt in return for setting aside USD 25 million to be used for Peru's protected areas.

Figure 10: Bilateral Debt Conversion: The Case of Peru



Carbon Credit Trading

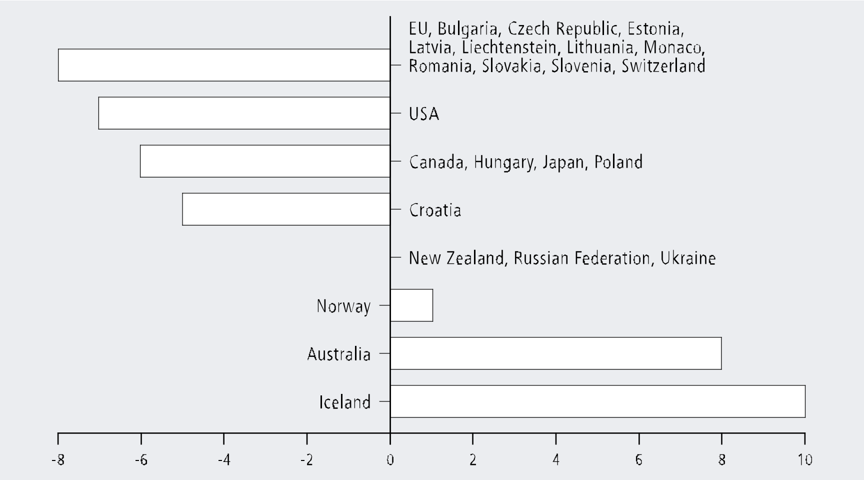
Countries in the East Asian region can take advantage of the monetary benefits from the reduction of carbon emissions. Carbon trading was initiated by the World Bank with the establishment of a USD 180 million prototype carbon fund in 2000. Currently, carbon trading is gaining market interest as many private financial investment houses are already setting up their own carbon funds to buy and pool carbon credits.

Carbon trading was brought about by the commitment by the industrialized countries to reduce emissions of six greenhouse gases by about 5 percent compared to 1990 levels during the period between 2008 and 2012. This agreement is legally binding. This means that states that have agreed to its terms and then fail to live up to their commitments will be sanctioned, including having to reduce their emissions even more in a subsequent period. States that withdraw from the entire agreement cannot be sanctioned.

The 5-percent reduction in emissions required by the protocol is an average: some countries are required to reduce more, and others less. The quotas and targets assigned to each country were arrived at through many rounds of tough negotiations. Figure 11 shows how different countries must reduce their emissions compared with 1990 levels.

Only the three countries: Iceland, Australia, and Norway are allowed to increase their emissions relative to 1990 levels by 10, 8, and 1 percent, respectively. Russia, Ukraine and New Zealand may keep their emissions at the same level as in 1990. The rest of the industrialized countries are to reduce their emissions by 6 and 8 percent from 1990 levels within the period 2008–2012. Even though the U.S. demanded that also developing

Figure 11: Carbon Emission Reduction Targets



countries be given reduction targets, the developing countries were not given any specific reduction commitments at this point in writing.

In the Kyoto Protocol, the developed countries agreed to limit their emissions of greenhouse gases. The Kyoto Protocol covers the following gases:

- carbon dioxide (CO_2);
- methane (CH_4);
- nitrous oxide (N_2O);
- hydrofluorocarbons (HFCs);
- perfluorocarbons (PFCs); and
- sulfur hexafluoride (SF_6).

Emissions of the different gases are compared by counting each gas in tons of "CO_2 equivalents," that is, the amount of each gas that contributes to the same amount of global warming as a ton of CO_2 over a specified period of time.

The agreement allows states to meet their targets in other ways than by simply reducing emissions domestically. Three so-called flexibility mechanisms were established to help states reduce their costs in meeting targets:

1. International emissions trading allows industrialized countries to buy or sell parts of the national emissions quota allocated by the Kyoto Protocol. Trade is limited to industrialized countries. The government of each country may allow companies to buy and sell emissions permits.

2. Joint implementation implies that an industrialized country pay for measures to reduce emissions in another industrialized country. This will give the buyer the right to emit more domestically, while the seller will be required to emit correspondingly less.
3. The Clean Development Mechanism allows industrialized countries to acquire emissions credits, that is, the right to emit greenhouse gases, by paying for emissions-reduction measures in developing countries that do not have emissions targets. These measures must also contribute to sustainable development in the recipient country. Detailed rules and regulations to ensure that the emissions reduction measures meet all the requirements are worked out.

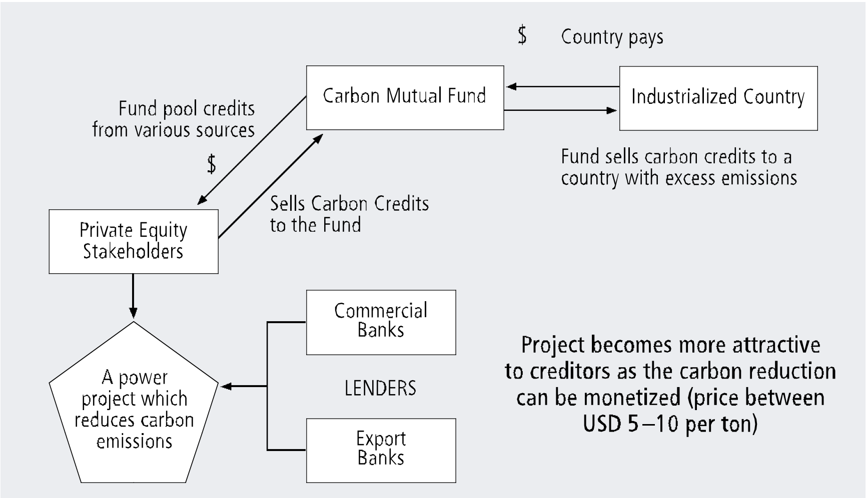
Figure 12 shows how carbon trading works and how it can potentially attract returns on a privately funded project. A carbon fund can be either privately funded or Global Environment Facility (GEF)/government-funded. According to estimates by World Bank analysts, carbon trading can boost returns by 0.5–2.5 percent [Environmental Finance, 2005].

Two examples of carbon trading are the North Wind power development and the landfill gas-fueled power projects.

North Wind Bangui Bay Project Philippines (North Wind)

North Wind is a USD 35-million wind power project in a remote part of northern Luzon. Power supply in this area, prior to the project's implementation, was expensive and unreliable. The project consisted of 15 wind turbines with a capacity of almost 25 MW, and annual energy

Figure 12: Carbon Trading: How Does It Work?



production is estimated to be almost 75 GWh. The sponsor is a local private company, North Wind Power Development Corporation, and almost 90 percent of the funding comes from the Danish International Development Agency.

The electricity produced by the project will be exported to the Luzon grid where it will displace diesel-based power generation at the margin, thereby reducing emissions of greenhouse gases and other air pollutants. The certified emission reductions generated by the project will be bought by the World Bank's Prototype Carbon Fund. Over the next 10 years, the fund expects to purchase a total of 356,000 tons of carbon dioxide equivalent.

Landfill gas-fueled power project

Another example where carbon trading will enhance viability of environmental projects is the power supply generated from methane in landfill sites [Box 6]. The methane produced from landfill to generate power will release less harmful carbon dioxide rather than pure methane into the atmosphere. Overall the amount of greenhouse gas emissions caused by landfilling solid waste will be reduced.

Sistemas de Energia of Mexico, a private company will own and operate a landfill gas-fuelled power plant. It has signed an USD 8.4 million emission reduction purchase agreement with the Prototype Carbon Fund for 2 million tons of carbon dioxide equivalent up to 2012. The project will dedicate 15 percent of carbon revenues to support nearby decentralized renewable energy project [Environmental Finance, 2005].

Box 6: Landfill Gases as a Source of Carbon Credits in China

As a greenhouse gas, methane has 21 times more global warming potential than the equivalent amount of CO_2. The biodegradation of organic matter, in the absence of oxygen generates methane as a byproduct. Municipal solid waste, which is rich in organic matter, when deposited in landfills degrades to produce significant amount of landfill gas (LFG). LFG is usually about 50 percent methane. Methane from municipal solid waste is one of the world's contributors of greenhouse gases. To reduce greenhouse gases, LFG can be flared or combusted as fuel. The methane fraction can be used to generate electricity, converted to vehicle fuel, or burned in industrial boilers.

China is estimated to produce 200 million tons of carbon equivalent per year. At USD 4.50 per ton of carbon equivalent, this means USD 900 million per year. The waste can also generate 10.5 million MWh/yr. At RMB 320/MWh, this could provide an additional RMB 3.4 billion.

Source: World Bank [2005a]

Biodiversity Offsets

Put simply, biodiversity offsets (or bio-offsets) are conservation activities intended to compensate for the unavoidable harm to biodiversity caused by commercial and public development projects. It differs from the term "set aside" or "rehab" which refers to avoidance and mitigation. In general, the term "offset" is understood to refer to "conservation activity that takes place outside the geographical boundaries of a development site in order to compensate for unavoidable harm, in addition to any mitigation that may take place on the site" [Kate et al., 2004].

Bio-offsets are interesting instruments that countries with rich biodiversity can explore and develop. This is brought about by the fact that an inevitable choice is sometimes made between the environment and a commercial project. In a way, bio-offsets are already being practiced on a voluntary basis by large multinationals with operations in environmentally sensitive areas in many developing countries.

In the U.S., the growth of bio-offsets was triggered by laws which protect endangered species [Box 7] or conservation of important ecosystems (for example, the U.S. wetlands). Over the years, the tradeable bio-offset rights were created resulting into a healthy conservation banking activities [Box 8]. Figure 13 shows how "biodiversity banking" works.

The main benefits of bio-offsets are the following:

1. It offers regulators a mechanism to encourage companies to make contributions to conservation on top of the regulation, mitigation, and rehabilitation activities onsite.
2. Conservation groups can use and influence bio-offsets to secure more and better conservation efforts and obtain additional funding for conservation. This is particularly relevant in the Southeast Asian region where large developments are happening without any benefit of a transfer to conservation groups.
3. It can strengthen a company's license to operate by encouraging regulators to grant permission for new operations and by securing the support of the local communities and nongovernmental organizations.

The main disadvantages are the following:

1. It can be used as an excuse for projects that must be avoided. This is particularly problematic in developing countries where there is a strong temptation for the developer and the regulator to collude.
2. It may be difficult to implement and will require specialists on biodiversity which developing countries lack.
3. There will always be a problem of equivalence, of whether a local ecosystem can be traded with another elsewhere.

Box 7: Examples of a Biodiversity Offset

Case of the Inland Sea Shorebird Reserve: A wetland offset to mitigate onsite habitat losses associated with mining

Kennecott Utah Copper Mine, a wholly owned subsidiary of Rino Tonto Plc., is North America's largest copper mine. Until the mid-1990s, Kennecott focused its efforts on producing copper molybdenum, gold, and silver from the Bingham Canyon Mine that lies 28 miles southwest of Salt Lake City, Utah. But at that point, the company needed additional storage capacity for "tailings" waste: sand-sized mineral particles that are an uneconomical byproduct from the milling of copper ores. After exploring a number of options, the company purchased an area of degraded saltpans and industrial land adjacent to its main tailings impoundment along the south shore of the Great Lake. However this property contained designated wetland habitat and Kennecott was required by U.S. law to offset, or mitigate, the loss of wetlands by creating an agreed upon number and value of habitat units. Kennecott Utah Copper Mine went beyond its regulatory obligations to create a 2,500 acre (1,011 ha) shorebird and waterfowl refuge.

A wetland mitigation plan was developed in coordination with a Technical Advisory Committee (TAC) comprising of representatives from the Utah Division of Wildlife Resources, U.S. Fish and Wildlife Service, U.S. Environmental Protection Agency, the Nature Conservancy, National Audubon Society and the U.S. Army Corps of Engineers. The plans established Kennecott's obligations for mitigation, construction, operation, maintenance, and monitoring. The TAC felt Habitat Evaluation Procedures (or HEP, a modeling system developed by the U.S. Fish and Wildlife Service) would provide the basis for replacement of habitat function and value to wildlife. HEP results in Habitat Units (HU) as the currency for project/ mitigation exchange. A one-to-one HU ratio was determined to be adequate for the site.

The mitigation plan was based upon providing similar or enhanced wetland habitats as compensation for impacts to wetlands covered by the Clean Water Act on the tailings impoundment project site. Nesting and migratory shorebirds and waterfowl were identified as the key elements requiring mitigation due to the project site's proximity to the Great Salt Lake which is part of the Western Hemispheric Shorebird Reserve Network.

Although 1,055 acres (427 ha) of wetlands were impacted by the project and the regulator had settled on a one-to-one ratio, Kennecott decided on a larger voluntary offset, aiming to enhance and restore a landscape within which the wetlands would be more likely to succeed in conservation terms. The company initially identified and purchased 2,500 acres (1,011 ha) for the wetlands mitigation less than a kilometer from the

Box 7: (continued)

project site. The site's suitability was based on the criteria of sufficient acreage, geological, and ecological similarity to the impacted area, water availability to sustain aquatic communities and adequacy of food support.

Construction of the wetland mitigation site started in May 1996 and was completed in January 1997. Water flowed into the mitigation site in February 1997 and the property was officially referred to as the Inland Sea Shorebird Reserve (ISSR). More than 100 species, including avocets, egrets, curlews, cinnamon teal, and snowy plovers (a species that is becoming scarce) now use the wetlands that inundate a landscape that was formerly used for grazing and salt evaporation ponds. Results from a 5-year monitoring against baseline data indicate that the mitigation plan has increased wildlife values substantially. Bird surveys point to a 1,000-fold increase in bird use over the baseline numbers for the same site.

In 1997, because of the initial success, the site was expanded to more than 3,600 acres (1,460 ha) and four ponds were added that it will remain as a bird preserve in perpetuity as well as act as a wetland mitigation bank for impacts from other projects affecting wetlands in the same watershed. In 2004, Great Salt Lake-Gilbert Bay was identified as an Important Bird Area for National Audubon where the ISSR is a significant contribution to bird use. In the long term, the company plans to handover the site to the National Audubon to become part of its large bird reserve and an 8–mile contiguous shoreline habitat.

Source: Kate et al. [2004]

Application of biodiversity offsets in Brazil

The Brazilian Forest Code of 1965 (Law 4771) requires at least 20 percent of the native vegetation on each property larger than 50 ha in the eastern, central-west and southern regions to be set aside and preserved as a Legal Forest Reserve. In this area, only sustainable forestry practices are permitted. The law classed forests in the north and northern central-west Amazonia as "primitive" where at least 50 percent (increased to 80 percent in 1996) of natural vegetation must be preserved in this way. The vegetation conserved must be representative of the area.

In the area where the 20 percent rule applies, if a landowner does not wish to set aside a relevant proportion of the land within the property, the owner must buy similar land in the neighborhood. If this offset area is outside the original "microregion" or "hydrographic basin," the area that the landowner must acquire increases to 30 percent. Detailed provisions at the state level encourage landowners in these cases to establish vegetation corridors [IUCN, 2003].

Box 8: The Birth of Conservation Banking in the U.S.

Conservation banking in the U.S. was born in the early 1990s, when the State of California became concerned with the fate of one particular songbird, the coastal California gnatcatcher. Because of increased development on the bird's preferred habitat — areas of coastal sage scrub — it was shortly to be placed on the state's endangered species list. Developers meanwhile were concerned that if this happened, their activities and a real estate boom would be curtailed, particularly around San Diego County, where coastal sage scrub is common. Environmentalists on the other hand, were concerned that unless gnatcatchers were protected by conservation of the dwindling remnants of their habitat, the bird would disappear.

The State of California decided that the solution was to protect those areas of coastal scrub that, because of their size, location, and ecology were particularly valuable for the gnatcatcher. The problem then became how to finance the acquisition of such land on the State's limited budget, which would not stretch to cover all the areas identified as crucial. At the same time, local governments were prohibited by a statewide provision from raising property taxes to pay for this sort of initiative. Californians needed to find creative ways of financing the conservation of the gnatcatcher habitat.

In 1993, a number of coinciding events led to the innovation of conservation banking. The gnatcatcher was added to the state's endangered species list at the same time that Bank of America — one of the world's largest banks — foreclosed on a 263-acre (or 106.43 ha) site in San Diego County known as the "Carlsbad Highlands." This property was an important habitat for the gnatcatcher and the Bank found that its development options for the site (and therefore its ability to sell the land) were limited. If it wanted to build on the land, it would have to pay large sums to mitigate its damage to gnatcatchers. The return would not necessarily cover the Bank's costs. So, Bank of America decided to look for other ways of obtaining value from its land. Also at this time, the California Department of Transportation (CalTrans) found that it, too, had a problem with gnatcatchers. It was building a highway on prime gnatcatcher habitat and, given the bird's new endangered status, the agency was obliged to mitigate the damage its project might cause. The stage was set for a deal.

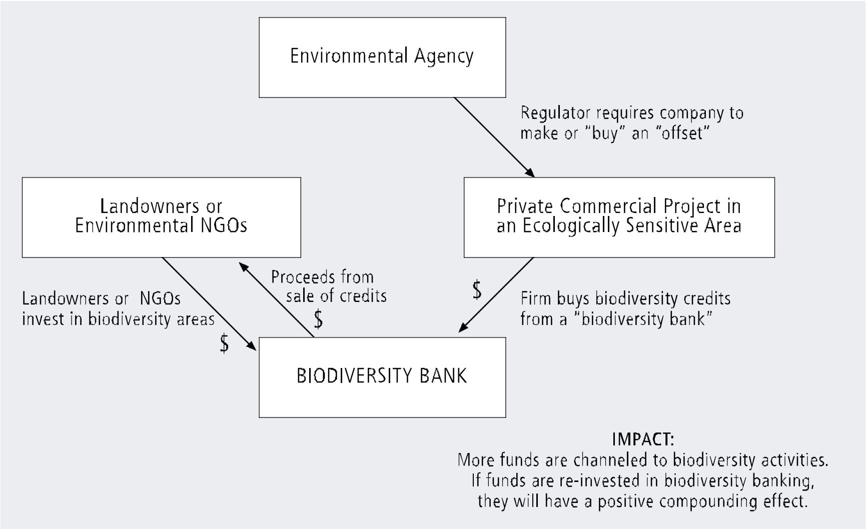
CalTrans agreed to pay Bank of America an undisclosed sum to put a conservation easement (so that the area would never be developed) on 83 acres (or 33.59 ha) of its property, in return for a number of gnatcatcher mitigation credits. By 1995, the Carlsbad Highlands became the state's first conservation bank. It has since sold all its available mitigation credits (about 180) at between USD 80,000 and USD 15,000 a piece. Today in San Diego County, similar mitigation credits sell for upwards of USD 25,000 each.

Box 8: (continued)

Since the creation of the Carlsbad Highlands Conservation Bank, Californians have created more than 40 conservation banks on a wide variety of species and habitats. There are even multimillion dollar businesses (for instance, a company called Wildlands, Inc.) that specialize in the creation of conservation banks and the sale of mitigation credits.

Source: Kate et al. [2004]

Figure 13: Biodiversity Banking



Direct Payments for Ecological Services

Direct payments are difficult to implement especially if it involves cross-border issues. An example of a direct payment initiative is the Programa de Pago de Servicios Ambientales in Costa Rica. In the second half of the 20th century, forest cover in Costa Rica fell from around 50 to 25 percent, and more than half of what remained was on unprotected, privately owned land.

In 1996, the Programa de Pago de Servicios Ambientales was setup to make direct payments to individual landowners, associations of landowners, or indigenous reserves in exchange for "environmental services" — anything from forest conservation to providing water supply.

Some 85 percent of contracts have been for forest conservation. By 2001, more than 2,800 km^2 were protected by payments of USD 4,000 per km^2 every year, and contracts covering a further 8,000 km^2 were being processed. Most of the money for these payments comes from a petrol tax on Costa Rican citizens, although the GEF has put up money for biodiversity conservation, Costa Rica's Office of Joint Implementation has paid for carbon sequestration and domestic hydroelectricity. Municipal water providers pay for water services [Nicholls, 2004].

Global Environment Facility (GEF) Incremental Cost Lending

GEF provides grants and loans to recipient countries for projects and programs that protect the global environment and promote sustainable development in six key areas: *(1)* climate change, *(2)* biodiversity, *(3)* international waters, *(4)* ozone layer depletion, *(5)* land degradation, and *(6)* persistent organic pollutants. GEF, originally setup as a pilot program in 1991, was restructured and replenished with over USD 2.0 billion in 1994 to cover incremental costs of activities in the six areas.

Essentially, GEF recognizes that many projects have benefits that flow beyond national borders and that individual countries are unlikely to consider those global benefits. GEF finances the incremental costs that cannot be justified locally but could be justified internationally [Tietenberg, 2000].

Since 1991, most of GEF's resources have been channeled to biodiversity, climate change, and international waters projects. Table 23 shows the breakdown of fund allocation for its six focal areas during the 1991–2004 period.

Biodiversity

These projects generally deal with one or more of four critical ecosystem types and the human communities found there: *(1)* arid and semi-arid zones; *(2)* coastal, marine, and freshwater resources; *(3)* forests;

Table 23: GEF Allocation for Its Focal Areas between 1990 and 2004

GEF Focal Areas	Fund Allocation (USD)
Biodiversity	1.89 billion
Climate Change	1.74 billion
International Waters	767 million
Ozone Layer Depletion	177 million
Persistent Organic Pollutants	141 million (included in May 2001)
Land Degradation	72 million (included in October 2002)

and *(4)* mountains. Between 1991 and 2004, co-financing amounted to USD 3.80 billion from recipient countries, bilateral agencies, other development institutions, the private sector, and nongovernmental organizations.

Climate change

Climate change projects are organized into four areas: *(1)* removing barriers to energy efficiency and energy conservation; *(2)* promoting the adoption of renewable energy by removing barriers and reducing implementation costs; *(3)* reducing the long-term costs of low greenhouse gas emitting energy technologies; and *(4)* supporting the development of sustainable transport. Co-financing for this area was worth USD 9.29 billion between 1991 and 2004.

International waters

These projects were aimed to reverse the degradation of international waters. The three categories of water projects are: *(1)* water bodies, *(2)* integrated land and water projects, and *(3)* contaminants. Co-financing amounted to USD 2.11 billion.

Ozone depletion

GEF, in partnership with the Montreal Protocol of the Vienna Convention on Ozone Layer Depleting Substances, funds projects that enable the Russian Federation and nations in Eastern Europe and central Asia to phase out their use of ozone-destroying chemicals. Between 1991 and 2004, GEF allocated more than USD 177 million to projects to phase out ozone-depleting substances. Co-financing was USD 182 million.

Land degradation

Destroyed forests and degraded water resources imperil biodiversity, induce climate change, and disturb hydrologic cycles. Land degradation was included into GEF's focal area in October 2002. Since then, co-financing for this sector amounted to USD 155 million.

Persistent Organic Pollutants (POPs)

POPs are highly stable compounds that circulate globally through a repeated process of evaporation and deposition, and are transported through the atmosphere and the oceans to regions far away from their original source. They accumulate in the tissues of living organisms, which absorb POPs through food, water, and air. The effects of POPs exposure include birth defects, cancers, and dysfunctional immune and reproductive systems. Co-financing for this sector amounted to USD 91 million since its inclusion into GEF's focal area in May 2001.

Conclusion

The discussion on the environmental problems presents both a challenge and an opportunity for both governments and the private sector. There are many possible financial structures that can be created to address specific problems. For conservation projects that require a sustained flow of funds over a long period of time and whose cash flow generation is low or nil, environmental trust funds are the more appropriate mechanisms. For urban projects that require large capital requirements, a financial structure that offers incentives to private participants is the key, whether it is the form of debt participation, joint venture, or a purely private activity. There are also many new instruments such as biodiversity offsets, carbon credit trading, private venture capital that governments must tap.

Table 24 shows a summary of instruments discussed and its practical applications.

The private sector will play a major role in financing the capital expenditure needs of the region in water, sanitation, solid wastes and hazardous wastes. For water supply and sanitation, the region will need around USD 14.8 billion in annual funding. Solid waste management will require an additional USD 7.3 billion at the minimum. Hazardous waste treatment cost is still undetermined due to limited data, as governments are yet to develop adequate monitoring and enforcement capacities. The more a country is constrained by its budget deficits and external debts, the more it needs the support of the private sector funding. As Table 25 shows, both the Philippines and Indonesia, two countries that are considered biodiversity centers, will need strong private sector participation, given their high levels of debts relative to GNP.

Environmental trust funds will be a main source of funding for many conservation activities. However, there is currently a shortage of funds for such activities. According to estimates [Balmford et al., 2004], the amount available for conservation represents only a fifth of what is necessary to maintain preservation areas. Therefore, East Asian governments must resort to more innovative funding mechanisms to limit the damage of growth on the environment. Some of these mechanisms, like biodiversity offsets and direct payments for ecological services and private venture capital must be explored to fill the financing gap.

Table 24: Financial Mechanisms and Potential Applications in East Asia

	APPLICATION
A. Private Equity in Public Sector Projects	
Solid Waste Management	At least USD 7.3 billion in annual expenditures on solid waste management from low- to middle-income countries in East Asia. China alone would need an additional 1,400 landfills over the next 25 years [World Bank, 2005a]. Landfill gas power also an attractive venture for the private sector.
Hazardous Waste Treatment	Shortage of hazardous waste treatment facilities. Big potential for private participation given limited resources and technical capability of governments. Thailand, Indonesia, and Philippines, generate around 4 million tons of toxic wastes yearly.
Water Supply and Sanitation	East Asia will need USD 7.8 billion for water supply and USD 7.0 billion for sanitation annually.
B. Environmental Trust Funds	Source of needed funds for conservation areas in biodiversity hotspots as well as rehabilitation activities in degraded environments.
C. Private Venture Capital	Holds promise for ecotourism, food processing, and renewable energy. Partnership between local government, NGOs and venture capital needed for sustainable livelihood.
D. GEF Incremental Cost Lending	Source of additional funding for six focal areas: biodiversity, climate change, ozone depletion, international waters, land degradation, persistent organic pollutants.
E. Carbon Credit Trading	China is estimated to produce 200 million tons (USD 900 million) of carbon credits from its garbage annually; other Asian countries can also take advantage of opportunities.
F. Debt-for-nature Swaps	Indonesia and Philippines have huge debt to GDP ratios. External debt for these countries is highest in East Asia, at 77 percent of GNP.
G. Biodiversity Offsets	Bio-offsets can have many uses given the commercial encroachment into many ecologically sensitive areas. Government should develop biodiversity banking to raise more funds for conservation activities.
H. Direct Payments for Ecology Services	Has many applications. Example: Cities should pay for the ecological services they receive from other municipalities such as watershed services and clean rivers.

Table 25: External Debt, GNP, and per Capita Income in East Asia

	GNP (USD billion)	External Debt 2003 (USD billion)	Debt to GNP Ratio (%)	GNP per Capita (USD)
Vietnam	38.8	15.8	41	240
Cambodia	4.1	3.1	77	306
China	1,416.8	193.6	14	620
Indonesia	173.5	134.4	77	980
Philippines	87.8	62.7	71	1,050
Thailand	135.9	1.8	38	2,740
Malaysia	96.1	49.1	51	3,890
Korea, Republic of	576.4			9,700
Hong Kong	176.2			22,990
Singapore	90.2			26,730
Japan	4,360.8			39,640

Source: World Bank [2005b]

References

ADB (Asian Development Bank). 2005. *Connecting East Asia: A new framework for infrastructure*. (Draft Paper).

Balmford, A., P. Gravestock, N. Hockley, C.J. McClean and C.M. Roberts. 2004. "The worldwide costs of marine protected areas." *PNAS*, 101 (26):9694–9697.

Barbier, E.B., M. Acreman and D. Knowler. 1997. *Economic valuation of wetlands: A guide for policymakers and planners*. Ramsar Convention Bureau, Geneva.

Cointreau-Levine, S. and A. Coad. 2000. *Private sector participation in municipal solid waste management*. Swiss Centre for Development Cooperation in Technology and Management, Switzerland.

de Groot, R.S., M.A. Wilson and R.M. Boumans. 2002. "A typology for the classification, description and valuation of ecosystem functions, goods and services." *Ecological Economics*, 41(3):393–408.

Environmental Finance. 2005 "Carbon volumes jump, but uncertainties persist." *Environmental Finance*, June 2005.

Gardiner, R. and K. Le Goulven. 2002. "Public goods." Briefing Paper. Towards Earth Summit 2002. Economic Briefing No. 3. Available at http://www.earthsummit2002.org/es/issues/GPG/gpg.pdf.

IUCN (The World Conservation Union). 2003. *Building a secure financial future: Finance and resources*. Proceedings of the Workshop Team. 5th IUCN World Parks Congress.

Kate, K., J. Bishop and R. Bayon. 2004. *Biodiversity offsets: Views, experience and the business case*. IUCN, Gland, Switzerland and Cambridge, UK and Insight Investment, London, UK.

Mendes, M.R. and H. Imura. 2004. "From end-of-pipe approach to the creation of a sound material-cycle society: Asian cases." In: *Proceedings of ISWA World Congress 2004. 18–21 October 2004, Rome, Italy.*

Mendes, M.R., M.A. Memon and S. Yedla. 2004. Issues and challenges for urban environment in Asia.

Mohd-Shahwahid, H.O. and R. McNally. 2001. *An economic valuation of the terrestrial and marine resources of Samoa*. The Division of Environment and Conservation, Department of Lands, Survey and Environment, Government of Samoa, WWF-UK and WWF-South Pacific. 81 pp.

MPP-EAS. 1999. *Total economic evaluation: coastal and marine resources in the Straits of Malacca*. MPP-EAS Technical Report No. 24/PEMSEA Technical Report No. 2. GEF/UNDP/IMO Regional Programme for the Prevention and Management of Marine Pollution in the East Asian Seas (MPP-EAS)/ GEF/UNDP/IMO Regional Programme on Building Partnerships in Environmental Management for the Seas of East Asia (PEMSEA), Quezon City, Philippines. 52 pp.

Nicholls, H. 2004. "The conservation business." *PLoS Biology*, 2(9):14 September 2004.

NRC (National Research Council). 2004. *Valuing ecosystem services: Toward better environmental decision making*. National Academies Press, Washington, DC.

Norriss, R. (ed). 1999. *The IPG handbook on environmental funds: A resource book for the design and operation of environmental funds*. The Inter-Agency Planning Group on Environmental Funds. Pact Publications, New York, NY.

Pagiola, S., K. von Ritter and J. Bishop. 2004. *How much is an ecosystem worth?* The World Bank, Washington, DC.

Probst, K.N. and T.C. Beirle. 1999. *The evolution of hazardous waste programs: Lessons from eight countries*. Center for Risk Management and Resources for the Future, Washington, DC.

Prudente, M.S., T. Kunisue, S. Tanabe and S. Aguja. 2002. "Persistent organic pollutants in human breast milk." Paper presented at the Environmental Threats to the Health of Children: Hazards and Vulnerability, Bangkok, Thailand, 3–7 March 2002.

Sandler, T. 2001. *On financing global and international public goods*. The World Bank. The International Bank for Reconstruction and Development. Washington, DC, USA.

Sandler, T. 2005. *Regional public goods and international organizations*. School of International Relations, University of Southern California. Available at www-rcf.usc.edu/~tsandler/Sandler_RPG_RIO_2006.pdf

Sien, L.S. and H. Kirkman. 2000. *Overview on land-based sources and activities affecting the marine environment in the East Asian Seas*. United Nations Environment Programme Regional Coordinating Unit, East Asian Seas Action Plan.

Tanabe, S. and T. Kunisue. 2007. "Persistent organic pollutants in human breast milk from Asian Countries." *Environmental Pollution*, 146(2):400–413.

Tietenberg, T. 2000. *Environmental and natural resource economics*. Addison Wesley, Massachussetts.

UNEP (United Nations Environment Programme). 2002. *Water supply and sanitation coverage in UNEP regional seas: Need for wastewater emission targets?* UNDP, Hague, The Netherlands.

World Bank. 2000. *Thailand environment monitor*. The International Bank for Reconstruction and Development, Washington, DC.

World Bank. 2001. *The Philippines environment monitor: Solid waste*. The International Bank for Reconstruction and Development, Washington, DC.

World Bank. 2003a. *Indonesia environment monitor*. The International Bank for Reconstruction and Development, Washington, DC.

World Bank. 2003b. *Thailand environment monitor*. The International Bank for Reconstruction and Development, Washington, DC.

World Bank. 2004. *The Philippines environment monitor: Assessing progress*. The International Bank for Reconstruction and Development. Washington, DC.

World Bank. 2005a. *Waste management in China: Issues and recommendations*. Working Paper No. 9. The International Bank for Reconstruction and Development, Washington, DC.

World Bank. 2005b. *World development indicators 2005*. The International Bank for Reconstruction and Development, Washington, DC.

Yepes, T. 2004. "Expenditure on infrastructure in the East Asian region, 2006–2010." Paper commissioned for the ADB-JBIC-World Bank East Asia Pacific Infrastructure Flagship Study. Available at //lnweb18.worldbank.org/eap/eap.nsf/Attachments/background+3/$File/resource-requirements.pdf.

SECTION 3

Case Studies

CHAPTER 17

The Mediterranean: Regional Cooperation in a Global Context[1]

Stefano Belfiore and Salvatore Arico

Introduction

In the Mediterranean, cooperation in the field of marine environmental protection dates from 1975, with the creation of the Mediterranean Action Plan (MAP), the first action plan established under UNEP's Regional Seas Programme. The MAP was conceived to assist the Mediterranean countries to assess and control marine pollution, to formulate their national environment policies, to improve the ability of governments to identify better options for alternative patterns of development, and to optimize the choices for allocation of resources. Its environmental objectives were embodied in the Convention for the Protection of the Mediterranean Sea against Pollution (the Barcelona Convention, adopted in 1976 and entered into force in 1978) and in a series of related protocols dealing with specific subjects (marine pollution, pollution from land-based sources, and specially protected areas and biodiversity).

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[1] This chapter was previously published: Belfiore, S. and S. Arico. 2006. "The Mediterranean: Regional cooperation in a global context." *Tropical Coasts*, 13(1):16–23.

Currently participated by 21 countries and the European Commission, the MAP has a coordinating unit, located in Athens, and six specialized regional activity centers (systemic and prospective studies, integrated coastal area management, marine biodiversity, prevention and response to marine pollution, remote sensing, and cleaner production) that assist countries in the implementation of activities. Among the most notable outcomes of the MAP was the establishment of the Programme for the Assessment and Control of Pollution in the Mediterranean Region (MED POL), which aims to assess the quality of the marine environment and which is participated in by laboratories from the entire region.

Key Developments since 1995

Phase II of the MAP

Following the United Nations Conference on Environment and Development (UNCED) of 1992, the entire system of the MAP was redesigned to address, in a less sectoral way, environmental and developmental issues originating on land through integrated coastal area management (ICAM). Such an approach led to the adoption in 1995 of the Action Plan for the Protection of the Marine Environment and the Sustainable Development of the Coastal Areas of the Mediterranean (MAP Phase II) [UNEP/MAP, 1995].

The evolution in the scope of the MAP implied that the Plan became more encompassing, thus providing a framework not only for environmental and scientific cooperation but also social, cultural, and economic cooperation. It provided a long-awaited framework for multilateral exchange of information, dialogue, collaboration, and cooperation among its Parties. Originally conceived as a marine-oriented agreement, the Barcelona Convention was amended in the same year to leave open the possibility to the Contracting Parties to extend its application to their coastal areas. The revised Convention entered into force in 2004 and to date, the only ratification explicitly mentioning its application to the coastal zone is that of Italy's.

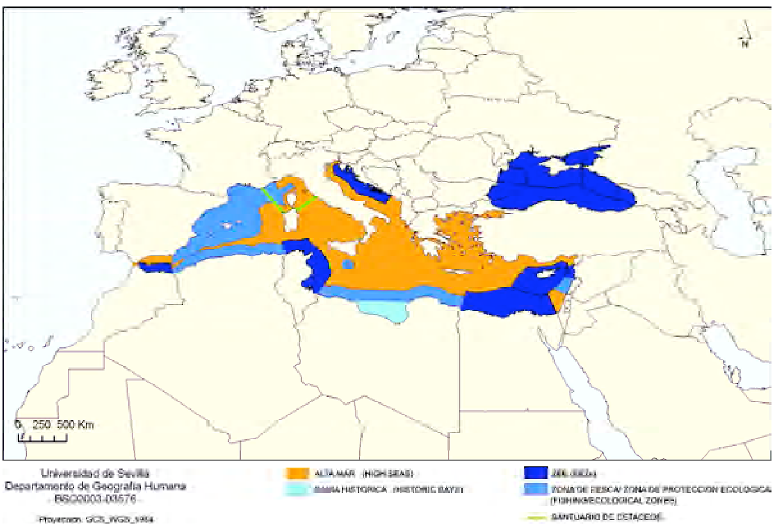
A new protocol on ICAM that aims to establish a common framework for the management of coastal zones and regional cooperation in this field is under elaboration. The renewed MAP laid the basis for a process aimed at defining uses of the Mediterranean space and resources in a manner that is consistent with the region's ecological features and social equitableness. Despite the fact that establishment of marine jurisdictional zones in the Mediterranean has not followed a systematic pattern but is rather the mixed consequence of national claims and the application of policy measures at the level of the European Union (EU) and the reflection of countries' capabilities to extend their activities to the high seas [Box 1], the current situation represents an optimal case for establishing a regional model of management of marine spaces and resources based on cooperative measures. An example comes from the establishment of the Mediterranean Marine Mammal Sanctuary by France, Italy, and Monaco in the Upper Tyrrhenian and encompassing areas beyond the jurisdiction of the Parties. Signed in 1999 and entered into force in 2002, the Agreement establishing the Sanctuary promotes conservation of marine mammals and scientific research and relies on existing governance arrangements for waters subject to sovereignty or jurisdiction of the Parties and on measures for ships flying their flags on the high seas.

The Euro-Mediterranean Process and the Enlargement of the European Union

A Euro-Mediterranean Conference of Ministers of Foreign Affairs, held in Barcelona on 27–28 November 1995, launched the Euro-Mediterranean Partnership (Barcelona Process), a framework for cooperation in the political, economic, and social sectors between the Member States of the EU and partners of the Southern Mediterranean [EU, 1995]. The main objectives of the Barcelona Process are: the creation of an area of peace and stability; the progressive establishment of a free trade area; and the strengthening of a social, cultural, and human partnership. This process is being advanced through both bilateral and multilateral relations. In particular, the Mediterranean Development Assistance Programme (MEDA), the financial instrument of the process, has funded cooperative projects for a total of Euro 5.458 billion (about USD 7 billion) during the period 1995–2003. Among its projects, MEDA includes the Short- and Medium-Term Priority Environmental Action Programme (SMAP), which supports actions for integrated water management, integrated waste management, emergency environmental management of hotspots, integrated coastal zone management, and combating desertification. Such actions represent the region's contribution and support to the implementation of the main multilateral environmental agreements — the United Nations (UN) Conventions to Combat Desertification (and its Annex Concerning Implementation at the Regional Level for the Northern Mediterranean), the UN Framework Convention on Climate Change, the Convention on Biological Diversity, the Convention on Wetlands (1971 Ramsar), the Convention on Migratory Species, the Convention on the International Trade of Endangered Species, and so on.

Box 1: Jurisdictional Zones in the Mediterranean Sea based on Historical Uses (Historic Bays), Ecological Zones, Exclusive Economic Zones (EEZs) and Areas beyond National Jurisdiction

The Mediterranean Sea is the only regional sea which has enjoyed a regime of high seas even after the codification of maritime jurisdictional zones by the UNCLOS. This particular condition owes to the special geopolitical situation of the region. While only three fishery zones were established until the 1990s in the Western Mediterranean (Malta, 1971; Algeria, 1994; Spain, 1997), these past few years have seen the creation of EEZs (Syria, 2003; Cyprus, 2004; Tunisia, 2005), new fishery zones (Libya, 2005), and a new jurisdictional zone, that is, the ecological protection zone. The establishment of an ecological protection zone by France in 2003 was followed by Croatia (Ecological and Fisheries Protection Zone, 2003) and Slovenia (2005). The EEZs established by Morocco in 1981 and Egypt in 2004[2] are also worth mentioning. Albania, Greece, Israel, Lebanon, Monaco, Serbia and Montenegro, and Turkey only have a territorial sea and this accounts for their particular geographic situation, including the difficult delimitation of boundaries between Greece and Turkey. Algeria, Cyprus, Egypt, France, Malta, Morocco, Spain, Syria, and Tunisia have established contiguous zones, where issues concerning customs, immigration, and the protection of cultural heritage can be regulated. It is possible to recognize a pattern where fishery issues appear predominant in the western Mediterranean, ecological protection in the central northern Mediterranean, and territorial issues in North Africa and the Middle East.



[2] Although with no clear specification for the Mediterranean

With the enlargement of the EU in 2004 came several implications in various areas, such as the enhancement and harmonization of approaches to environmental management, including environmental legislation and subregional cooperative actions in the marine environmental field. In the longer term, the EU enlargement process will be instrumental in implementing the agreed goals of the Barcelona Process with specific regard to peace and stability and the creation and maintenance of a functioning free trade area. This however will necessitate reliance on an effective partnership to ensure the fulfillment of an environmental, social, and cultural sustainable development. The contribution of other regional cooperation forums and processes to the evolution of cooperation between Mediterranean countries should not be undermined, although such contributions have been made on a topical basis without considering explicitly or in-depth possible synergistic effects. An example is the work of the North Atlantic Treaty Organization (NATO) with regard to military cooperation, including peaceful purposes such as scientific and technological cooperation and normative work and program activities of the Council of Europe. Another example is the Ancona Charter which was signed in 2000 to promote cooperation in fields of peace and security in the Adriatic-Ionic region through economic development, as well as the enhancement of historical and cultural heritage.

An Evolving Jurisdictional Framework

Between 1992 and the present, a number of multilateral environmental agreements and international plans of action agreed upon at high-level intergovernmental meetings and international conferences have emerged [Table 1]. These processes and events reflect at the same time the specific needs of countries and also impose on them the obligation to implement international agreed provisions; moreover, they inform the design and implementation of overseas development assistance.

New issues have emerged in the cooperation agenda of the Mediterranean that are related to environmental, social, and economic security. For example, efforts are underway with regard to developing a regional system for tsunami early warning and mitigation. An Intergovernmental Coordinating Group (ICG) for the Tsunami Early Warning and Mitigation System in the North-Eastern Atlantic, the Mediterranean, and Connected Seas (ICG/NEAMTWS) was established in 2005 under the aegis of the Intergovernmental Oceanographic Commission (IOC) of UNESCO. The ICG/NEAMTWS will work towards the formulation and operationalization of a multi-hazard early warning system for the North Eastern Atlantic, the Mediterranean, and connected seas and will consist of four major components:

Table 1: Overview of Relevant International Agreements and Status of Participation in them by Mediterranean Countries

COUNTRY	AGREEMENTS			
	Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks	Convention on Biological Diversity (1992)		Convention on Wetlands (Ramsar, Iran, 1971)
Albania	– – –	05/01/94 (A)		29/02/96 (R)
Algeria	– – –	13/06/92 (S)	14/08/95 (R)	04/03/84 (R)
Bosnia and Herzegovina	– – –	26/08/02 (A)		01/03/92 (R)
Croatia	– – –	11/06/92 (S)	07/10/96 (R)	25/06/91 (R)
Cyprus	25/09/02 (R)	12/06/92 (S)	10/07/96 (R)	11/11/01 (R)
Egypt	– – –	09/06/92 (S)	02/06/94 (R)	09/09/88 (R)
France	19/12/03 (R)	13/06/92 (S)	01/07/94 (R)	01/12/86 (R)
Greece	19/12/03 (R)	12/06/92 (S)	04/08/94 (R)	21/12/75 (R)
Israel	– – –	11/06/92 (S)	07/08/95 (R)	12/03/97 (R)
Italy	19/12/03 (R)	05/06/92 (S)	15/04/94 (R)	14/04/77 (R)
Lebanon	– – –	12/06/92 (S)	15/12/94 (R)	16/08/99 (R)
Libya	– – –	29/06/92 (S)	12/07/01 (R)	05/08/00 (R)
Malta	11/11/01 (R)	12/06/92 (S)	29/12/00 (R)	30/01/89 (R)
Monaco	09/06/99 (R)	11/06/92 (S)	20/11/92 (R)	20/12/97 (R)
Morocco	– – –	13/06/92 (S)	21/08/95 (R)	20/10/80 (R)
Palestinian Territories	– – –	– – –		– – –
Serbia and Montenegro	– – –	08/06/92 (S)	01/03/02 (R)	27/04/92 (R)
Slovenia	– – –	13/06/92 (S)	09/07/96 (R)	25/06/91 (R)
Spain	19/12/03 (R)	13/06/92 (S)	21/12/93 (R)	04/09/82 (R)
Syria	– – –	03/05/93 (S)	04/01/96 (R)	05/07/98 (R)
Tunisia	– – –	13/06/92 (S)	15/07/93 (R)	24/03/81 (R)
Turkey	– – –	11/06/92 (S)	14/02/97 (R)	13/11/94 (R)

(dd/mm/yy; A = accession; R = ratification; S = signature)

	AGREEMENTS			
	UNESCO Convention on the Protection of the Underwater Cultural Heritage (2001)	United Nations Framework Convention on Climate Change (1992)	United Nations Convention to Combat Desertification (1992)	United Nations Convention on the Law of the Sea (1982)
	– – –	03/10/94 (R)	27/04/00 (R)	23/06/03 (R)
	– – –	13/06/92 (S) 09/06/93 (R)	14/10/94 (S) 22/05/96 (R)	11/06/96 (R)
	– – –	07/09/00 (R)	26/08/02 (R)	12/01/94 (R)
	01/12/04 (R)	11/06/92 (S) 08/04/96 (R)	15/10/94 (S) 06/10/00 (R)	05/04/95 (R)
	– – –	16/06/92 (S) 15/10/97 (R)	29/03/00 (R)	12/12/88 (R)
	– – –	09/06/92 (S) 05/12/94 (R)	14/10/94 (S) 07/07/95 (R)	26/10/82 (R)
	– – –	13/06/92 (S) 25/03/94 (R)	14/10/94 (S) 12/06/97 (R)	11/04/96 (R)
	– – –	12/06/92 (S) 04/08/94 (R)	14/10/94 (S) 05/05/97 (R)	21/07/95 (R)
	– – –	04/06/92 (S) 04/06/96 (R)	14/10/94 (S) 26/03/96 (R)	– – –
	– – –	05/06/92 (S) 15/04/94 (R)	14/10/94 (S) 23/06/97 (R)	13/01/95 (R)
	– – –	12/06/92 (S) 15/12/94 (R)	14/10/94 (S) 16/05/96 (R)	05/01/95 (R)
	23/06/05 (R)	– – –	15/10/94 (S) 22/07/96 (R)	– – –
	– – –	12/06/92 (S) 17/03/94 (R)	15/10/94 (S) 30/01/98 (R)	20/05/93 (R)
	– – –	11/06/92 (S) 24/11/92 (R)	05/03/99 (R)	20/03/96 (R)
	– – –	13/06/92 (S) 28/12/95 (R)	15/10/94 (S) 07/11/96 (R)	– – –
	– – –	– – –	– – –	– – –
	– – –	12/03/01 (R)	– – –	12/03/01 (R)
	– – –	13/06/92 (S) 01/12/95 (R)	28/06/01 (R)	16/06/95 (R)
	06/06/05 (R)	13/06/92 (S) 21/12/93 (R)	14/10/94 (S) 30/01/96 (R)	15/01/97 (R)
	– – –	04/01/96 (R)	15/10/94 (S) 10/06/97 (R)	– – –
	– – –	13/06/92 (S) 15/07/93 (R)	14/10/94 (S) 11/10/95 (R)	24/04/85 (R)
	– – –	– – –	14/10/94 (S) 31/03/98 (R)	– – –

1. Hazard assessment, risk and modeling;
2. Seismic and geophysical measurements;
3. Sea-level measurements; and
4. Advisory, mitigation, and public awareness.

The ICG is expected to formulate a complete plan of action by December 2006, including the implementation of trials for key components of the early warning system with the aim of having an initial operational system in place by December 2007 [IOC, 2006].

From Epistemic Communities to a Broader Set of Actors: The Mediterranean Commission on Sustainable Development

In a seminal study, Haas [1989, 1992] emphasized the role of scientists and experts — epistemic communities — in shaping the environmental agenda for the Mediterranean. Acting as a transnational coalition, scientists and experts were not only able to direct the coastal states of the basin towards converging priorities and policies to respond to increasing marine pollution, through the creation of the regime built around the Barcelona Convention, but also to promote stronger and broader rules for pollution control and rules that could be adapted as new evidence supports the case. At the level of the MAP, the role of epistemic communities is best seen in the creation and operation of MED POL and the establishment of scientific and technical committees and national focal points. Established in 1975 and originally coordinated by UNEP with the cooperation of five UN agencies (FAO, WHO, WMO, IOC, and IAEA), MED POL has been developed in three phases (Phase I, 1975–1980; Phase II, 1981–1995; and Phase III, 1996–2005) that show the evolution of the Programme from building a network of collaborating laboratories to the establishment of national monitoring programs and finally becoming a strategic tool for the implementation of relevant agreements.

The Mediterranean Protocol on Land-based Sources was amended in 1996 to include land-based activities and called for the development of national plans of action to reduce and eliminate land-based pollution. In 1997, a Strategic Action Programme (SAP) to Address Pollution of the Mediterranean Sea from Land-based Activities was adopted, identifying key sources of pollution, remedial actions, associated costs and possible targets, and deadlines. The SAP identified 107 pollution hotspots and 51 sensitive areas needing special attention. Currently, 13 out of 22 Parties have accepted the 1996 Amendments [UNEP/MAP, 2006].

In recent years, scientific assessments have been used to bring the findings to the attention of policymakers. Perhaps the most renowned is the Intergovernmental Panel on Climate Change. Recently, a 4-year scientific assessment of the status and trends of ecosystem services (the benefits that people derive from ecosystems) that are crucial for human well-being — the Millennium Ecosystem Assessment (MA) — was completed by more than 1,350 scientists from 95 countries [Box 2; MA, 2005].

Similar to the MA are a recent project funded by the Global Environment Facility that addresses the conservation of the Mediterranean large marine ecosystem and other measures for the conservation of wetlands and coastal and marine ecosystems and the building of country capacity. A Transboundary Diagnostic Analysis (TDA) conducted at the Mediterranean scale examines transboundary concerns and their root causes, with a view to helping set priorities for action.

When the Barcelona Convention system was redesigned in 1995, a need was felt to open the system to the participation of nongovernmental organizations (NGOs) and other components of civil society. A Mediterranean Commission on Sustainable Development (MCSD) was created, composed of 37 members representing each of the 22 Contracting Parties to the Barcelona Convention as well as 15 rotating representatives from wider society (five each from local authorities, the business community, and NGOs) that in principle have a mandate of 2 years. The MCSD is intended to address broader issues of sustainable development not included in the MAP and the Barcelona Convention. It operates through working groups that provide recommendations to the Contracting Parties. So far, eight sets of recommendations on coastal management, managing water demand, indicators, tourism, information/awareness, industry, urban development, and trade have been adopted, and work is ongoing on cooperation and financing and on local governance. As a result of the work of the MCSD, a Mediterranean Strategy for Sustainable Development (MSSD), which gives great importance to the participatory approach, has been prepared [UNEP/MAP, 2006].

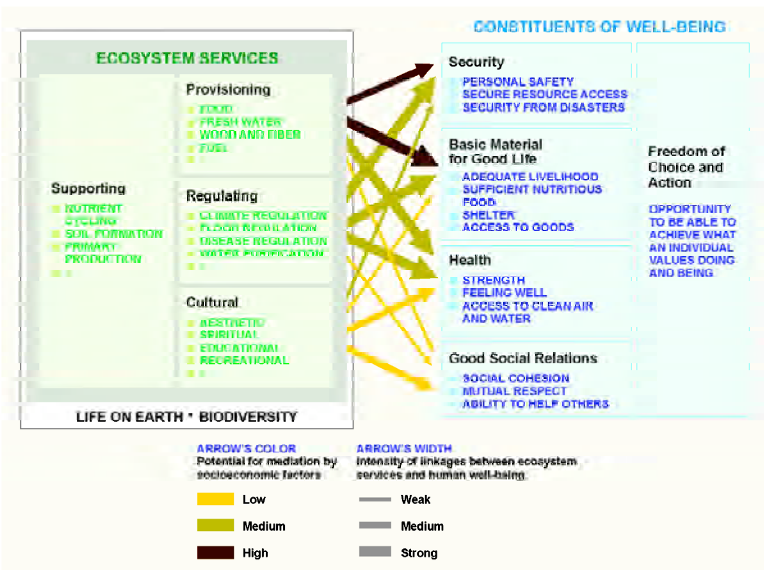
Throughout the preparatory process of the MSSD, many technical reports were prepared and workshops organized; in particular, the Vision and Framework Orientations for Sustainable Development in the Mediterranean were prepared together with a series of Strategic Thematic Notes on each of the priority issues identified in the MSSD.

Outcomes and Challenges of Regional Ocean Governance and Cooperation

Table 1 shows that governance arrangements are significant in number and the participation in them by Mediterranean countries is high. Means to measure their implementation do exist, such as implementation

Box 2: Linkages Between Ecosystem Services and Human Well-Being

Ecosystem services are crucial to the main constituencies of human well-being (basic material for a good life, health, good social relations, security and freedom of choice and action). But these services can be affected negatively by indirect drivers of change — demographic factors, socioeconomic and political factors (globalization, trade market, governance-related issues, international institutional and legal frameworks), technological and cultural factors (beliefs, consumption choices, traditional practices, and so on) — and direct drivers of change that affect the provision of ecosystem services, such as changes in local uses of space and resources, species introductions or removal, technological adaptation and use, external inputs such as biological control in production systems, harvest and resources consumption, and climate change. Cooperative frameworks and programs should ultimately succeed in minimizing, preventing, and controlling the adverse effects of indirect drivers of change on ecosystem services on which human well-being depends. In the specific case of the Mediterranean region, it would be important to formally assess how in its 30-year history such a cooperation has contributed to ensure equitable access to resources, security from disasters, adequate livelihood systems, sufficient food of an appropriate nutritional value, the environmental conditions that underpin hygiene, and health and cohesion among Mediterranean countries.



Courtesy of the Millennium Ecosystem Assessment indicators associated with national reporting under most of the multilateral environmental agreements. More recently, the focus of assessments has been on the degree of acceptance and implementation of collective rules [Vallega, 1996], the comprehensiveness of cooperation in the field of security [Kullenberg, 2002] or on qualitative assessment of specific regional instruments, such as the Protocol on Land-based Sources [Massoud et al., 2003]. Important information on the state of the environment and natural resources has been generated by the TDA, particularly on marine pollution and fisheries, and enhanced outlooks and long-term scenarios have recently been issued [Antipolis, 2005]. A new emphasis has also been placed on prioritization of pollution issues for more focused cooperative actions [EEA, 2006].

Conclusion

Although the Mediterranean cooperation experience constitutes one of the models at which the international community can look and from which it can take inspiration, in order to replicate successful approaches and avoid making the same errors in terms of modalities and content of cooperation programs and activities, there is a need to evaluate the Mediterranean experience on the basis of more integrated and holistic conceptual and methodological approaches. A few adjustments in the content and modalities of Mediterranean cooperation, coupled with a strengthened multicultural dialogue and scientific cooperation, will not only allow the region to adapt to the evolving European and global contexts (an important global target being represented by the Millennium Development Goals) but also to propel the Mediterranean as a leading model in regional cooperation.

References

Antipolis, S. 2005. *A sustainable future for the Mediterranean. The Blue Plan's Environment and Development Outlook*. Blue Plan.

EEA (European Environment Agency). 2006. *Priority issues in the Mediterranean Environment*. EEA, Copenhagen.

EU (European Union). 1995. Barcelona Declaration, adopted at the Euro-Mediterranean Conference, 27–28 November 1995, Barcelona, Spain.

Haas, P. 1989. "Do regimes matter? Epistemic communities and Mediterranean pollution control." *International Organizations*, 43:377–403.

Haas, P. 1992. "Introduction: Epistemic communities and international policy coordination." *International Organizations*, 46:1–35, Knowledge, Power, and International Policy Coordination.

IOC (Intergovernmental Oceanographic Commission). 2006. Intergovernmental Coordination Group for the Tsunami Early Warning and Mitigation System in the North Eastern Atlantic, the Mediterranean and Connected Seas (ICG/NEAMTWS), First Session, 21–22 November 2005, Rome, Italy. UNESCO, Paris.

Kullenberg, G. 2002. "Regional co-development and security: A comprehensive approach." *Ocean and Coastal Management*, 45:761–776.

MA (Millennium Ecosystem Assessment). 2005. *Ecosystems and human well-being: Synthesis*. Island Press, Washington, DC. 137 pp.

Massoud, M.A., M.D. Scrimshaw and J.N. Lester. 2003. "Qualitative assessment of the effectiveness of the Mediterranean Action Plan: Wastewater management in the Mediterranean Region." *Ocean and Coastal Management*, 46:875–899.

UNEP/MAP. 1995. *Action Plan for the Protection of the Marine Environment and the Sustainable Development of the Coastal Areas of the Mediterranean (MAP Phase II)*. United Nations Environment Programme/Mediterranean Action Plan (UNEP/MAP), Athens.

UNEP/MAP. 2006. www.unepmap.gr.

Vallega, A. 1996. "Geographical coverage and effectiveness of the UNEP Convention on the Mediterranean." *Ocean and Coastal Management*, 31:199–218.

CHAPTER 18

The Baltic Sea Region*

Terttu Melvasalo

Historical Background

The international efforts to save the Baltic Sea started several decades ago. These efforts included scientific international cooperation in marine research. This intergovernmental, bilateral or multilateral cooperation to save the sea has been continuing for over 30 years. The exchange of marine-related scientific information between countries belonging to the socialist block and others was initiated as a bilateral scientific-technological cooperation. The oldest official bilateral program dealing with protection of a sub-area of the Baltic Sea began in 1968. It involved cooperation over the Gulf of Finland between Finland and the Soviet Union. This was followed by an agreement in 1972 dealing with the protection of the Gulf of Bothnia, signed by Finland and Sweden, and in 1973 a cooperation between the Soviet Union and Sweden. Later, more bilateral agreements were signed.

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From seven Baltic Sea States in 1972 (Denmark, Finland, German Democratic Republic, Federal Republic of Germany, Poland, Sweden and the Union of the Soviet Socialist Republics [USSR]), the number of the Baltic Sea States was reduced to six in 1990 due to the unification of Germany. The number of countries increased again due to the dissolution of the USSR in 1991. At present, there are 14 countries in the catchment area, but only 9 of them are coastal states (Denmark, Estonia, Finland, Germany, Latvia, Lithuania, Poland, Sweden, and Russia). The contribution to the river discharge of the other countries (Byelorussia, Czech Republic, Slovak Republic, Norway, and Ukraine) is considered relatively small.

The social and economic situation varies between countries mainly due to notable political changes in the region at the end of the 1980s and early 1990s. Since 2004, eight coastal states have been members of the European Union (EU). The only nonmember is Russia which has a short coastline on the Baltic Sea, but has a huge pollution load, especially that flowing via River Neva through the city of St. Petersburg (formerly Leningrad). More than 5 million people are living in this coastal region.

In the early 1970s, the responsible authorities in many Baltic Sea countries recognized that the protection and enhancement of the marine environment cannot be effectively accomplished solely by national efforts or by bilateral subregional cooperation. It became obvious that close regional multilateral cooperation of all riparian countries and other appropriate international measures were urgently needed to protect the entire sea area.

Description of the Region and the Scientific Background

The Baltic Sea, neither an ocean nor a lake, is one of the geologically youngest aquatic environments in the world. It is also the world's largest brackish water body, with a strong estuarine character. Since its formation some 12,000 years ago, this unique area has undergone several drastic changes that have increased stress on the biota, fish, benthic fauna and flora, as well as plankton in the area. Part of its short history is well recorded in the sediments of the Baltic Sea deep basins [Winterhalter et al., 1981].

The Baltic Sea is a semi-enclosed sea with very restricted water exchange with the ocean via the North Sea. The water exchange plays a very important role in the marine character of the Baltic Sea which needs to be considered in all evaluations of changes in the marine environment. The stagnant deep water is occasionally exchanged through inflows of water with higher density filling the deep basins with oxygen-containing waters. This new water may remain in the deep for a long time until the oxygen disappears and hydrogen sulfide is formed. The area of these dead bottoms varies depending on the stagnation periods and the inflows of more saline, oxygen-containing water masses over a shallow sill through the narrow Danish Straits from the North Sea. This phenomenon — bottom layers turning anoxic from time to time — has been recorded for decades, even when the influence of man was negligible [Jansson, 1995].

The Baltic Sea is relatively shallow. Its average depth is 60 m and the deepest area is only around 460 m. The surface water salinity in the south is around 10 ppt decreasing drastically to the north, water there being almost fresh. The structure of the Baltic Sea is determined by freshwater input, salt- and oxygen-containing water input via the Danish Sounds in the south, and its internal processes. Parts of the sea are covered with ice every winter. However, during cold winters the whole sea may be covered with ice. The species composition is rare and unique, living under continuous stress. The renewal time of the water is estimated to be some 30–40 years. There are a few big rivers and numerous small rivers flowing to the sea. The sea area is about 368,000 km^2, which is about 0.1 percent of the world's ocean, but the drainage area is almost 1.8 million km^2.

Oceanographic investigations in the Baltic Sea began by the end of the 19th century. However, some geographic investigations, such as land uplift in the northernmost countries, were conducted even earlier. The collection of data on salinity, temperature, and oxygen of the deep basins began in 1893 and continues until today, with some interruptions during World War I and II. These time-series data sets provide an extremely important basis and background material for all research in the Baltic Sea [Mälkki, 2001].

The marine scientists of different countries maintained a regular communication since the beginning of the 20th century. An important scientific forum, the International Council for the Exploration of the Sea (ICES) was established by the governments in 1902. It provides advice in marine science for the North Atlantic area, including the Baltic Sea. ICES, which has become an important advisory body for the Baltic Sea regional intergovernmental organizations, was in the beginning mainly for the gathering and evaluation of data relevant for fisheries; but in the 1970s, with the increasing pollution issues, environmental matters were included in the data collection activities.

As the northern part of the Baltic Sea is covered with ice several months during the winter, marine research was, from the beginning, linked to physical oceanography including ice research. These observations, in addition to increasing scientific knowledge, have been providing ship traffic information, mainly in the transport of goods via the Baltic Sea to the harbors. Nowadays, the role of traffic is very important due to very frequent traffic of passenger ships operating even during winter time when the sea is covered with ice, and due to increases in oil transportation in the whole sea.

Fishery-related observations as well as estimations of land uplift were important information from the studies conducted earlier. During the first decades of the 20th century, scientific marine physics observation networks were established, for example, in the determination of sea currents and changes in water level for both science and harbors. Also, the first marine research vessels were constructed in the beginning of the century enabling wider studies of hydrographical variations around the entire Baltic Sea. Joint scientific expeditions of several research vessels from different countries were conducted as early as the 19th century allowing for regular interactions among scientists. This tradition of joint scientific expeditions, and later joint exercises serving joint maritime interests, has continued until today. Naturally, there were respites during the World Wars. During these periods, when some of the countries had lost their independence (for example, Estonia, Latvia, and Lithuania from World War II until 1991), and when USSR created new rules and restrictions, many were not able to participate fully in all joint exercises.

Problems of the Region

The vulnerable marine environment of the Baltic Sea and its drainage area is clearly influenced by human activities. The problems related to the marine environment caused by humans began some 50 years ago although the degradation of some coastal areas was reported earlier. Today almost 85 million people live in the catchment area and almost 30 million still lack proper wastewater treatment facilities. There is a strong pulp and paper industry in the catchment area, as well as other industries, which are point sources of harmful heavy metals, other chemicals, and organic substances entering the sea via watercourses and the atmosphere. Illegal oil and waste discharges from ships caused increasing problems, which are nowadays well under control.

The Industrial Revolution, population explosion, and urbanization impacted the ecosystems of the sea, the effects of which became more pronounced at the start of the 20th century. In the 1950s and 1960s, discharges from cities, industry, agriculture, and ships increased significantly. The archipelagos and beaches have become areas for recreation and intense fishing. More than a hundred million tons of oil was carried annually through the Baltic Sea in the 1970s and the figure is nowadays much greater due to increases in transportation and the construction of new oil harbors.

Still, in the 1950s, the open Baltic Sea was described as relatively clean, even though problems were observed in the coastal areas. In some countries, the concern on the pollution problems of waters around big cities was articulated as early as the 1920s. The pollution was then mainly due to discharges of untreated urban and industrial wastewaters. Physical, chemical, and biological observations were included in the early research programs, but the environmental studies and the consideration of the manmade changes and their impacts in the marine environment began in most countries only in the 1960s and 1970s, while in others only by the 1980s. The first Ministries of Environment were established in some countries around this time.

At the end of the 1960s, a deep concern on the increasing pollution of the sea was expressed by scientists from many Baltic Sea countries. The pollution originated from many sources such as discharges through rivers, estuaries, outfalls and pipelines, dumping and normal operations of vessels, as well as through airborne pollutants. Agricultural effluents contained high concentrations of nutrients like nitrogen and phosphorus compounds, as well as pesticides. On the one hand, the anthropogenic eutrophication, or nutrient enrichment, had stimulated fish production thereby triggering the establishment of fish farms in the archipelagos. On the other hand, eutrophication resulted in algal blooms including the massive growth of toxin-containing algae.

Some chemical compounds — toxic synthetic persistent organic pollutants (POPs) that had never been observed before — were found throughout the area in water, sediment, and biota. Some of these compounds were accumulating in the food chain. The greatest concerns were directed first towards the levels and effects of chlorinated hydrocarbons, heavy metals, oil, and nutrients [Melvasalo et al., 1981].

The accumulation of the chlorinated hydrocarbons, dichlorodiphenyl-trichloroethane (DDT) and polychlorinated biphenyls (PCBs) was considered to be an acute problem in the 1970s. In some countries, such as Denmark and Sweden, the sale of cod liver was banned due to high contents of DDT and PCBs. Some species of flora and fauna suffered greatly. The thickness of the egg shells of birds feeding on fish and mussels was correlated to DDT, and the decrease in the reproduction of the white-tailed eagle and seals was linked with high levels of PCBs. Oil spills and illegal discharges from ships killed birds and fish and spoiled seashores. Moreover, ecological disasters concerning seals and fish-feeding birds were reported. Various diseases were found in animals such as fish. Even after the first decade of the Helsinki Commission (HELCOM) cooperation in the 1980s, a number of harmful toxic substances were still observed, continuing the harm to living organisms in spite of measures taken to ban or limit the use and discharge of such substances.

In the 1970s, there were a few scientific regional working bodies which were collecting relevant information. Such information was needed to advise administrators and governments in the estimation of the changes in the marine environment. The most important groups were ICES, particularly its Scientific Community on Oceanic Research Working Group, and two nongovernmental organizations (NGOs): the Baltic Marine Biologists and the Conference of the Baltic Oceanographers. These groups met on a regular basis and organized regional symposiums for critical presentation of research results.

Fortunately, all Baltic Sea countries have highly-respected research institutes, research vessels, and dedicated scientists. The strength of the region comes from international forums where scientific results are presented and analyzed. From these scientific forums, it was recognized that to save the Baltic Sea, strategic actions should be planned, implemented, and evaluated in combination with continuous science research, administration, and a strong political will.

Regional Institutional Arrangements

Development of the 1974 Helsinki Convention and the Helsinki Commission

The first UN International Conference on the Human Environment, which was held in Stockholm, Sweden in 1972, was a historical milestone when high-level politicians from participating countries initiated something concrete to improve the marine environment. The meeting recommended immediate actions for the protection of the seas and established the United Nations Environment Programme (UNEP) to assist developing countries to solve their environmental problems.

Also during the 1972 Conference, and through the invitations of Finland, all seven Baltic Sea States at that time — Denmark, Finland, German Democratic Republic, Federal Republic of Germany, Poland, Sweden, and the USSR — expressed their concern on the pollution of the Baltic Sea and their willingness to take action to improve and protect the sea. They decided to establish their own, independent, intergovernmental cooperation body at the highest political level: the Interim Baltic Marine Environment Protection Commission. (Finland made the initial effort through diplomatic channels with other countries to guarantee the success of the proposal.) This was a joint effort of all seven countries to save the Baltic Sea.

Bilateral environmental agreements and working structures established in the late 1960s and early 1970s as well as contacts with the various scientists helped the diplomatic dialogue among the politically different countries from the Eastern block (German Democratic Republic, Poland, and USSR) and Western block (Denmark, Finland, Federal Republic of Germany, and Sweden). Initial negotiations and informal meetings during the preparatory phase and the Interim period (1974–1980) were very important to achieve a common understanding to the many difficult issues related to the drafting of and preparations for the Convention on the Protection of the Marine Environment of the Baltic Sea Area (also called the Helsinki Convention) and its implementation. It was, however, a common understanding that even if the bilateral cooperation was useful in many ways, the Baltic Sea could be saved only if all surrounding countries would agree on joint rules for the protection work. Thus, the Convention was a step in the right direction [Melvasalo, 1984].

In drafting the Helsinki Convention, its Articles and Annexes, various teams of experts from multidisciplinary sectors, such as from marine science, water, technology, maritime field, and law, provided their inputs. Draft documents were considered on the administrative, national, bilateral, and multilateral levels before they were presented at the political level for decisionmaking.

The drafting of the Helsinki Convention took 2 years. It was signed in 1974 and entered into force in 1980. The Convention comprised a Preamble, Articles, and Annexes. A permanent governing body was thereafter established: the Baltic Marine Environment Protection Commission or the Helsinki Commission [HELCOM, 1980]. It is headquartered in Helsinki, Finland, with an international Secretariat (called the HELCOM Secretariat) and started with three professional staff and a few assistants. The number of personnel of the Secretariat has increased slightly during the subsequent years due to an increase in workload [HELCOM, 2004].

Aim and content of the 1974 Helsinki Convention

The objective of the 1974 Convention was to protect the Baltic marine environment against all forms of pollution from land and sea as well as atmospheric sources. Dumping from ships was prohibited including pollution in the context of seabed utilization and research. There were 29 Articles, 6 Annexes, principles and obligations concerning prevention of pollution from ships, and some regulations concerning pleasure boats, reception facilities, and cooperation in combating marine pollution by oil or other harmful substances, and so on. (The fisheries however, were regulated by another convention: the Convention on Fishing and Conservation of the Living Resources in the Baltic Sea or the Gdansk Convention, signed in 1973.)

The 1974 Convention covered the entire Baltic Sea, the Baltic Proper, the Gulf of Bothnia, the Gulf of Finland and its entrance, including the Kattegat but excluding the Skagerrak. The internal waters were excluded. This was because it was formulated during the time of the Cold War, a time when it was politically impossible to include the coastal waters and the catchment area of all countries. However, according to the Convention, the Contracting Parties must ensure that the aims of the Convention would be achieved in their internal waters as well. As regards to land-based pollution, all measures were to be taken to control and minimize pollution, with special emphasis on noxious heavy metals, persistent pesticides, lignin, oil, and radioactive materials.

On the prevention of pollution from ships, the Convention placed strict limitations on the discharges of polluting substances, such as oil, chemicals, sewage, and garbage. Dumping was prohibited, but dumping of dredged spoils was allowed if they do not contain significant amounts of any harmful substances. Appropriate measures were required to prevent pollution originating from exploration and exploitation of the seabed. Detailed guidelines were given for the cooperation between the Contracting Parties as well as for national capacities for combating oil pollution in the sea.

The Convention was not legally binding. The Helsinki Commission had been operating mainly on Recommendations on Action to be taken by the Contracting Parties. The decisions in the Commission meetings were to be made unanimously. The decisions and recommendations of the Commission were intended to be incorporated in the national legislation of each of the Contracting Parties while the Commission was tasked to followup the enforcement of the measures as deemed appropriate.

Working structure

The Interim Commission (1974–1980) was composed of the following elements: a decisionmaking level, annual meetings, and administrative and expert level gatherings in two permanent working groups: the Scientific-Technological and the Maritime Working Groups. Later, other committees were formed and one subgroup to respond to questions and issues. For other fields, a number of ad hoc working groups were convened. Only a few observer organizations were accepted to attend the meetings in those years. The main lines of the working structure were developed during the Interim period [HELCOM, 1994].

A first of its kind, an overall assessment was compiled in 1980 on the effects of pollution on the natural resources of the marine environment. Plans for a comprehensive joint monitoring program were also presented. The existing and established bilateral contacts were valuable especially for the exchange of information on scientific results from the different countries. Literature was collected and compiled for the HELCOM Bibliography on an annual basis. The HELCOM Bibliography was considered an important channel for the exchange of information because nonpublished material, that is, "grey literature," was accepted.

Because decisionmaking at the Commission level must be unanimous, the preparatory work of the committees and working groups was of utmost importance. The main principle was that the proposed decisions at the committee level and the report should be adopted by consensus. Sometimes, however, this was not possible. This consequently presented an additional burden at the Commission meetings, requiring ad hoc expert groups to be present during these meetings to provide their expert advice on the most difficult questions and issues.

Ministerial Meetings (considered as political milestone events) were organized in 1988, 1990, 1992, and 1994. Several Ministerial Declarations were adopted during these periods. In 1990, the reduction of pollution from the entire catchment area was included in the activities. Due to the spirit of the Convention and the working traditions, none of the countries dominated the cooperation efforts. The Chairmanship is rotated in a 2-year period. Leaders were chosen in alphabetical order of the countries' names (in French). Countries enjoying good economic conditions have sponsored certain activities. These countries were designated Lead Countries. Many Lead Countries have been appointed for specific activities since the late 1980s. On the other hand, countries in transition stages have been able to arrange meetings and provide experts and leadership in other, less expensive, activities. In joint exercises, such as combating exercises, air surveillance, or intercalibrations, it has been necessary to appoint a leading country or countries. Since the 1990s, HELCOM has coordinated the development of the geographic information system for the Baltic Sea drainage area in cooperation with other intergovernmental organizations, such as the UN Economic Commission for Europe, the World Health Organization, Commission of the European Communities, and UNEP-Global Resource Information Database [Brusendorff, 2005].

Since the 1980s, regular meetings among the Chairmen of the Commission and the committees with the Secretariat have been held. In the late 1980s, the Scientific-Technological Committee was divided into two new working groups: the Environmental Committee and the Technological Committee. In 1990, a new activity was included. A High Level Task Force (from 1990 to 1992) was established on the basis of a decision by the Prime Ministers and has continued as the Joint Comprehensive Environmental Action Programme since 1992.

When the transparency in the Baltic Sea cooperation increased and more political interest was obvious, some relevant intergovernmental organizations (IGOs) and NGOs were accepted as observers to contribute to the work. These organizations initially had to present their application for observership and the decision for acceptance as observers was made by the Commission. Also, important work was done with different research institutes, local governments, universities, industrial sectors, and naturally with some IGOs such as the various UN bodies. HELCOM has at present around 20 observers, both IGOs and NGOs. An important regional cooperation body is the Council of the Baltic Sea States, a body for the Ministers of Foreign Affairs. At the level of cities, there is the Union of the Baltic Cities, where environmental questions are also dealt with. An important component of the cooperation is the participation of some relevant grassroot organizations, such as Coalition Clean Baltic. The World Wildlife Fund has an active role in the implementation work in the Joint Comprehensive Environmental Action Programme and Nature Conservation fields. One of the new observer organizations is Baltic 21, a regional multistakeholder process for sustainable development initiated by the Prime Ministers of the Baltic Sea States.

Financing

During the period 1974–1980, Finland acted as Lead Country for the work of the Interim Commission. The Finnish government shouldered the main costs, specifically, the Secretariat work and most of the meetings. After the Convention entered into force, the financial contributions of the Contracting Parties became equal. However, due to political and economic changes in the region, some relief in financial contributions was accepted for a certain period only. Finland has, however, continued to support the costs of hosting the Headquarters.

There have been many problems in keeping a sufficient amount of the budget at pace with the increasing demands of the partners. One solution has been that specific activities have been supported by member countries; another was that some observer organizations have undertaken some responsibilities in the work as accepted by the Commission. In other cases, revision of activities drastically has been the only way out of the financial problems. The principle is that the country, which invites a meeting, also will carry the costs of the meeting except the costs of the Secretariat. The plans for different meetings have been made, most often at least 1 or 2 years in advance. Thus it has been possible to estimate in advance the costs of the meetings and different activities and include them in the schedules and budgets at the national level and in the Commission [HELCOM, 2003b].

The consideration of the activities included in the draft budget has been a difficult topic because of the different priorities in different countries. The Executive Secretary is responsible for drafting the budget and reporting to the Commission annually. In drafting the budget of the Commission, the role of the Heads of Delegation has become important. The regular meetings of the Heads of Delegation were established in the 1990s. These meetings were held to facilitate the work of the Commission in its decisionmaking and to advise the Executive Secretary and the Chairmen of the Committees as well as the Secretariat.

Implementation of the 1974 Convention

The implementation of the Convention in practice could take place only at a national level. It was important to adopt appropriate amendments in the national water legislation by each member country, because the Convention Area did not include internal waters or the drainage area of the Baltic Sea at that time. Informal groups of legal experts were invited by the Commission to meet from time to time in order to assist in the preparation of appropriate changes in the Convention Annexes.

It soon became evident that it was necessary to adopt recommended measures over the whole drainage area. Thus the inclusion of internal waters to the common program became important. A decision was made by the Ministers in 1990 to include the catchment area as target area for the reduction of pollution entering the Baltic Sea. A number of new principles were adopted during those years and it became evident that the time had come to include internal waters to the Convention. A consideration of possibilities to revise the Convention of 1974, or at least to amend its Annexes, was proposed. After a number of changes, a new Convention was drafted, based on the old Convention, but containing many significant changes in the principles as discussed below.

The 1992 Helsinki Convention and the Task Force

A new Convention was signed in 1992, but it entered into force only in 1999. The composition of Parties has changed over the years compared to those of 1974, growing from seven countries to nine countries and the EU. The most significant change was, however, the change of the Convention Area to include the nations' internal waters. Another significant new principle was that measures to reduce land-based pollution should be applied throughout the catchment area [HELCOM, 2004].

The key elements of the 1992 Helsinki Convention include:

- Inclusion of the internal waters;
- Relevant measures must be introduced in the drainage area to prevent and eliminate pollution;
- Fundamental principles, including the "precautionary principle," the "polluter pays principle," and obligations to use the Best Available Technology and Best Environmental Practice;
- Detailed priority groups of harmful substances restricted or totally banned from use;

- Detailed criteria and measures for preventing land-based pollution, among others, common principles for issuing permits for wastewater discharges and air emissions;
- Environmental impact assessment;
- Prohibition of incineration;
- Nature conservation and biodiversity;
- Reporting and the exchange of information; and
- Information to the public.

As was the case in the drafting of the 1974 Convention, throughout the preparation process of the new Convention, multidisciplinary scientific, technological, and maritime experts were involved.

In 1990, the Prime Ministers of the Baltic Sea States decided to setup an ad hoc High Level Task Force to propose a program to restore the Baltic Sea to sound ecological balance. Representatives of Norway, Czechoslovakia, and the Commission of the European Communities as well as four multilateral development banks were also involved. The aim of the High Level Task Force was to coordinate and supplement the analyses of the different parts of the Baltic Sea and to prepare a joint comprehensive program for the reduction of emissions in order to restore the Baltic Sea to its original ecological balance. The Contracting Parties to the Helsinki Convention made special appropriations to the Task Force budget [HELCOM, 2003a].

The Joint Comprehensive Environmental Action Programme was adopted by the Ministers of Environment in 1992 and the Programme Implementation Task Force was established. All the countries with territory within the Baltic Sea drainage area became members. The membership also included the Baltic Sea Fishery Commission and international financing institutions: the European Bank for Reconstruction and Development, the European Investment Bank, the Nordic Investment Bank, Nordic Environment Finance Corporation, and the World Bank. A number of international organizations were involved in the Programme as observers.

The Joint Comprehensive Environmental Action Programme focused its attention on the 132 biggest polluters (both point sources and diffuse sources) in the drainage basin of the Baltic Sea, even in some landlocked countries that were not signatories of the Helsinki Convention. Of the "hotspots," 47 were classified as "priority hotspots," two-thirds of which were located in the countries in transition and they accounted for 75 percent of the total estimated investment costs. The program was planned to be implemented in 20 years (1993–2012) and the financial resources needed were estimated to be ECU 18 billion (ECU is almost equivalent to the present Euro). The implementation of the Programme was divided into two phases: the first one (1993–1997) was estimated to cost ECU 5 billion; the second one (1998–2012) an additional ECU 13 billion.

The Programme consists of six major elements:
- policies, laws, and regulations;
- institutional strengthening and human resources development;
- investment activities;
- management programs for coastal lagoons and wetlands;
- applied research; and
- public awareness and environmental education.

In order to provide a firm basis for the concrete Programme, seven pre-feasibility studies were carried out by the international banks as Executing Agencies. The focus of these studies was to identify cost-effective action. The main responsibility for preparatory work was with the Executing Agencies and the Task Force Secretary appointed within the HELCOM Secretariat. For financing of the implementation of the Joint Comprehensive Environmental Action Programme, multitudes of funding sources were seen to be necessary. This included:
- domestic financing in the countries themselves;
- multilateral financing from the multilateral development banks;
- bilateral financing from the countries that would find it cost-effective to support the Programme; and
- private sector financing through joint ventures to modernize the industries in Central and Eastern Europe that will manufacture the equipment and provide the services necessary to clean the environment.

It was furthermore argued that there was a need for considerable additional financial resources and new financial instruments and institutional developments.

Achievements and Lessons Learned

Monitoring, Assessments, and Recommendations

The state of the marine environment reports have been prepared jointly and published regularly every 5 years since 1980. Most of the first recommendations dealing with the protection of the marine environment from pollution from land-based sources have been based on scientific evaluations of the state of the Baltic Sea.

It was very early realized that in spite of the long tradition of observations on marine parameters, an agreement on joint parameters and a quality assurance strategy was needed. In order to produce reliable research results, the monitoring methodologies, including sampling and analyzing methodologies should be compared and harmonized. In the succeeding years, several joint intercalibration exercises were arranged on different parameters. The bilateral cooperation in this field supported the work of the Interim Commission and, later on, the monitoring activities in the framework of HELCOM. The activities have since then included a jointly agreed network of monitoring stations, the coordination of research vessel cruises, intercalibration and intercomparison exercises, the preparation of detailed sampling and analytical methodology handbooks, the reporting of data, and the preparation of appropriate material for HELCOM publications. The expertise of ICES has been used from the beginning to assist the scientists, experts of the countries, and the Secretariat to carry out all the tasks requested by the governments in the Commission meetings.

Specific expert groups were established in the early 1980s for the monitoring of airborne pollutants as well as for radioactive substances. Relevant international organizations, such as the International Atomic Energy Agency, WHO, and the World Meteorological Organization, were invited to participate. In April 1986, the nuclear power plant in Chernobyl exploded. As a result, radioactive fallout spread over vast areas. The sharp fallout layer of radioactive substances, such as cesium and strontium, formed an easily observable maximum in the sediment sequences all over the area. On the basis of these layers, the rate of sedimentation could be exactly determined. This has served as an aid in considering the role of sediments in material balance studies in the Baltic Sea. Followup reports on the fate of the radioactive material in the ecosystem and in sediments have been published by the Commission. After the Chernobyl accident, a more comprehensive followup procedure and reporting than originally included in the Commission's plans was established.

It was understood that the development of reliable monitoring and analyzing methods for a number of harmful substances, like mercury, lead, zinc, copper, oil, and organic harmful substances, is needed to create concrete measures to be taken by the member countries. It became obvious that a special program was needed to consider the pollution from land-based sources. The first pollution load compilation was prepared in 1986. As further discussed below, the available data was far from reliable at that time due to it — among other reasons — being politically sensitive, and the restrictions on delivering or publishing such data. This has improved however following the dissolution of the USSR [HELCOM, 1998b].

During the first 20 years of the Convention, there were many political difficulties and changes in the region. This caused several changes in the working atmosphere which were reflected in the joint activities. The recommendations during the first years were considered relatively weak, very general in nature, and without precise reporting obligations. The recommendations improved dramatically during the years when more precise details were included.

In the maritime field, relevant decisions by the International Maritime Organization (IMO) were drafted in the form of recommendations. These were then adopted as HELCOM recommendations in 1980. A HELCOM Combating Manual was prepared and revised from time to time harmonizing the regulations with other agreements (for example, the Bonn and Copenhagen Agreements). A strategy to establish and use port reception facilities was agreed along the lines of IMO requirements, and a number of detailed recommendations were adopted.

In the environmental field, a ban on the use of some harmful substances like DDT, PCBs, mercury, cadmium, and zinc was recommended. Later, certain actions to be taken in different fields were included such as in agriculture, the treatment of sewage in urban areas, pre-treatment of industrial wastes, and so on. It was agreed that the Commission should indicate more concrete action with a clear followup timetable. More details were included and certain sectors of industry were provided their own set of recommendations, for example, sectors concerned with the restriction of water and air emissions from priority pollution sources, such as metal surface treatment, chemical industry, pulp and paper mills, textile industry, leather production, incinerators, municipal wastewaters, agriculture, and so on. In the late 1980s and early 1990s, the responsibility for reporting the implementation of each of the recommendations and their corresponding timetable was accepted. Each of the countries acted as Lead Country for specific recommendations. This included a followup of the implementation of specific recommendations in all countries and the preparation of relevant reports for the Commission. These activities included a number of expert meetings organized by the Lead Countries.

The Interim Period and the Commission in 1974–1992

In spite of differences in the culture, social, economic, and political conditions in the Baltic Sea States, the first decade could be described as a time of cooperation and enthusiasm in applying the scientific and technological information and knowledge to improve the condition of the Baltic Sea. Some encouraging results were achieved due to joint activities. During its first 10–15 years, the main achievements were as follows:

- The use of DDT was banned in all seven countries and the use of PCBs strictly limited.
- The discharges of a group of new hazardous chemicals such as polychlorinated terphenyls (PCTs) was prohibited.
- The discharges from ships were strictly limited and reception facilities for ships' waste were established in ports.

- A definite decrease in the amount of ship-generated pollution was observed along the Baltic shoreline.
- Rules and guidelines for cooperation in combating oil spills were established.
- International rules on pilotage and safe routes for large ships were established as well as a position reporting system for ships carrying hazardous cargoes.
- Joint guidelines for the cooperative environmental monitoring program were established including sampling procedure, data collection and data treatment, reporting, intercalibrations and intercomparisons, and evaluations. When the monitoring and assessment work was organized, ICES was actively involved from the beginning to assist the countries to establish appropriate joint programs and to contribute to the evaluation work.
- A clear decrease in the mercury concentration in fish and other living organisms was observed.
- The recovery of some endangered species like seal populations and white-tailed eagle occurred.

Much information on the pollution load, the amount of discharge and technology was gathered using the existing subregional official mechanisms. This helped in developing appropriate HELCOM recommendations and guidelines which aimed to establish concrete action to be taken in reducing pollution from land-based sources. In 1986, the first compilation of pollution load data and preparation of jointly agreed guidelines for data collection and reporting were included in the work. Joint exercises were arranged in the scientific field, for example, intercalibrations, and in the maritime fields, for example, in combating oil spills, and so on.

During the first decade of HELCOM, a number of recommendations — many of which were drafted during the Interim period (1974–1980) — were adopted by all Baltic Sea States. The joint programs on monitoring and periodic assessments were also adopted. Requests to reduce and eliminate a number of harmful toxic substances from the discharges and the use of these chemicals in the industry were made and subsequently adopted. In the maritime and combating fields, most HELCOM recommendations at first dealt with the adoption of principles recommended and agreed within the framework of the IMO.

Politically, the Baltic Sea area was divided into two main groups of countries: the western democratic countries (Denmark, Federal Republic of Germany, Finland, and Sweden) and the USSR and "friends" (Poland and German Democratic Republic). For 50 years, Estonia, Latvia, and Lithuania used to be included in the USSR until the latter's dissolution in

1991. The big differences in the social, political, and economic structures caused problems. The lack of transparency, delay or nonsubmission of data, wrong data and information, and the like, affected the cooperative work. There were drawbacks when the participation of key persons was cancelled or when some countries did not attend the meetings. This brought about a delay in making decisions, leaving them open and postponed until the next forum.

Due to the region's history, there were some sensitive questions limiting the possibility of taking up relevant topics. Security of the region was excluded from the joint considerations. For instance, there were problems related to war gas ammunitions dumped into the sea during the World War II and discharges from the nuclear power plants, and so on. Sometimes the different interpretations of the Articles and Principles of the Convention caused problems among member countries and their national legislation. There were examples of problem areas dealing with dredging, treating of dumped ammunitions, using substances recommended to be banned, and so on.

In the beginning, most of the pollution load questions were sensitive items. Later, the situation was improved and cooperation was established to consider pollution sources, the amount and fate of various pollutants, and the need for decisions to reduce the load. Cultural differences caused some problems in spite of the fact that all countries are highly industrialized. For example, the reporting process of action taken at the national level differed much from country to country. In the maritime field there were problems in establishing more binding rules for the Baltic Sea region as a sensitive sea area than those adopted by IMO.

The first joint report on the pollution load compiled within HELCOM from 1986 was not reliable due to big gaps in the data sets and a very heterogeneous data set submitted from different sources. Joint guidelines for the collection of pollution load data were agreed upon for the next period in the framework of HELCOM. However, still in the mid-1990s and in the review of the load, gaps in the data submission were reported. Difficulties in working along the joint guidelines or even collecting data on the obligatory parameters were noted. There were agreements by the governments to decrease the pollution load within given timetables by certain percentages. One of the main problems was how to consider the diffuse sources and river discharges, specifically with regard to the anthropogenic sources of the load [HELCOM, 1998a].

One important step was the establishment of the aforementioned HELCOM Bibliography which included the annual collection and compilation of appropriate data which was to be distributed to all member countries. The Commission also established its own publication series entitled the *Baltic Sea Environment Proceedings*.

In general, it was felt that the Commission had created a model of international cooperation that would be adequate enough to serve as an example for other international organizations.

The New 1992 Convention

In the late 1980s and 1990s, the recommendations included more details, such as: *(a)* a timetable for reporting the action taken by Governments in applying the measures agreed upon; *(b)* how to deal with sectors like the chemical industry, pulp and paper industry, agriculture and fish farming; and *(c)* how to protect the sea against pollution caused by the transport of oil and other chemicals or caused by accidents or illegal discharges from the ships. Thus the thrust was no longer to agree that human activities cause harmful effects in the joint sea areas, but in creating a policy framework for member countries that illustrate action, if effective enough, could and would be agreed upon in all the countries to reduce pollution.

Some positive changes, like a decrease in the pollution load, were observed. The loads from point sources, municipalities, and industries decreased significantly. New technology was applied in industry and new or improved treatment plants were constructed for urban areas. Some new relevant organizations were adopted as observers. Some of these observer organizations worked actively in the expert group level. The HELCOM work increased public awareness and concern on the state of the Baltic Sea. Outside the HELCOM work, additional networks were established, such as those between presidents of universities, mayors of big cities, Baltic 21, and so on, aiming at the promotion of the sustainable development in the Baltic Sea region.

In the cooperation, the main players in most countries were those institutions, which had a role in: *(a)* marine research, *(b)* environmental management or sea administration, or *(c)* diplomatic cooperation between countries sharing the sea. In some countries, a specific national Baltic Sea Board was established to facilitate the cooperation between different institutions, such as ministries and research institutions. Also universities and some nature protection organizations participated in the preparatory work at the national level. Contacts with industry and the maritime field were established to obtain expert advice in the preparation of HELCOM recommendations before adoption.

One important achievement is that there now exists increased awareness and open dialogue among scientists, decisionmakers, and the public regarding threats and problems of the Baltic Sea.

After adopting joint rules for collecting and analyzing procedures, activities were included to implement them such as the collection of pollution load data from land-based sources and the compilation of appropriate data conducted step by step. One milestone was the adoption of a joint comprehensive action program for 20 years at the highest level. This program was to identify the greatest pollution sources and to take action to reduce the load remarkably. In 1990, the strong political will of all countries helped establish a Task Force to lead this priority project for 20 years. The project was the Joint Comprehensive Environmental Action Programme.

Much work and a lot of investment activities were carried out to implement the Joint Comprehensive Environmental Action Programme. Its main purpose was to achieve reduction of the pollution problems in the Baltic Sea. By the year 2002, more than 50 hotspots were written off from the original list of 132 problem areas. The countries in transition firmly committed themselves to tackle their hotspots to the extent possible with their own resources.

Scientists have often expressed controversial opinions and forecasts on the effects of the prioritized measures on the entire Baltic Sea. From the beginning of the Joint Comprehensive Environmental Action Programme, it was clear that implementing this program alone would not solve the problems of the entire sea. The causes for the ecological degradation are both natural and manmade. Twenty years (1993–2012) was understood to be too short a period in the recovery of the marine environment. No large-scale improvement was expected in the open sea in such a short time. However, coastal waters, shores, bays, and archipelagos are expected to become healthier, improving the human environment, with the drastic decrease of pollution load from cities, industries, and agriculture. The Programme was a parallel — although partly integrated — activity to the other HELCOM activities in restoring the sea. Today, it is a more independent Programme, but the implementation and the achievements are reported through the Commission [HELCOM, 1998a].

Still, the recent reports of the activities to HELCOM and several evaluations have revealed that the activities and environmental investments are still very slow, far from what is necessary to improve the state of the Baltic Sea significantly. The construction of wastewater treatment plants for all discharges from St. Petersburg, a main pollution source, is still waiting for final investments. The building of the Leningrad Dam is still ongoing and pollution problems related to dam construction could be observed both in the area partly closed by the dam and in the surrounding areas. Eutrophication, that is, anthropogenic increases in nutrients in water bodies that under certain circumstances may result in low oxygen content, even to the death of fishes, was only one of the problems.

In spite of different opinions of the experts on the best solutions, the construction of treatment plants seemed to be the most urgent action to be taken by the authorities, however, this would require a huge amount of funding.

In spite of investments in other treatment plants and efforts to reduce pollution from the catchment area, the blooms of blue-green algae are an annual nuisance in the Baltic Sea. These blooms are expected to continue in future years, even decades. The reason for this is suggested to be from the internal load of nutrients from the sediments. New harbors and increased traffic in the sea area imply the need for more modern and frequent means and methods to monitor the sea.

There are specific features in the Baltic Sea agreement which could identify the main reasons for its success during the past 30 years. They include the long-lasting scientific cooperation and the use of data and observations to benefit the health of the sea. In addition, the success may be a result of decisionmaking relying on traditional cooperation among neighboring countries as well as multilateral regional cooperation to work together at the scientific and cultural levels, even while the languages used among nations were diverse. The initial strategy was to tackle first the open sea and not to violate the sovereignty of the nations. Step by step, during the years that followed, increasing activities led finally to considering the in-depth reasons for the problems of the sea and to setting up realistic and concrete programs for solving them [Velner, 2005].

The working structure of the Commission invites all partners to be involved with intergovernmental cooperation at several levels: experts, administrators, and decisionmakers. Cooperation among these different levels led to increasing the number of partners to include appropriate organizations such as IGOs and NGOs, industries, and even international financing institutions.

The HELCOM recommendations have been the main tools in implementing the Convention throughout the years. It has been easy to change many recommendations to make them stricter or even to add reporting details. This has proved to be very useful. They have been developed from very general actions to concrete actions which were agreed upon in detail. They also included followup responsibilities, the role of the Lead Countries, and implementation and reporting timetables. Assigning the responsibility for specific activities to each country as Lead Country, for example, in the collection of data and the preparation of background documents to be considered in joint meetings, has been a big step forward in the transparency of actions taken by the partner countries.

The many years of covering long-term timetables for high level and administration level meetings as well as many working groups has proved to work well. It has included preliminary invitations of countries to host a particular meeting. Very useful during the time, when traveling was very much restricted from some countries due to political reasons, was the long-term planning with respect to arranging meetings to be held in different countries with many countries in attendance, thus involving more representatives, including new administrators or politicians. Also the permanent Secretariat has proved to serve well in keeping the decisionmaking and the history of different decisions in order. A good practice is in the rotation of the chairmanship of the Commission done in alphabetical order of the Contracting Parties.

In the mid-1990s, the Commission decided that all efforts should be made to avoid duplication of any work carried out by other intergovernmental organizations, especially when considering the implementation of the different decisions and possible changes needed in the working structure. It was pointed out that in other relevant international organizations, the Contracting Parties should emphasize the needs of the Baltic Sea region. It was also felt that HELCOM should turn to a more project-oriented organization. Consequently, Lead Parties should take over the administrative responsibility for meetings within project groups, thus decreasing the number of meetings supported by the HELCOM Secretariat. When the administrative costs of the projects are primarily carried by national budgets, it would create savings in the HELCOM budget.

In the 21st century, HELCOM is again changing its strategy and a new approach is being built based on the European Marine Strategy and HELCOM's political commitments. Social and economic issues are integrated in the work. This makes actions increasingly harmonized, with the efforts of other organizations bringing added value and avoiding duplication.

For the public, that is, for administrators and technical and scientific people involved in the implementation work, it was important that the HELCOM Bibliography was made available and the meeting reports, assessments, and guidelines were published by the Commission's own publication series, the *Baltic Sea Environment Proceedings*. In the late 1990s, the HELCOM website was established with a regular updating procedure.

Conclusion

There are many achievements and many success stories in the work of HELCOM. Many positive changes have been observed in the marine environment as a consequence of action taken by the countries following the recommendations agreed internationally. However, a lot of work still remains to be done to fulfill the agreements.

Since 2004, the Baltic Sea is the sea area of 9 countries, but there are only 2 partners in the negotiations: the EU and Russia. Even if the latest members of EU (namely, Estonia, Latvia, Lithuania, and Poland) are in a transition stage for some collaborative actions, the joint interests in the protection of the Baltic Sea are characterized by its long history among the countries with activities continuously directed to the same goals. The EU adopted the Water Framework Directive in 2000. It is demanding specific activities in the field of water protection in all EU countries. Appropriate changes must be made and included in their national legislation which in turn affects HELCOM activities.

The Baltic Sea Convention itself shows that there is a need for cooperation in order to improve the state of the marine environment of the Baltic Sea. The decisions by the Commission are not legally binding and no sanctions are available. The principle has been that the agreed rules, regulations, and recommendations will be included in the national legislations of the riparian countries. Therefore all diplomatic ways have been used to promote the implementation of the Convention and jointly agreed recommendations. In order to achieve the target, real action to reduce the pollution of the joint sea has been used.

IMO declared the Baltic Sea as a special area in 2004, having stricter regulations against oil pollution. Risks of oil spills have increased since the 1990s due to new oil harbors and growing transport of oil in the Baltic Sea.

The strength of the Commission has been that the organization, its working structure, and decisions have been modified several times depending on new priorities and funds available. After a number of recommendations and Ministerial Declarations, the new Convention was signed in 1992. It was based on the original one, but included many decisions made previously as HELCOM recommendations or as amended Annexes. This clarified some questions related to obligations of the members and priorities in the action plans.

The flexibility in the decisionmaking structure of HELCOM has been useful in many cases. An example is how the specific project was established with different partners in a Task Force, the process leading to the Joint Comprehensive Environmental Action Programme in 1992. Following the meeting of Prime Ministers and Environment Ministers, the project was established within HELCOM; however, not all countries — nor the participating international financial institutions — were members of the Commission. This cooperation has included additional political joint activities, such as consideration of funding by Finance Ministers and meetings of Ministers of the Environment.

The Baltic Sea was, and still is, under the great influence of humans. In spite of successful cooperation and a significant decrease of pollution load, the amount of discharges of nutrients, phosphorus, and nitrogen are still enormous. Measures to decrease the input were, and still are, strongly governed by the economic situation and political will in the countries.

The appropriate technology exists and is ready to be applied, however, in order to further decrease pollution, it is necessary to continue the strategy in identifying and prioritizing problem areas.

Due to political reasons during the first two decades, not all necessary information was available for countries to prioritize the problems and actions needed for the entire Baltic Sea. Also there were big gaps in the knowledge in the amount of pollution load entering the sea via the atmosphere. But in many countries, the expensive investments in building treatment plants for municipal and industrial wastewaters were done and the jointly agreed upon recommendations were implemented, in spite of delays or even neglect of some countries.

Many municipalities and industries continuously discharge their untreated wastewaters directly to watercourses and into the coastal areas. Inadequate or total lack of municipal treatment is compounded by the discharge of industrial wastewaters without treatment to municipal sewage systems. Agricultural practices, including intensive livestock husbandry, are significant contributors to the high nutrient load. Airborne pollution and increasing traffic and transport are also threatening the Baltic Sea.

The implementation of the Baltic Sea Joint Comprehensive Environmental Action Programme with "hotspots" is the responsibility of each country. It is evident that in many "prioritized hotspots," international funding is necessary.

HELCOM is a well-established and efficient organization with a number of networks of high level experts from different fields representing all member countries. The Commission will continue its work as a coordinating body for the measures agreed upon by the Contracting Parties. The Commission is also responsible for providing appropriate databases, expertise and advice to the governments, international and national forums as well as advice to the public on various environmental issues. Due to the very large changes in the political situation around the Baltic Sea during the past decade, cooperation between countries is now easier and environmental problems can be more easily addressed. Cooperation is needed in a wide perspective, that is, in political, social, economic, and cultural fields. Continued cooperation with a number of other organizations is needed.

During the past 30 years, the number of different initiatives in the region has increased. At the same time, at the global level, especially within the UN, decisions concerning environmental issues have increased, for example, in the UN Commission on Sustainable Development. The HELCOM Joint Comprehensive Environmental Action Programme established in 1992 may have served as a model for the UN Global Programme of Action for the Protection of the Marine Environment from Land-based Activities adopted in 1995 in Washington, DC, USA, under which UNEP was invited to act as Secretariat.

The Baltic arena has become more and more populated by politically driven organizations and initiatives, such as Ministerial Meetings, Council of Foreign Ministers, and cooperation among subregions, cities, schools, universities, and NGOs. HELCOM is continuously under pressure to carefully followup all other relevant activities and to prioritize its work as agreed upon by the governments in the regional framework and at the global level.

The EU has been a dominant force in the region since 2004. Now there are new questions in the Baltic Sea political atmosphere influencing trade and marketing. Some of the Baltic Sea States are members of NATO, causing a need for consideration of the safety of the region. The roles of HELCOM, EU, and Russia are now brought into new light.

Over the years, some criticism concerning the regulations by EU in some water protection areas transpired. There are big differences between the northernmost countries located close to the shallow semi-Arctic Baltic Sea, compared to those surrounding the Mediterranean or the North Atlantic. The effects of pollution load, not only from municipalities and industry but also from agriculture and fish farming, are much more serious in the heavily utilized shallow waters which are characterized by slow-water exchange. Thus it is very important that cooperation continue among the countries with joint interests in protecting the Baltic Sea, within the EU, and all countries sharing the drainage basin, including other organizations dealing with marine protection issues.

The discharges through the River Neva and discharges to the eastern part of the Gulf of Finland are still one of the greatest problems of the Baltic Sea. Thus, it is not enough that decisions by EU are implemented in the EU member countries. The remaining challenge is to find political, economic, and social will for cooperation with the non-EU country, Russia, which shares the coastline of the Baltic Sea. This cooperation is aimed for Russia to work in the same direction and, as much as possible, within the same timetable. This is important in future HELCOM work.

There are still illegal oil discharges, harmful algal blooms, new harbors under construction, increasing traffic and transport in the Baltic Sea, need for scientific cooperation and collection of different data and evaluation of the results, among others. The big question is how different activities can continue and whether there will be enough political will in the future to cleanup the Baltic Sea.

The big difference compared to the past is that, at present, HELCOM is increasingly governed by decisions planned and made on the European level. This means that there is a need for closer cooperation with other regional marine protection organizations in the neighborhood especially with the OSPAR Convention for the North-East Atlantic and a need to harmonize the decisions to the extent possible with all EU regional seas, the North Sea, and Mediterranean Sea. In the EU, the decisions are legally binding. These pose as a challenge to the Baltic Sea experts and administration to work harder in order to avoid decisions not suitable for the protection of the unique Baltic Sea marine environment. The implementation of the EU legislation in all member countries will contribute to the target goals, which are to improve the state of the marine environment of the Baltic Sea. HELCOM will naturally continue acting as a link between EU and non-EU parties. It will also act as the cooperation body promoting marine environmental protection with its non-EU member, Russia, which possesses only a short shoreline on the Baltic Sea, but is still, and probably will remain, a very big source of pollution via the Neva River.

The flexibility of the operating structure of HELCOM will show its strength in the coming years. HELCOM has been a leading regional marine environmental protection organization for more than 30 years. There is no reason why it cannot continue its role as the coordinating advisory body for the region in spite of the big changes in the economic, social, political, and environmental development arena in the region.

References

Brusendorff, A.-C. 2005. "Introduction of the Executive Secretary." *HELCOM News*, 1/2005.

HELCOM. 1980. *Joint Activities of the Baltic Sea States within the Framework of the Convention on the Protection of the Marine Environment of the Baltic Sea Area 1974–78*. Baltic Sea Environment Proceedings No.1. 1979.

HELCOM. 1994. "Twenty years of international cooperation for the Baltic marine environment 1974–1994." HELCOM Pamphlet. 44 pp.

HELCOM. 1998a. HELCOM Programme Implementation Task Force (HELCOM PITF). The Baltic Sea Joint Comprehensive Environmental Action Programme. Annual Report 1998 (Mimeographed). HELCOM. 92 pp.

HELCOM. 1998b. *The 3rd Baltic Sea pollution load compilation (PLC-3)*. Baltic Sea Environment Proceedings No.70. Helsinki Commission, Helsinki. 133 pp.

HELCOM. 2003a. *The Baltic Sea Joint Comprehensive Environmental Action Programme (JCP): Ten years of implementation*. Baltic Sea Environment Proceedings No. 88. Helsinki Commission, Helsinki. 76 pp.

HELCOM. 2003b. *The review of more specific targets to reach the goal set up in the 1988/1998 Ministerial Declarations regarding nutrients.* Baltic Sea Environment Proceedings No. 89. Helsinki Commission, Helsinki. 89 pp.

HELCOM. 2004. "Thirty years of protecting the Baltic Sea. HELCOM 1974–2004." Helsinki Commission Pamphlet. 27 pp.

Jansson, B.-O. 1995. "The Baltic Sea in time perspective." *World of the Baltic Sea Pamphlet Magasine om Östersjön och regionen*, 2:18–21.

Mälkki, P. 2001. "Oceanography in Finland 1918–2000." *Geophysica*, 37(1–2):225–259.

Melvasalo, T. 1984. "Assessment of the state of the Baltic Sea." *Aqua Fennica*, 14(1):15–20.

Melvasalo, T., J. Pawlak, K. Grasshoff, L. Thorell and A. Tsiban. (eds). 1981. *Assessment of the effects of pollution on the natural resources of the Baltic Sea*. Baltic Sea Environment Proceedings No. 5B. Helsinki Commission, Helsinki. 426 pp.

Velner, H.-A. (ed). 2005. *Water protection of the Gulf of Finland and Estonian water bodies*. Tallinn University of Technology, Tallinn.165 pp.

Winterhalter, B., T. Flóden, H. Ignatius, S. Axborg and L. Niemistö. 1981. "Geology of the Baltic Sea," pp. 1–121. In: *The Baltic Sea*. Elsevier Oceanography Series 30. Edited by A. Voipio. Elsevier, Amsterdam.

CHAPTER 19

Integrated Management of a Large Marine Ecosystem — The Benguela Case Study[1]

Michael J. O'Toole

The Benguela as a Large Marine Ecosystem

The Benguela Current ecosystem is situated along the coast of southwestern Africa, stretching from east of the Cape of Good Hope in the south, northwards into Angolan waters, and encompassing the full extent of Namibia's marine environment. It is one of the four major coastal upwelling ecosystems which are located at the eastern boundaries of the world's oceans.

Like the Humboldt, California and Canary systems, the Benguela is an important center of marine biodiversity and marine food production. Its distinctive bathymetry, hydrography, chemistry, and trophodynamics combine to make it one of the most productive ocean areas in the world, with a mean annual primary productivity of 1.25 kgCm yr^{-1}, about six times higher than that of the North Sea ecosystem [Brown et al., 1991].

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Based on the large marine ecosystem (LME) concept and definition proposed by Sherman [1994], and subsequently elaborated upon, some 64 LMEs have been delineated. The Benguela, which is No. 29 on the list, fits the definition well but unlike some of the other LMEs, such as the Black Sea, Caspian Sea, the Bay of Bengal and the Baltic Sea, the Benguela is an open boundary system situated between the Atlantic, Indian, and Southern Oceans.

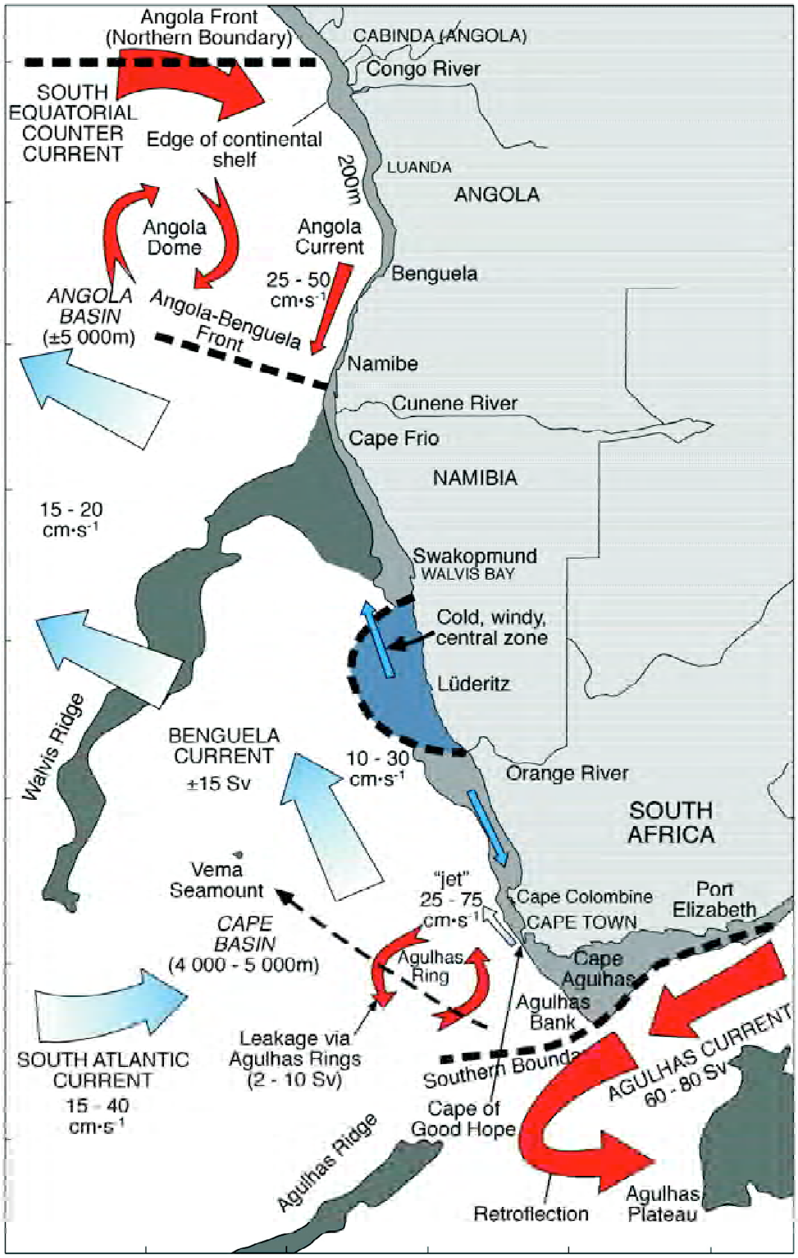
The greater part of the Benguela Current Large Marine Ecosystem (BCLME) is bounded to the landward side by the Namib Desert and a sparsely populated arid environment. Apart from the Congo River in northern Angola there are few river discharges with inputs limited to episodic extreme flooding events.

The Benguela system is unique compared with other upwelling systems worldwide in that it is bounded to the north and south by two major warm water systems, the equatorial eastern Atlantic and the Indian Ocean's Agulhas Current and retroflection area [Shannon and Nelson, 1996]. The principal upwelling center in the Benguela, which is situated near Luderitz in southern Namibia is the most concentrated and intense found in any upwelling regime. Sharp frontal systems exist at the boundaries of the upwelling but these vary in intensity both in time and space. Much of the marine environment, mainly those off Namibia and Angola, is naturally hypoxic or even anoxic at depth as a result of subsurface flow southwards from the tropical Atlantic [Bubnov, 1972; Chapman and Shannon, 1985; Hamukuaya et al., 1998]. This is further compounded by depletion of oxygen from more localized biological decay processes. There are also teleconnections between the Benguela and processes in the North Atlantic and Indo-Pacific Oceans. One instance is El Niño. The southern Benguela is also located at a major choke point in the "Global Climate Conveyor Belt," where warm surface water is moved from the Indo-Pacific into the North Atlantic via the Indian Ocean. As a result, its marine and coastal environments are extremely vulnerable to any future climate change or increasing variability in climate [Figure 1].

The boundaries of the BCLME encompass the entire upwelling region, the frontal systems and the exclusive economic zones (EEZs) of Angola, Namibia, and South Africa. To the south, the boundary has been set at 27°E (near Port Elizabeth) as the eastern limit. While the Angola-Benguela front comprises the northern extent of the main upwelling zone, the influences of upwelling are felt seasonally along the entire Angolan coast [Shannon et al., 1987]. The northern boundary of the BCLME is therefore set at 5°S in Cabinda Province and is in general agreement with the transition zone between the Guinea Current LME and the BCLME shown by Sherman [1994].

The BCLME displays a high degree of variability over a broad spectrum of time and space. In the south, upwelling tends to be more

Figure 1: External and Internal Boundaries of the Benguela Current Large Marine Ecosysem, Bathymetric Features and Surface (Upper Layer) Currents



seasonal than in the remainder of the Benguela with the main upwelling season being out of phase with that of the north. This is a consequence of a seasonal shift in the atmospheric pressure systems and increased influence of westerly winds during the austral winter in the south. In the central and northern Benguela, upwelling is most pronounced during winter and spring and winds have a diurnal character with a land-sea breeze effect.

The Resources of the Benguela Current Large Marine Ecosystem

The BCLME is an important global reservoir of biodiversity and biomass of fish, seabirds, crustaceans, and marine mammals. Beneath the seabed are rich resources of diamonds, oil, and gas.

The productive waters of the BCLME support a number of commercially exploited fish, including hake, pilchard (sardine), anchovy, horse mackerel, tuna, orange roughy as well as crustaceans fisheries for rock lobster in the south and shrimp and deep water crab in the north.

In Namibia, the fisheries sector is the second largest export earner in the economy after mining. Earnings from fishing grew from USD 48 million (4 percent of gross domestic product or GDP) in 1991 to USD 336 million (6.6 percent of GDP) in 2002. More than 20 commercial species are targeted and total landings amount to 623,391 tonnes in 2002.

In Angola, sardinellas, horse mackerel, sardines (pilchard), dentex, shrimp, crab, lobster, and tropical bottom species are targeted by the fishing industry. The fisheries sector is the third most important industry in the country, after oil and diamond mining. Fish provides nearly half of the animal protein in Angola. Between 1998 and 2000, the total Angola catch increased from 157,148 tonnes to 245,806 tonnes and fish consumption increased over the same period, reaching 17.3 kg per person.

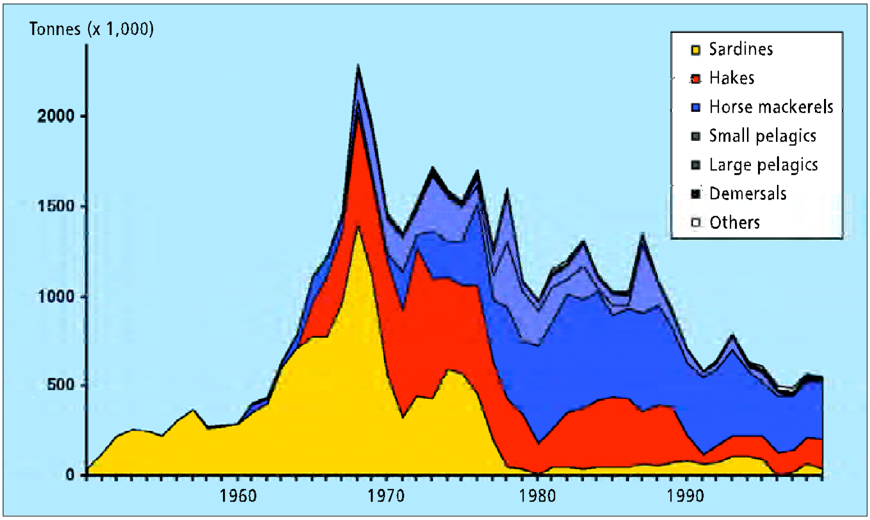
In South Africa, the main targeted species are hake, sardine, anchovy, rock lobsters, squid, tuna, and various species caught by line. The country's fishing fleet ranges in size from small rock lobster dinghies to highly sophisticated freezer trawlers. In 2002, South Africa's total catch amounted to 746,808 tonnes.

Small scale and artisanal fisheries provide an important livelihood and food source for coastal communities in some areas of the BCLME, particularly in Angola, while recreational fishing for various species caught by line is a popular pastime in Namibia and South Africa.

Other marine species which are not harvested (such as whales, dolphins, and seabirds) are increasingly recognized as a valuable resource for nature-based tourism.

Major changes in the landings of principal species of finfish and crustaceans have occurred [Figure 2]. Much of the declines in stocks of hake, sardines, and rock lobster occurred during the 1960s and 1970s and were undoubtedly the consequences of overfishing. However, changes in environmental conditions could be contributing factors.

Figure 2: Trends in Fish Catches Off Namibia, 1950–1998



Source: Hampton et al. [1999]

Sardine *(Sardinops sagax)* and anchovy *(Engraulis japonicus)* are caught mainly off Namibia and South Africa and to a lesser extent off Angola. In more recent years, the biomass of sardine resources declined sharply off Namibia following the 1963 Benguela Niño.[2] Another collapse occurred there in 1974, again following a protracted but less intense, Benguela Niño. The resources showed a slow recovery subsequently but this was retarded by the most recent 1995 Benguela Niño.

[2] The term "Benguela Niño" was coined by Shannon et al. [1986] and refers to large scale episodic warm events that occur along the coast of southern Angola and Namibia every 10 years, and which have a character not unlike the El Niño in the Pacific Ocean. Benguela Niños have a strong effect on regional fisheries and were reported in 1934, 1963, 1974, 1984 and 1995. For further discussions see Gammelsrod et al. [1998], Shannon and O'Toole [2003], and Shillington et al. [2006].

Anchovy was abundant off Namibia in the 1970s but has become less significant in the catches there during the past decade. In the southern Benguela, the sardine stock declined in the late 1960s and again after 1976, only recovering as a result of successive good year classes in the late 1980s to 1990s. In the south, the anchovy which was the dominant species during the 1970s and 1980s appears to have been partly replaced by the increasing biomass of sardine.

Two species of hake, *Merluccius capensis* and *M. paradoxus*, occur in the northern and southern Benguela and form the basis of a large commercial fishery. Adult hakes are good swimmers, undergo diurnal vertical migration, and can tolerate a range of temperatures. Being relatively opportunistic feeders, long-lived, and fished over a variety of age classes, hakes would be robust to all but major environmental perturbations. There is evidence from catch results that in recent years *M. capensis* is declining in abundance in Namibian waters and is being replaced by a migration of *M. paradoxus* from South African waters. This indicates that longshore shifts in hake stocks occur in the Benguela [Sumalia et al., 2003]. Although hake can evidently tolerate low oxygen levels, down to 0.25 ml per liter, they would avoid areas of extremely low concentrations of oxygen. Thus it is likely that the systemwide low oxygen event of 1993 to 1994, which was followed by the 1995 Benguela Niño, did retard the expected recovery of the hake resources off Namibia [Woodhead et al., 1998; Gammelsrod et al., 1998]. Nevertheless, on a time scale of decades, the main impact on hake appears to be due to overfishing rather than changes in the environment.

The most important commercial pelagic species off Angola are the sardinellas, *Sardinella aurita* in the south and *S. maderensis* in the north. The main spawning area is in the region between Point Noire and the Congo River, with peak spawning in March and April. Longshore migration of both species occurs seasonally, with an equatorward shift to the spawning grounds during the first part of the year and a return migration of adults occurring later in the year. There is some evidence that a southward shift in the distribution of sardinellas occurred in the mid-1960s which was followed by an equatorward displacement during the early 1980s. These displacement of stocks which occur across national boundaries have important implications for resource management.

The rock lobster, *Jasus lalandii*, was formerly abundant in the nearshore waters of the Benguela. However, in the 1980s, there was a sharp decline in production throughout the Benguela system. Off Namibia, it has been attributed to overexploitation and change in availability related to fluctuations in the levels of oxygen depletion of bottom water. In the southern Benguela, the decrease in population was as a result of reduced growth rate possibly related to reduced availability of ribbed mussels.

The relationship between changes in abundance of certain resources in the Benguela ecosystem and changes in the diets of predators such as seabirds and seals has been highlighted by Crawford et al. [1992] and Crawford [1999]. In the southern Benguela, numbers of Cape cormorants that breed in any years are closely related to the biomass of anchovy. Similarly, the distribution and breeding of the African penguin is related to the abundances of anchovy and sardine. Following the collapse of the sardine stocks in the 1960s, penguin colonies in southern Namibia and near Cape Town crashed to low levels and the center of their distribution shifted eastwards with increasing reliance on anchovy. This trend was reversed in the mid-1980s when the sardine stocks began to recover.

The nearshore and shelf environments of the BCLME hold rich reserves of oil, gas, and minerals, particularly diamonds. In Namibia, mining is by far the most important productive sector of the economy, contributing 20 percent to the GDP. Marine diamond mining is a rapidly developing sector yielding 54 percent of the country's total diamond production of 1.48 million carats. The contribution of diamond mining to Namibia's GDP was ND 1.8 billion (or 5.6 percent of the GDP) in 2003. Offshore diamond concessions extend for the full length of the Namibian coastline from the Orange River in the south to the Kunene River in the north. Namdeb Diamond Company, an equal partnership between De Beers and the Namibian government, is the country's main diamond producer.

In South Africa, there is increasing emphasis on offshore diamond mining operations. At present, marine diamond mining comprises about 10 percent of South Africa's total diamond production. Terrestrial concessions, including beach mining concessions, are mined between the Orange River mouth and the Olifants River. Alexkor and De Beers Namaqualand (Pty) Ltd. dominate diamond production in South Africa. In 2002, marine mines produced 74,000 carats compared to 50,000 carats in 2001.

No coastal or offshore mining currently occurs in Angola as most prospecting and mining activities are concentrated inland.

Angola is the second largest oil producer in Africa after Nigeria. Offshore oil mining began in Angola in 1966 following the discovery of an oil field (by the Gulf Oil Company) in the Cabinda enclave and in the province of Zaire.

Today, oil contributes 70 percent of Angola's GDP and about 90 percent of all exports. Oil production has exceeded 700,000 barrels per day every year since 1996 and is currently in the region of one million barrels per day. Production is expected to rise rapidly over the next decade.

Angola's offshore waters are subdivided into 35 blocks, stretching into the Atlantic Ocean in three distinct bands: the shallow water blocks, the deep water blocks and the "ultra deep water" blocks. By 2012, over

80 percent of the country's oil production will come from deep water and ultra deep water wells.

There has been an active gas exploration off Namibia since 1968, but only one significant discovery has been made. This is the Kudu Gas Field which lies 130 km offshore of southern Namibia. Namibia plans to exploit the Kudu Gas Field for use in electricity generation and supply in both Namibia and neighboring South Africa.

Exploration for oil in South Africa has resulted in 9 oil and 20 gas discoveries. The Mossgas gas field is currently in production as are the Oribi and Sable oil fields which lie approximately 120 km offshore. It is anticipated that there will be an increase in oil and gas prospecting off the west and south coast of South Africa in the future. New wells are likely to be drilled in deep water on the continental shelf.

The information on the full impacts of marine diamond mining and offshore oil and gas production on the BCLME is largely unknown. At a local level, the effects of the disturbances due to these operations are known to have a detrimental impact on water quality, the pelagic and benthic ecosystems. However, in the case of benthic organisms, recolonization and recovery can take up to 5 years in an area of operation. One of the main concerns is the cumulative effects of intensive operations over a long period on the living marine resources.

The Colonial Legacy

In the 19th century, the potential wealth of the African continent became apparent resulting in a great rush for territories and colonization by foreign — particularly European — powers. Boundaries between colonies were hastily established, often arbitrary and generally drawn with little regard for the native inhabitants and natural habitats. Colonial land boundaries in the Benguela region were established at rivers such as Cunene and Orange. Not only were the languages and cultures of the foreign occupiers different (Portuguese, German, English, and Dutch) but so were their laws and management systems which became the legal basis and administrative structures in the three now independent and democratic countries of Angola, Namibia, and South Africa. As a consequence of European influence, the current ocean governance framework lacks inter-agency or interministerial coordination for the management of the marine environment and its resources with scant regard for their sustainability. Mining concessions, oil and gas exploration and production, fishing rights, and coastal development have subsequently taken place with inadequate integration and little regard for other users.

Prior to the enactment of the United Nations Law of the Sea Convention (UNCLOS) in 1982 which respected sovereign rights within EEZs, there was an explosion of foreign fleets fishing off Angola, Namibia, and South Africa during the 1960s and 1970s leading to a plundering of the rich fisheries resources of the Benguela region. This is highlighted quite dramatically in Figure 2 which shows trends in fish catches off Namibia over the last few decades. This period also coincided with the liberation struggles and associated civil unrest in all the three countries. In the case of Namibia, over whom the mandate by South Africa was not internationally recognized, there was an added problem in that, prior to independence in 1990, an EEZ could not be proclaimed. Although attempts were made to control the foreign exploitation of Namibia's fish resources through the establishment of the International Commission for the Southeast Atlantic Fisheries, this proved to be relatively ineffective in managing fish stocks. Until fairly recently, environmental issues and sustainable management were low priorities on the political agenda in South Africa. Another consequence of the recent civil war in Angola was the migration of population to the coast creating localized pressure on marine and coastal resources and resulting in the destruction of coastal forests and mangroves and severe pollution of some embayments.

Regional Cooperation and Integrated Management

Nearly all of the problems in the BCLME which require scientific investigation and management action are common to all the 3 countries — Angola, Namibia, and South Africa. For example, most of the region's important harvested resources are shared between countries or move across national EEZ boundaries at times. Environmental variability and change impact the ecosystem as a whole; the consequences of which are highly unpredictable. Mining impacts and pollution, while seemingly localized, are really transboundary issues as are harmful algal blooms and the loss of biodiversity. Capacity building in the region (both human and infrastructure) is a problem; in particular, there is an inadequate knowledge about marine science and technology as one moves from south to north. With an end to the colonial past, apartheid, and civil conflict in the region in the early 1990s, a strong case has been made to address the problems and fragmented management in a collective manner.

In 1995, the Ministry of Fisheries and Marine Resources (Namibia) hosted an International Workshop/Seminar on Fisheries Resource Dynamics in the Benguela Current Ecosystem in partnership with the German Organization for Technical Cooperation (GTZ) and the Norwegian Agency for Development Cooperation (NORAD) and the Intergovernmental Oceanographic Commission (IOC) of the United Nations Educational, Scientific and Cultural Organization. This meeting proved to be a milestone in regional cooperation, for out of it evolved two major Benguela initiatives.

The Benguela-Environment-Fisheries-Interaction and Training (BENEFIT) Programme was launched in April 1997 jointly by Angola, Namibia, and South Africa with its Norwegian and German partners. Its main purpose was to "develop the enhanced science capacity required for sustainable utilization of living marine resources of the Benguela ecosystem" by *(1)* improving knowledge and understanding of the dynamics of important commercial stocks, their environment, and linkages between environmental processes and stock dynamics; and *(2)* building appropriate human and material capacity for marine science and technology in the countries bordering the Benguela ecosystem. The BENEFIT Programme, spearheaded by the fisheries institutions of the region, catalyzed the development of the second regional multisectoral management initiative, the Benguela Current Large Marine Ecosystem (BCLME) Programme which in turn promoted further cooperation between the three countries and the other global LME programs.

Through the assistance of the United Nations Development Programme (UNDP) and the Global Environment Facility (GEF), Angola, Namibia, and South Africa developed the broad-based regional multisectoral BCLME Programme aimed to achieve sustainable integrated management of the Benguela Current ecosystem. It differed from the BENEFIT Programme (which focused on building scientific capacity for fisheries) by addressing management mechanisms and issues across a broad spectrum of key sectors including fisheries, seabed mining, and oil and gas exploration and production. The Project also addressed issues related to impacts of environmental variability, coastal zone management, ecosystem health, socioeconomics, and governance. Transboundary management, environmental protection, and capacity building were the cornerstones of the BCLME initiative and provided an ideal opportunity for the international community to assist the three countries in developing appropriate mechanisms that would ensure long-term sustainability of the ecosystem.

In 1998, GEF through UNDP, facilitated the development of a comprehensive BCLME proposal through a PDF Block B grant. This process was lengthy and complex involving a prescribed procedure and broad consultations with stakeholders through numerous meetings and two major regional workshops [Croll, 1998; Croll and Njuguna, 1999]. Through these consultations, consensus was built and a set of six comprehensive thematic reports or integrated overviews — on fisheries, environment, mining, coast, oil and gas, and socioeconomics — were commissioned [Hampton et al., 1999; Shannon and O'Toole, 1999; Tapscott, 2000]. These processes set the stage in the development of the Transboundary Diagnostic Analysis (TDA) and the Strategic Action Programme (SAP).

The SAP was completed in 1999 and subsequently signed by seven Ministers (representing fisheries, environment, petroleum, energy, and mining) from Angola, Namibia, and South Africa [BCLME SAP, 1999]. The Project Brief and full implementation phase of the BCLME was approved by the GEF Council in late 2001 and the Programme commenced in March 2002 following the completion and signing of the Project Document.

The Transboundary Diagnostic Analysis (TDA)

Within the framework of the GEF International Waters operational strategy for project funding, countries must produce a TDA that details the problems and issues, threats, actual or likely future disputes, conflicts, and their root causes. This is an integral part of preparation of the so-called PDF Block B grant application process [Duda, 2002; Wang, 2004]. The TDA process must be formulated in a bottom-up-type approach with full consultation with the private and public sectors of the participating countries. This collaborative, factual analysis is the essential starting point for determining priorities for action and for diagnosing root causes that produce the stress on the transboundary system [Duda, 2002]. The TDA is, in effect, the first step in producing an action program to address priorities and to monitor and evaluate three types of indicators: process, stress reduction, and environmental status.

The first step in the process is therefore to identify the key transboundary issues and their associated problems. The second is to identify the root causes of these problems and the third step is to specify the affordable and implementable remedial actions that are needed. Initially, the process seems unwieldy and bureaucratic. However, having gone through the various stages, it is clear that the process is rigorous, necessary, and logical. For example, essential elements of the TDA were formulated and prioritized through consensus group discussions following the process: issues > problems > causes > impacts > uncertainties > socioeconomic consequences > transboundary consequences > activities/solutions > priorities > costs.

In the case of the development of the BCLME Programme, the TDA process involved a wide range of regional stakeholders including representatives from government institutions, industry, the universities, and nongovernmental organizations (NGOs) as well as consultants and international LME experts. Regional planning workshops were held in

1998 and 1999. From these broad consultative processes, a consensus view emerged; three main transboundary issues need to be addressed in the Benguela: *(1)* sustainable management and utilization of living marine resources; *(2)* assessment of environmental variability, ecosystem impact, and improvement of predictability; and *(3)* maintenance of ecosystem health and pollution management.

Through the participatory TDA process, seven major transboundary problems were identified, their root causes established, and suites of actions formulated [BCLME TDA, 1999]. The seven perceived problems and their transboundary characteristics are as follows [Figure 3]:

1. **Decline in BCLME commercial fish stocks and non-optimal harvesting of living resources.** The boundaries of the BCLME extend through the EEZs of the three countries with most of region's harvested resources shared between countries or move across national boundaries. Overharvesting by one country can lead to depletion in the other and impacts the ecosystem as a whole.

2. **Uncertainty regarding ecosystem status and yield in a highly variable environment.** The Benguela environment is highly variable and the ecosystem is naturally adapted to this. However, sustained environmental events such as Benguela Niños, Agulhas intrusions, and changes in winds, impact the system as a whole, compounding the negative effects of fishing, while poor predictive ability limits a systemwide capacity to manage effectively. In addition, the BCLME is believed to play an important role in global ocean and climate processes and may be an important site for the early detection of global climate change.

3. **Deterioration in water quality — chronic and catastrophic.** Although most impacts of chronic deterioration in water quality are localized national issues, they are common to all of the countries and require collective action. Moreover, chronic pollution can favor the growth of less desirable species, and result in species migration. Catastrophic events (major oil spills, maritime accidents) can impact across country boundaries, requiring cooperative management and sharing of cleanup equipment and manpower.

4. **Habitat destruction and alteration.** These include modification of seabed and coastal zone and degradation of coastscapes. Although most impacts may appear localized, habitat alteration or loss due to fishing and mining can cause migration of fauna and systemwide ecosystem change. Uncertainties exist about the regional cumulative

impacts on the benthic and pelagic environments from mining and associated sediment remobilization. Inadequately planned coastal development and diamond mining along the shoreline result in degradation of coastscapes and reduce the regional value of tourism.

5. **Loss of biotic integrity (such as changes in community composition, species and diversity, introduction of alien species, and the like) and threats to biodiversity/endangered and vulnerable species.** Past overexploitation of targeted fish species has altered the ecosystem, impacting all levels (including top predators) and reducing the gene pool. Some species are threatened or endangered and exotic species have been introduced into the Benguela system. This is becoming a global transboundary problem.

6. **Inadequate capacity to monitor/assess ecosystem resources, environment, and variability.** There is inadequate capacity (expertise and ability) to monitor and assess adequately the shared living resources and to monitor environmental variability. Moreover, there is unequal distribution of this capacity between the three countries.

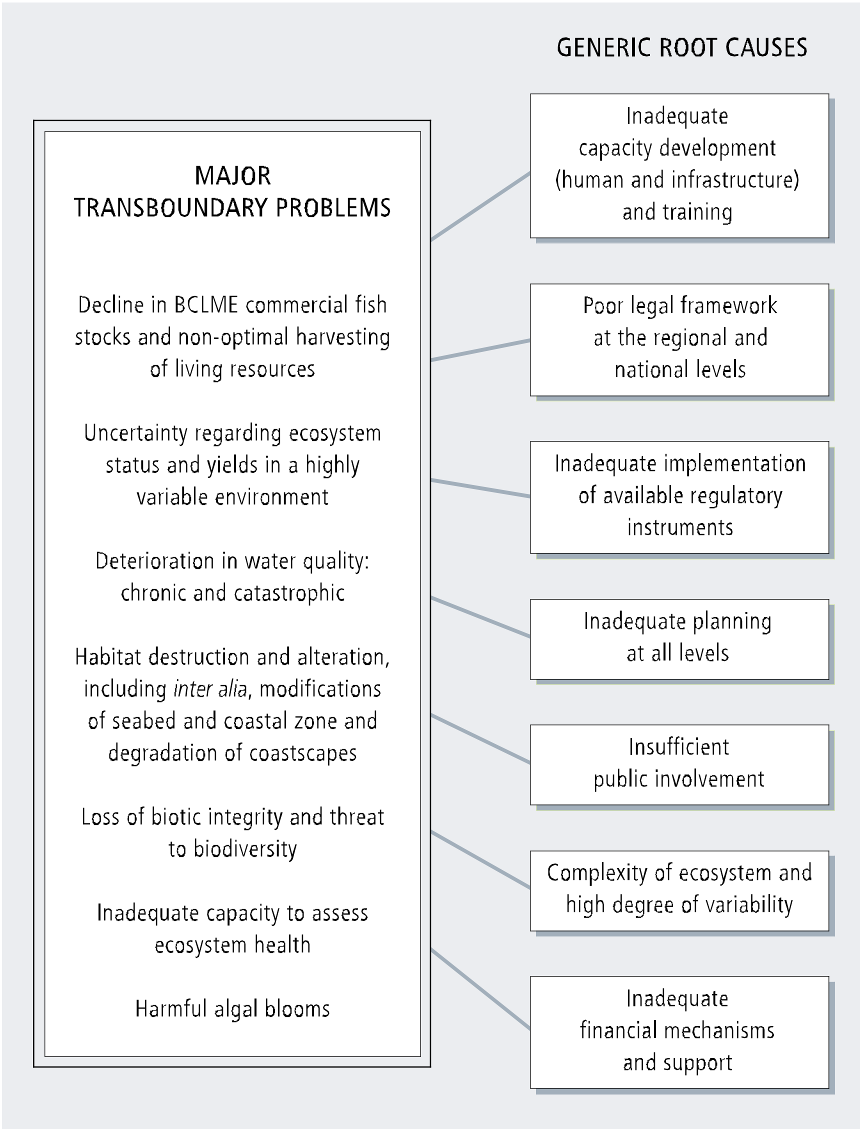
7. **Harmful algal blooms** (HABs) occur in all three countries which face similar problems in terms of impacts and management, and which require collective regional action to address.

Within these seven broad areas, a further breakdown at the next level of the TDA determined the causes, likely impacts, risks and uncertainties, socioeconomic consequences, transboundary consequences, proposed activities/solutions, priorities and incremental costings (that is, over and above those spent by national governments), and anticipated outputs.

The common root causes of the problems identified in the BCLME were determined as follows:

- Complexity of ecosystem and high degree of variability (resources and environment);
- Inadequate human and infrastructure capacity development and training;
- Poor legal framework at regional and national levels;
- Inadequate implementation and enforcement of available regulatory instruments;
- Inadequate planning at all levels;
- Insufficient public involvement; and
- Inadequate financing mechanisms and support.

Figure 3: Major Transboundary Problems of the BCLME and Generic Root Causes using the Transboundary Diagnostic Analysis Process



Following the TDA, the next step in the process was to specify agreed collective actions which must be taken to address the issues and threats facing the BCLME. These actions must be practical, affordable, and sustainable.

Development and Implementation of a Strategic Action Programme (SAP)

The SAP is, in essence, a concise document that outlines regional policy for the integrated sustainable management of the BCLME as agreed by the governments of Angola, Namibia, and South Africa [BCLME SAP, 1999]. The SAP spells out the challenge (regional problems), establishes principles fundamental to integrated management in the region, specifies the nature, scope, and timetable for deliverable management policy actions (based on TDA input), details the institutional arrangements necessary to ensure delivery, elaborates on wider cooperation (that is, cooperation between the BCLME region and external institutions), specifies how the BCLME Programme will be financed during the startup and implementation phase, and outlines approaches to ensure the long-term self-funding of the integrated management of the BCLME.

The broad aims of the BCLME SAP was to address years of colonial exploitation and fragmented management which led to inadequate planning and integration, poor legal frameworks and inadequate implementation of existing regulatory instruments, insufficient public involvement, and inadequate capacity development and financial support mechanisms. These legacies superimposed on a complex and highly variable environment have manifested themselves, for example, in the decline of fish stocks, non-optimal utilization of resources, increasing pollution, habitat destruction, and threats to biodiversity, all of which have transboundary implications. The challenge of the SAP was therefore to initiate a process to halt the changing state of the ecosystem and, where possible, reverse the process through the development and implementation of sustainable integrated management for the BCLME as a whole. In addressing the transboundary problems, issues, and threats identified in the TDA, the following principles fundamental to cooperative action were developed and adopted as part of the SAP:

- Apply the precautionary principle;
- Promote anticipatory actions (for example, contingency planning);
- Stimulate use of clean technologies;
- Promote use of economic and policy instruments that foster sustainable development (for example, polluter pays principle);
- Include environmental and health considerations in all relevant policies and sectoral plans;
- Promote cooperation among states bordering BCLME;
- Encourage the interests of other states in the Southern African Development Community (SADC) region;

- Foster transparency and public participation within the BCLME Programme; and
- The three governments to actively pursue a policy of co-financing with industry and donor agencies.

In addition to the above measures, it was proposed that an Interim Benguela Current Commission (IBCC) be established during the implementation phase of the BCLME Programme in order to strengthen regional cooperation and oversee the delivery of the key outputs. This would be followed by the formation of a permanent Benguela Current Commission (BCC).

The key institutional structures put in place to implement the BCLME Programme were the establishment of the Programme Steering Committee (PSC) comprising mainly of governments, UNDP-GEF and SADC stakeholders, a Programme Coordination Unit (PCU), Activity Centers (environmental variability; living marine resources; and biodiversity, ecosystem health, and pollution) and the appointment of a Chief Technical Advisor and Directors of the Activity Centers.

The BCLME Programme was approved by the GEF in 2000 and launched in 2002 with the formation of the PSC and the appointment of a Chief Technical Advisor.

The first year of the BCLME Programme was spent in establishing the PCU and three Activity Centers and the recruitment of staff. In addition, specialist task, consultative, and advisory groups were created to formulate projects that would address the issues and threats outlined in the SAP. Some 60 projects were developed and contracted out mainly to clients in the region including universities, government agencies, and NGOs. Projects were classified into three broad areas: *(1)* environmental variability; *(2)* living marine resources; and *(3)* biodiversity, ecosystem health, and pollution. A list of some of the key projects developed to address the issues and threats outlined in the SAP are as follows:[3]

- Establishment of an ecosystem approach to fisheries management in the BCLME region;
- Evaluation and mitigation of the bycatch of seabirds, pelagic sharks, and turtles in longline fisheries of the BCLME;
- Determination of the optimal harvesting strategies for the hake and longline fisheries in Namibia and South Africa;
- Development of a responsible aquaculture policy for the BCLME region;

[3] A more complete list of the BCLME projects are given in Benguela Current News [2003–2005] and details on the various projects, key documents, publications and reports are found on the Programme's website (www.bclme.org.).

- Improvement of knowledge and understanding of the artisanal fisheries in the BCLME region, especially in Angola;
- Monitoring of the BCLME using top predators as indicators of ecosystem change;
- Assessment of the cumulative effects of marine diamond mining on the BCLME;
- Development of a regional oil spill contingency plan;
- Harmonizing of national environmental policies and legislation for marine mining, dredging, and offshore petroleum exploration and production in the BCLME;
- Modeling of cumulative effects of offshore petroleum exploration and production activities on the marine environment of the BCLME region;
- Development of an operational capacity for monitoring HABs in Angola and Namibia;
- Harmonization of regulations for microtoxins for application in BCLME countries;
- Development of regional capacity for real-time observation and forecasting of HABs in the BCLME;
- Development of an early warning system for the BCLME for Benguela Niños including warm and cold water and catastrophic low oxygen events; and
- Development of an annual State of the Environment and Ecosystem Report for the BCLME.

Sustainable Management and Governance of the BCLME

A substantial coordinated effort in the years ahead will be required to address the overexploitation of the resources of the BCLME. This will need a sustained effort, not only by the three countries bordering the Benguela but also by all stakeholders, including the international community.

A recent study to examine the feasibility of establishing a Benguela Current Commission in the BCLME region was carried out by Cullinan et al. [2004]. It addresses a series of key questions which examine whether such a move would be justifiable, and if so, identify the best options. These questions are as follows:

a. Are the existing governance systems for marine resource management adequate to ensure the long-term protection and ecologically sustainable use of the BCLME?

b. Is regional cooperation between Angola, Namibia, and South Africa necessary and/or desirable for the effective protection of the BCLME and to manage human uses of the ecosystem? If so, in relation to which matters should the countries cooperate?
c. Is the establishment of an institutional structure for regional cooperation in relation to the BCLME necessary and/or desirable, and if so, how should it be established and structured to ensure that it is viable, sustainable, and effective?

The main conclusions indicated that the existing governance systems for marine resource management were not adequate to ensure the long-term protection and ecologically sustainable use of the BCLME. This was primarily because they lack the capacity to identify priorities at an ecosystem level and to coordinate action to ensure compliance throughout the ecosystem. The shared nature of the ecosystem meant that no one country had the jurisdiction to control all activities that could impact on that part of the BCLME within its jurisdiction. In addition, all of the countries had gaps in their legal frameworks which undermine the protection of the BCLME at the national level (for example, inadequate or no legislation dealing with environmental impact assessments of projects with transboundary impact, integrated coastal management, and regional cooperation in relation to the conservation of marine ecosystems).

The three BCLME countries have committed themselves under various binding treaties (such as UNCLOS and the SADC Fisheries Protocol) and through their support of other nonbinding international instruments (for example, the Food and Agriculture Organization's Code of Conduct for Responsible Fisheries) and the SAP to cooperate in a range of ways in relation to the marine environment. These obligations and commitments cover issues such as: *(1)* information sharing and exchange in relation to marine living resources, the marine environment, aquaculture, conservation, and scientific knowledge; *(2)* the confirmation and management of the aquatic environment and aspects of it; and *(3)* regional and global cooperation in relation to fisheries matters, pollution and the conservation and management of marine living resources, the marine coastal environment, and aquaculture. The institutional structures for implementing these commitments were either nonexistent or inadequate.

In order to implement an ecosystem approach to the BCLME, it would be necessary to establish institutional structures for ongoing cooperation between the three BCLME countries, which at a minimum, deal with those human activities which have the potential to have significant negative impacts on the BCLME ecosystem as a whole.

The establishment of a BCC was therefore justified on several grounds, including: *(1)* the need for an appropriate institutional mechanism to implement the ecosystem approach; *(2)* to fulfill existing international obligations and undertakings of the three countries; *(3)* to develop a better understanding of the BCLME; *(4)* to improve the management of human impacts on the ecosystem; *(5)* to facilitate regional capacity building; and *(6)* to increase the benefits derived from shared fish stocks.

The study recommended that such a regional or institutional structure could only be established by an agreement among the three countries and this should ideally be through a binding agreement or treaty.

It was also advised to establish an IBCC as soon as possible as a preliminary step towards formalizing a fully negotiated legal BCC agreement. This IBCC would enable the parties to learn from experience before transforming it into a permanent BCC.

The preferred option for the IBCC/BCC is to develop a more management-oriented structure provided that the parties are committed to increase their levels of cooperation in relation to the BCLME. This is in order to achieve an evolution from focusing primarily on joint research and information exchange to active cooperation on management issues. This option involves the establishment of a BCC for cooperative management of transboundary ecosystems that is made up of a Ministerial Conference to determine policy, a Joint Management Board to coordinate the development and implementation of the SAP, and three Joint Management Committees supported by task-specific working groups and advisory groups.

The establishment of a BCC as outlined above is likely to be both viable and sustainable provided that: *(1)* it receives high level political support from each of the countries; *(2)* it is implemented in a manner that reflects the critical success factors identified in this chapter; *(3)* the performance of the structure is reviewed after an initial period and adjustments made where appropriate; and *(4)* the structure is brought into operation on a phased basis. It is likely that the IBCC/BCC will focus on the ecosystem approach to management, in particular, cooperative management of shared fish stocks and the linkages between environmental factors and fluctuations in these populations. The establishment and operationalizing of an early warning system, including routine monitoring lines and a regionwide state of the environment reporting mechanism, would also be seen as part of any cooperative agreement.

A recent study on the economics of regional cooperation in fisheries management [Sumalia et al., 2004] estimated the huge incremental costs and benefits attached to and derived from such a partnership for Angola, Namibia, and South Africa and to the region as a whole. Particular attention was given to the transboundary commercial fish stocks (such as hake, sardine, and horse mackerel), and contributions to broader national and regional development objectives (such as food security, poverty alleviation and job creation). Key outputs were an economic case for taking an ecosystem approach to fisheries management relative to traditional fisheries management models as well as recommendations to optimize domestic and regional benefits from regional cooperation in scientific investigations, joint stock assessment, enforcement, and environmental monitoring.

The study found that the net benefits from regional cooperative management of the BCLME were substantial. These benefits justified the establishment of a regional institutional organization such as the BCC. However, political will and strong country support for the concept of joint management was essential to success as was a sustainable funding mechanism for the operation of such a BCC over the long term.

The Next Steps

The full BCC has been established in August 2006 and a Ministerial Conference was held in July 2007. An interim agreement [Annex 1] has been signed by six ministers for the three countries.

The newly established BCC will require strong support over the next 5 years from both the GEF and other donor partnerships. This is especially important in order to strengthen the institutional support necessary for effective transboundary management and to put in place legal and governance mechanisms to restore depleted fisheries and reduce coastal degradation. It will also be necessary for the three countries to realign national policies, legislation, and operational practices to ensure a transboundary approach to implementing ecosystem-based management.

The scientific activities of the BCC will focus on rebuilding the hake, horse mackerel and pilchard stocks in the BCLME as well as the establishment of marine protected areas and the conservation of marine biodiversity in order to ensure long-term sustainability and conservation of fisheries, vulnerable species, and habitats.

Acknowledgements

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References

BCLME SAP. 1999. *Strategic Action Programme for the integrated management and sustainable development and protection of the Benguela Current Large Marine Ecosystem*. UNDP, Windhoek, Namibia. 23 pp.

BCLME TDA. 1999. *Benguela Current Large Marine Ecosystem Programme (BCLME) Transboundary Diagnostic Analysis (TDA)*. UNDP, Windhoek, Namibia. 51 pp.

Benguela Current News. 2003–2005. Newsletters of the Benguela Current Large Marine Ecosystem Programme: Issues 1–3. Programme Coordination Unit, Windhoek, Namibia.

Brown, P.C., S.J. Painting and K.L. Cochrane. 1991. "Estimates of phytoplankton and bacterial biomass and production in the northern and southern Benguela ecosystems." *South African Journal of Marine Science*, 11:537–564.

Bubnov, V.A. 1972. "Structure and characteristics of the oxygen minimum layer in the Southestern Atlantic." *Oceanology*, 12(2):193–201.

Chapman, P. and L.V. Shannon. 1985. "The Benguela ecosystem. 2. Chemistry and related processes," pp. 183–251. In: *Oceanography and marine biology: An annual review*. Edited by M. Barnes. Aberdeen University Press, United Kingdom.

Crawford, R.J.M. 1999. "Seabird responses to long-term changes in prey resources off southern Africa," pp. 688–705. In: *Proceedings of 22nd International Ornithological Congress, Durban*. Edited by N. Adams and R. Slotow. Birdlife South Africa, Johannesburg.

Crawford, R.J.M., L.G. Underhill, C.M. Raubenheimer, B.M. Dyer and J. Martin. 1992. "Top predators in the Benguela ecosystem — implications of their trophic position." In: *Benguela trophic functioning*. Edited by A.I.L. Payne, K.J. Brink, K.J. Mann and R. Hilborn. *South African Journal of Marine Science*, 12:95–99.

Croll, P. 1998. Moderators Report on Benguela Current Large Marine Ecosystem (BCLME) First Regional Workshop, UNDP, 22–24 July 1998, Cape Town, South Africa. 73 pp.

Croll, P., and J.T. Njuguna. 1999. Benguela Current Large Marine Ecosystem (BCLME). Second Regional Workshop, United Nations Development Programme, 12–16 April 1999, Okahanja, Namibia. Report prepared for the Global Environment Facility/UNDP Benguela Current Large Marine Ecosystem Programme. UNDP, Windhoek, Namibia.

Cullinan, C., S. Munkejord and H. Currie. 2004. Institutional study regarding the establishment of a regional organization to promote integrated management and sustainable use of the BCLME. Draft Report. EnAct International for UNOPS. 85 pp.

Duda, A. 2002. *Monitoring and evaluation indicators for GEF International Waters Projects*. Monitoring and Evaluation Working Paper. Global Environment Facility, Washington, DC. 11 pp.

Gammelsrod, T., M.J. O'Toole, C.J. Bartholomae, D. Boyer and V.L. Filipe. 1998. "Intrusion of warm surface water layers at the southwest African coast in February — March 1995: The Benguela Niño '95." *South African Journal of Marine Science*, 19:41–56.

Hampton, I., D.C. Boyer, A.J. Penney, F. Pereira and M. Sardinha. 1999. *Integrated overview of fisheries of the Benguela Current region*. BCLME Thematic Report 1. UNDP, Windhoek, Namibia. 89 pp.

Hamukuaya, H., M.J. O'Toole and P.M.J. Woodhead. 1998. "Observations of severe hypoxia and offshore displacement of Cape hake over the Namibian shelf in 1994." *South African Journal of Marine Science*, 19:57–59.

O'Toole, M.J., L.V. Shannon, V. de Barros Neto and D.E. Malan. 2001. "Integrated management of the Benguela Current region," pp. 229–252. In: *Science and integrated coastal management*. Edited by B. von Bodungen and R.K. Turner. Dahlem University Press, Berlin, Germany.

Shannon, L.V., A.J. Boyd, G.B. Brundrit and J. Taunton-Clark. 1986. "On the existence of an El Niño-type of phenomenon in the Benguela system." *Journal of Marine Research*, 44(3):495–520.

Shannon, L.V., J.J. Agenbag and M.E.L. Buys. 1987. "Large and mesoscale features of the Angola-Benguela front." In: *The Benguela and comparable ecosystems*. Edited by A.I.L. Payne, J.A. Gulland and K.H. Brink. *South African Journal of Marine Science*, 5:11–34.

Shannon, L.V. and G. Nelson. 1996. "The Benguela: Large scale features and processes and system variability," pp. 163–210. In: *South Atlantic circulation: Past and present*. Edited by G. Wefer and G. Siedler. Springer, Verlag.

Shannon, L.V. and M.J. O'Toole. 1999. *Integrated overview of the oceanography and environmental variability of the Benguela Current region*. BCLME Thematic Report No. 2. UNDP, Windhoek, Namibia. 57 pp.

Shannon, L.V and M.J. O'Toole. 2003. "Sustainability of the Benguela: *exAfrica semper aliquid novi*," pp. 227–253. In: *Large marine ecosystems of the world*. Chapter 10. Edited by G. Hempel and K. Sherman. Elsevier Press, Amsterdam, The Netherlands.

Sherman, K. 1994. "Sustainability, biomass, yields and health of coastal ecosystems: An ecological perspective." *Marine Ecology Progress Series*, 112:227–301.

Shillington, F.A., C.J.C. Reason, C.M. Duncombe Rae, P. Florenchie and P. Penven. 2006. "Large scale physical variability of the Benguela Current Large Marine Ecosystem (BCLME)," pp. 48–68. In: *Large* *marine ecosystems*. Volume 14. Edited by V. Shannon, G. Hempel, P. Malanotte-Rizzoli, C. Moloney and J. Woods. Elsevier B.V. Ltd.

Sumalia, U., G. Munro and H. Keith. 2004. *Benguela Current Commission (BCC): Economic study on the BCC*. Report for UNOPS on behalf of BCLME Programme, Fisheries Economics Research Unit, Fisheries Centre, University of British Columbia, Vancouver, BC. 67 pp.

Sumalia, U., C. Ninnes and B. Oelofsen. 2003. "Management of shared hake stocks in the Benguela marine ecosystem," pp. 143–158. In: *Papers presented at the Norway-FAO expert consultation on the management of shared fish stocks. 7–10 October 2002. Bergen, Norway*. FAO Fisheries Report No. 695, Suppl. FAO, Rome.

Tapscott, C. 2000. *An overview of the socio-economics of some key marine industries in the Benguela Current Region*. BCLME Thematic Report No. 6. UNDP, Windhoek, Namibia.

Wang, H. 2004. "An evaluation of the modular approach to the assessment and management of large marine ecosystems." *Ocean Development and International Law*, 35:267–286.

Woodhead, P.M., H. Hamukuaya, M.J. O'Toole, and M. McEnroe. 1998. "Effects of oxygen depletion in shelf waters on hake populations off central and northern Namibia." In: *International symposium: Environmental variability in the South East Atlantic*. Edited by L.V. Shannon and M.J. O'Toole. NATMIRC, Namibia.

Annex 1
THE BENGUELA CURRENT COMMISSION: INTERIM AGREEMENT

PREAMBLE

The Contracting States:

RECOGNISING the unique character of the Benguela Current Large Marine Ecosystem, the threats to it, and its significance for their socio-economic development and for the well-being of their people;

CONSCIOUS of their joint responsibility as custodians of this globally significant large marine ecosystem to conserve it for the benefit of present and future generations;

RECOGNISING that effective long-term cooperation between them in implementing an ecosystem approach to the management of human activities affecting the Benguela Current Large Marine Ecosystem requires the establishment of stable institutional arrangements;

RECALLING their common commitment recorded in the Strategic Action Programme adopted and signed by them between 10 November 1999 and 25 February 2000 to establish a Benguela Current Commission;

HAVE AGREED as follows -

Article 1. USE OF TERMS

For the purposes of this Agreement —

"adverse impact"

(a) includes any actual or potential detrimental effect on the Benguela Current Large Marine Ecosystem that results directly or indirectly from human conduct originating wholly or partly within the territory of a Contracting State or from a vessel or aircraft under its jurisdiction or control; and

(b) includes any actual or potential detrimental effect on legitimate uses of the Benguela Current Large Marine Ecosystem, on the health of people in the Contracting States or on their ability to provide for their health, safety and cultural and economic well-being, which occurs or may occur as a consequence of a detrimental effect referred to in (a); but

(c) does not include any actual or potential detrimental effect that is negligible or which has been assessed and determined to be acceptable under this Agreement;

"BCLME Programme" means the Benguela Current Large Marine Ecosystem Programme established in accordance with the United Nations Development Programme ("UNDP") project document RAF/00/G32/A/IG/31 signed by representatives of the Governments of Angola, Namibia, and South Africa, and the UNDP in March 2000;

"Benguela Current Large Marine Ecosystem" means the relatively large marine ecosystem associated with the Benguela Current and characterised by distinct bathymetry, hydrography, productivity and trophically dependent populations, that is bounded by the high water mark along the coasts of South Africa, Namibia and Angola and:

(a) to the North by the line of latitude 5° South;
(b) to the South by a boundary 200 nautical miles South of the baseline along South Africa's mainland from which the extent of South Africa's territorial sea is measured in accordance with the 1982 United Nations Convention on the Law of the Sea;
(c) to the East by the meridian 27° East; and
(d) to the West by the 0° meridian;

"Commission" means the Benguela Current Commission established by Article 5 and includes any committees, sub-committees or working groups established from time to time by an organ of the Commission in accordance with this Agreement;

"ecosystem" means a dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit;

"Ecosystem Advisory Committee" means the Benguela Current Ecosystem Advisory Committee established by Article 5 and described in Article 9, and includes any sub-committees or working groups established by it in accordance with Article 9(4);

"environment" includes, but is not limited to, the whole or any component of:

(a) nature, which includes air, water (including the sea), land (including soils and minerals), energy and living organisms other than humans;
(b) the interaction between the components of nature and between those components and humans; and
(c) physical, aesthetic and cultural qualities or conditions that affect the health and wellbeing of humans;

"Management Board" means the management board of the Contracting States described in Article 7, and includes any committees or working groups established by it in accordance with Article 7(10);

"Ministerial Conference" means the conference of the Ministers described in Article 6;

"pollution" means the introduction by humans, directly or indirectly, of substances or energy into the Benguela Current Large Marine Ecosystem, which results or is likely to result, in hazards to human health, harm to living organisms and ecosystems, damage to amenities or interference with legitimate uses of the Benguela Current Large Marine Ecosystem, including fishing and navigation;

"Secretariat" means the secretariat of the Commission described in Article 8;

"Strategic Action Programme" means the Strategic Action Programme for the Benguela Current Large Marine Ecosystem adopted and signed during the period from 10 November 1999 to 25 February 2000 on behalf of the Republic of Angola by the Minister of Fisheries and Environment and the Minister of Petroleum; on behalf of the Republic of Namibia by the Minister of Fisheries and Marine Resources, the Minister of Environment and Tourism, and the Minister of Mines and Energy; and on behalf of the Republic of South Africa by the Minister of Environmental Affairs and Tourism and the Minister of Mineral and Energy Affairs, as revised from time to time by the Ministerial Conference; and

"trans-boundary adverse impact" means an adverse impact that extends beyond the territory of the Contracting State in which the physical origin of the adverse impact is situated.

Article 2. OBJECTIVE

1. The objective of this Agreement is to give effect to the Strategic Action Programme by establishing a Benguela Current Commission in order —
   (a) to establish a formal institutional structure for cooperation between the Contracting States that will facilitate the understanding, protection, conservation and sustainable use of the Benguela Current Large Marine Ecosystem by the Contracting States; and
   (b) to further the objectives recorded in the Strategic Action Programme.

Article 3. JURISDICTIONAL SCOPE

This Agreement applies to the area of the Benguela Current Large Marine Ecosystem to the extent that it falls within the internal waters, territorial seas or exclusive economic zones of the Contracting States, as well as to all human activities, aircraft and vessels under the jurisdiction or control of the Contracting State to the extent that these activities, or the operation of such aircraft or vessels result, or are likely to result, in adverse impacts.

Article 4. COOPERATION

The Contracting States shall co-operate in good faith in the implementation of this Agreement, including co-operating in –

(a) building the capacity of the Management Board, the Secretariat, the Ecosystem Advisory Committee, and any other subsidiary bodies established in accordance with this Agreement;
(b) implementing the Strategic Action Programme; and
(c) negotiating, agreeing, and bringing into force a more comprehensive legal instrument in accordance with Article 10.

Article 5.
ESTABLISHMENT OF BENGUELA CURRENT COMMISSION

1. The Benguela Current Commission is hereby established.
2. The Commission has the following organs:
   (a) the Ministerial Conference referred to in Article 6;
   (b) the Management Board referred to in Article 7;
   (c) the Secretariat referred to in Article 8; and
   (d) the Benguela Current Ecosystem Advisory Committee, referred to in Article 9.
3. The structure of the Commission is represented in the diagram in Annex 2 but if there is a conflict between the text of this Agreement and Annex 2, the text of the Agreement shall prevail.

Article 6. MINISTERIAL CONFERENCE

1. The Ministerial Conference consists of national delegations from each Contracting State, each led by a Minister authorised to represent that Contracting State.
2. The Ministerial Conference shall evaluate the implementation of this Agreement and in particular shall –
   (a) approve any changes to the Strategic Action Programme;
   (b) mandate the taking of whatever action may be necessary or appropriate to facilitate the effective implementation of the Strategic Action Programme; and
   (c) take all measures necessary to expedite the negotiation, conclusion, signature, ratification and implementation of the comprehensive legal instrument referred to in Article 10.

3. Meetings of the Ministerial Conference shall be chaired in rotation by the heads of delegation of each of the Contracting States, proceeding in the order that the Contracting States notify each other in accordance with paragraph 1 of Article 16 that they are bound by this Agreement.
4. Decisions of the Ministerial Conference shall be taken by consensus between the delegations of all the Contracting States except that in relation to any matter that only affects two Contracting States, the agreement of those Contracting States shall be sufficient for the Ministerial Conference to take a decision on that issue.
5. Meetings of the Ministerial Conference shall be convened by the Secretariat either in accordance with a decision of the Ministerial Conference, or at the written request of any Contracting State.
6. Any State which is not a party to this Agreement and any other body or agency, whether governmental or non-governmental, whose experience or expertise is relevant to the activities of the Commission, or any in relation to matters dealt with in the Strategic Action Programme, which has informed the Secretariat of its wish to be represented as an observer may be admitted to a meeting of the Ministerial Conference, unless one or more of the Contracting States present, object. The admission and participation of observers shall be subject to the rules of procedure adopted by the Ministerial Conference.

Article 7. MANAGEMENT BOARD

1. The Management Board comprises national delegations from each Contracting State, each led by a Director-General or Permanent Secretary, or his or her nominee.
2. The role of the Management Board is to promote a co-ordinated regional approach to dealing with management issues concerning the Benguela Current Large Marine Ecosystem, and its functions include —
   (a) coordinating the implementation by the Contracting States of the Strategic Action Programme and this Agreement; and
   (b) advancing and representing the common interests of the Contracting States in matters concerning the Benguela Current Large Marine Ecosystem.
3. The first meeting of the Management Board shall be held within three months of this Agreement entering into force in accordance with Article 16 and at that meeting the Management Board shall adopt rules and procedures for itself and determine the initial composition of the Ecosystem Advisory Committee and of the committees referred to in paragraph 10(a).
4. Unless the Management Board decides otherwise, each of its meetings shall be chaired in rotation by the head of a delegation, proceeding in the order that the Contracting States notify each other under paragraph 1 of Article 16 that they are bound by this Agreement.

5. Decisions of the Management Board shall be taken by consensus between the delegations of the Contracting States except that in relation to any matter that only affects two Contracting States, the agreement of those Contracting States shall be sufficient for the Management Board to take a decision on that matter.
6. Meetings of the Management Board shall be convened by the Secretariat, either in accordance with a decision of the Management Board, or at the written request of any Contracting State.
7. The Management Board shall adopt rules and procedures for itself and for any committee or working group established by it under this Agreement.
8. The Management Board shall -
   (a) interpret and apply the policy decisions of the Ministerial Conference;
   (b) oversee and direct the activities of the Secretariat, the Ecosystem Advisory Committee, and any committee or working group established by it in accordance with paragraph 10;
   (c) develop and approve budgets, action plans and work programmes for the Commission;
   (d) integrate the recommendations of the Ecosystem Advisory Committee and any subsidiary bodies established in accordance with this Agreement and resolve any conflicts between their recommendations;
   (e) appoint and oversee the executive secretary of the Secretariat and appoint the Ecosystem Advisory Committee co-ordinator;
   (f) co-ordinate the implementation of the Strategic Action Programme;
   (g) review periodically the effectiveness of the implementation of the Strategic Action Programme and where necessary make recommendations to the Ministerial Conference concerning amendments to the Strategic Action Programme;
   (h) establish mechanisms for interacting with the private sector, non-governmental organisations, and other stakeholders and communities;
   (i) ensure that there is adequate consultation with stakeholders in relation to the development and amendment of the Strategic Action Programme and other action plans; and
   (j) facilitate and support the process of negotiating and adopting a comprehensive legal instrument in accordance with Article 10.
9. The Management Board may make recommendations to the competent authorities of a Contracting State, on management issues relating to the protection, enhancement and ecologically sustainable use of the Benguela Current Large Marine Ecosystem and of any aspect of it, including recommendations in relation to any matter referred to in Annex 1.
10. The Management Board –
   (a) shall at its first meeting establish the following committees which shall continue to exist until the Management Board decides otherwise:
      (i) a minerals and petroleum committee;
      (ii) a marine living resources committee; and
      (iii) an ecosystem health sub-committee; and

(b) may establish one or more additional committees or working groups to deal with specific issues of concern to two or more of the Contracting States.

11. Each committee or working group shall determine its own rules of procedure to the extent that these have not been determined by the Management Board.
12. Working groups may include any person with appropriate expertise or who represents a particular sector or group of people with an interest in the matter being dealt with by the working group.

Article 8. SECRETARIAT

1. The Management Board shall within nine months of the entry into force of this Agreement, appoint an executive secretary of the Secretariat and a co-ordinator to co-ordinate the activities of the Ecosystem Advisory Committee.
2. The executive secretary shall:
   (a) direct and manage the Secretariat;
   (b) supervise the co-ordinator of the Ecosystem Advisory Committee; and
   (c) report to the Management Board.
3. Until the person appointed as executive secretary in accordance with paragraph 1 takes up that position, the Coordination Unit of the BCLME Programme shall perform the functions of the Secretariat of the Commission and the Chief Technical Adviser of the BCLME Programme shall perform the functions of the executive secretary of the Secretariat, but the consent of the Steering Committee of the BCLME Programme shall be required for this arrangement to be continued after 31 December 2007.
4. The functions of the Secretariat are:
   (a) to facilitate the implementation and effective monitoring of the Strategic Action Programme;
   (b) to carry out the tasks assigned to it by the Management Board;
   (c) to arrange and support meetings of the Ministerial Conference, the Management Board, the Ecosystem Advisory Committee, and other subsidiary bodies established under this Agreement, including taking and keeping minutes of these meetings;
   (d) to negotiate with donors interested in supporting the implementation of the Strategic Action Programme;
   (e) to perform the financial and other administrative services required for the proper and efficient operation of the Commission;
   (f) to formulate draft work programmes and prepare draft budgets for the Commission;
   (g) to prepare plans, projects, assessments, reports and other documents required by the Commission and to assist the Ecosystem Advisory Committee and subsidiary bodies established under the Agreement to prepare such documents;

(h) to obtain and update regularly information required by the Contracting States for the implementation of this Agreement and of the Strategic Action Programme;
(i) to facilitate the exchange of information in order to promote the objectives of this Agreement, including by ensuring that up-to-date information relevant to the implementation of this Agreement is disseminated to all Contracting States and to the public;
(j) to prepare reports on its performance and on the performance of subsidiary bodies established in accordance with this Agreement and to present them to the Management Board; and
(k) to perform any other functions delegated to it by the Ministerial Conference or the Management Board.

Article 9. ECOSYSTEM ADVISORY COMMITTEE

1. The Ecosystem Advisory Committee consists of experts nominated by each of the Contracting States who shall be appointed and supervised by the Management Board.
2. The role of Ecosystem Advisory Committee is –
   (a) to support decision-making by the Management Board, the Ministerial Conference and the Contracting States by providing them with the best available scientific, management, legal and other information, and expert advice concerning the conservation and ecologically sustainable use and development of the Benguela Current Large Marine Ecosystem; and
   (b) to build capacity within the Contracting States to generate and provide the information and expert advice referred to in (a) on a sustainable basis.
3. The Ecosystem Advisory Committee shall determine its rules of procedure to the extent that these have not been determined by the Management Board.
4. The Ecosystem Advisory Committee may establish working groups or subcommittees to assist it in the performance of its functions.
5. Working groups may include any person with appropriate expertise or who represents a particular sector or group of people with an interest in the matter being dealt with by the working group.
6. The Ecosystem Advisory Committee shall meet at least once annually and shall make decisions by consensus.
7. The Secretariat shall convene the first meeting of the Ecosystem Advisory Committee within three months of the first meeting of the Management Board convened in accordance with Article 7(3).
8. The Ecosystem Advisory Committee shall submit annually to the Management Board, a draft work plan and budget for the forthcoming two years and a draft annual report of its activities during the previous year.

Article 10.
NEGOTIATION OF COMPREHENSIVE LEGAL INSTRUMENT

The Contracting States shall use their best endeavours to bring into force by no later than 31 December 2012, a binding legal instrument that will establish a comprehensive framework to facilitate the implementation by the Contracting States of an ecosystem approach to the conservation and development of the Benguela Current Large Marine Ecosystem.

Article 11. FINANCIAL RESOURCES

The Commission shall be funded from funds provided by the Contracting States and donors. Unless otherwise agreed, the Contracting States shall contribute in equal proportions to the budget of the Commission.

Article 12. SETTLEMENT OF DISPUTES

1. In the event of a dispute between Contracting States concerning the interpretation or implementation of this Agreement, the States concerned shall seek a solution through negotiation.
2. If the States concerned cannot settle the dispute through negotiation they shall agree in good faith on a dispute resolution procedure which may include jointly seeking mediation by a third party (which may be a Contracting State that is not involved in the dispute).

Article 13. MARITIME BOUNDARIES

The Contracting States have entered into this Agreement without prejudice to any claims that they may have in relation to the delimitation of their maritime boundaries and nothing in this Agreement or done pursuant to it, shall be construed or interpreted as conduct on the part of a Contracting State signifying that it either consents to, or disputes, a particular maritime boundary.

Article 14.
RELATIONSHIP WITH OTHER INTERNATIONAL AGREEMENTS

1. The provisions of this Agreement shall not affect the rights and obligations of any Contracting State deriving from any existing international agreement, except where the exercise of those rights and obligations would threaten the health of the Benguela Current Large Marine Ecosystem or any part of it.

2. The Contracting States shall implement this Agreement in a manner that is consistent with the rights and obligations of States under the international law of the sea.

Article 15. AMENDMENT OF THIS AGREEMENT

Any Contracting State may propose amendments to this Agreement and all amendments to this Agreement must be agreed to in writing by all the Contracting States.

Article 16. ENTRY INTO FORCE

1. This Agreement shall enter into force on the thirtieth day after two or more Contracting States have notified the other States in writing of their consent to be bound by the provisions of this Agreement.
2. Nothing in this Agreement shall be interpreted or construed as requiring it to be ratified, accepted or approved by the legislatures of the Republics of Angola, Namibia or South Africa and each of those States must determine the process to be followed under their law for this Agreement to become binding on them.
3. Copies of the signed agreement, the notifications referred to in paragraph 1, and any instruments of ratification, approval or acceptance that may have been required by the laws of the Contracting States, shall be deposited with the Secretary-General of the Southern African Development Community.
4. Unless all the Contracting States agree otherwise in writing, this Agreement terminates on 31 December 2012.

IN WITNESS WHEREOF the undersigned, being duly authorised by their respective governments, have signed the English and Portuguese texts of this Agreement, both texts being equally authentic.

On behalf of the Republic of Angola:

Done at this day of 2006 in triplicate.

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Minister of Fisheries

Done at this day of 2006 in triplicate.

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Minister of Urbanisation and the Environment

Done at this day of 2006 in triplicate.

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Minister of Petroleum

On behalf of the Republic of Namibia:

Done at this day of 2006 in triplicate.

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Minister of Fisheries and Marine Resources

Done at this day of 2006 in triplicate.

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Minister of Environment and Tourism

Done at this day of 2006 in triplicate.

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Minister of Mines and Energy

On behalf of the Republic of South Africa:

Done at this day of 2006 in triplicate.

____

Minister of Environmental Affairs and Tourism

Done at this day of 2006 in triplicate.

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Minister of Minerals and Energy

Annex to ANNEX 1

ADVISORY MANDATE OF THE COMMISSION
(Article 7[9])

The Commission may, among other matters, consider and make recommendations, in accordance with national laws, to the Contracting States concerning –

(a) the monitoring, control and surveillance of marine fisheries;
(b) the determination of optimum levels of harvesting in respect of stocks which are known or suspected to be shared or straddling stocks, or where the harvesting of those stocks is likely to have significant impact on the Benguela Current Large Marine Ecosystem;
(c) the conservation of the biological diversity of the Benguela Current Large Marine Ecosystem;
(d) the implementation of integrated coastal management and of the ecosystem approach in accordance with international law and non-binding international undertakings made by the Contracting States;
(e) the establishment of a system of marine protected areas;
(f) the rehabilitation of environmentally degraded areas;
(g) the coordination of regional efforts to conserve species such as sea birds which are not harvested;
(h) the prevention of the introduction of harmful and invasive alien species (including the coordination of efforts to manage ballast water and sediment within the Benguela Current Large Marine Ecosystem);
(i) responses to harmful algal blooms;
(j) environmental impact assessment and other procedures for the planning and approval of new projects and activities which have the potential to impact on the Benguela Current Large Marine Ecosystem;
(k) processes and standards for minimising and remediating the environmental impacts arising from marine prospecting, mining and dredging and from the exploration and development of oil and gas fields, including their associated pipelines;
(l) contingency plans for dealing with extreme events and threats such as major oil spills;
(m) the adoption and enforcement of harmonised regulatory frameworks for the discharge of sewage, pollutants, waste and other pollution control measures;
(n) guidelines on water quality standards within the Benguela Current Large Marine Ecosystem;
(o) maritime safety and related matters with the potential to impact on the Benguela Current Large Marine Ecosystem; and
(p) the responsibilities, procedures and routines for the exchange of information and liaison between authorities in the different Contracting States.

CHAPTER 20

The Wider Caribbean[1]

Anders Alm

The Caribbean — A Sea of Diversity and Vulnerability

Human, Cultural, and Biological Diversity

The Wider Caribbean (Gulf of Mexico, Caribbean Sea and adjacent regions of the Atlantic) is a fascinating region. In the continental countries around the sea and on the island states and territories, there is a diversity of races, languages, political status (independent states, colonies/overseas territories, associated states, overseas department) and level of economic development. In the past, the region was an important crossroad from the old world to the new world and the basis for cultures, traditions, and political and legal systems which are usually inherited from former colonial powers.

[1] An abridged version of this chapter was published: Alm, A. 2006. "The Wider Caribbean: A sea of diversity and vulnerability." *Tropical Coasts*, 13(1):38–43.

Today, the region is still a crossroad between north and south, between the Atlantic and the Pacific, between poverty and desperation of the developing countries and what is perceived as the greatest country of opportunities in the world. The contrasting socioeconomic features and security aspects of the Caribbean Sea range from a world class tourist and cruise destination, its global significance for maritime transport, an important trade and energy production area (offshore oil and gas), and a vital source of income and benefits for people's daily needs, to a safe haven for substandard shipping and flags of convenience, poverty, drug trafficking and illegal immigration.

An important characteristic of the Wider Caribbean, in particular for the smaller island states, is that a large part of the region can be considered as coastal zones. Landmasses are small and the exclusive economic zone (EEZ) quite large. The coastlines are highly urbanized with high population densities while the ocean, which traditionally has been used to dilute and dispose wastes, receives an ever-increasing discharge of nutrients and other pollutants.

The Caribbean is a global biodiversity "hotspot" and therefore is one of the highly prioritized regions included in the global strategy for biodiversity conservation. The region has a relatively large number of endemic plants and animals, but also provides habitat and nesting sites for migratory marine mammals, turtles, and avian species. The principal coastal ecosystems are wetlands and tidal flats, sandy and rocky beaches, coral reefs, seagrass beds, mangroves, and offshore islets. The Caribbean has about 8 percent of the world's coral reefs and the world's second longest barrier reef.

The countries of the Wider Caribbean are both united and separated by the Caribbean Sea. The cooperative arrangements on marine environmental issues — by bringing the countries together — stand out by its long history which goes back several decades of fundamental sociopolitical differences and disputes over maritime demarcation issues.

Vulnerability

Water, Coast, and Sun — The Bread and Butter for National Economies

Traditionally, many of the smaller national economies in the Caribbean region are highly undiversified and dependent on the service sector or export trade of a few products under preferential access. The coastal areas with attractive coastlines often provide greater economic opportunities and attract not only short-term visitors, but also development of second homes and permanent residences. For example, the population along the U.S. Gulf of Mexico coast has increased more than 50 percent from 1970 to 1990. The contributions of marine and coastal assets to the economies are fundamental (for example, tourism, shipping, fishing) and any threat to these assets will have serious socioeconomic implications, in particular, for the relatively small and vulnerable economies of island states.

Tourism is the top or among the most important foreign exchange earners for a majority of the countries in the region. The tourism industry is worth about USD 28 billion per year (14.8 percent of gross domestic product or GDP) in the Caribbean islands where about 20 million visitors and 12 million cruise passengers enjoy the precious beaches and blue waters of the region. This priority sector is aggressively targeted for further development throughout the region. Tourism in the coastal areas of U.S., Mexico, Central and South America has also grown into a significant industry. For example, Miami Beach in the U.S. has 21 million visitors a year generating USD 2.4 billion in foreign tourism revenues.

Shipping is important for many countries in the region. Most of the exports and imports are carried by ships as they pass through several globally important sea lanes such as the region's strategic straits and the Panama Canal. Major oil routes to the U.S. ports, to the lightening areas[2] off the Cayman Islands, and to transshipment and refining centers in the Antilles make the Caribbean one of the most transited regions in the world by oil tankers. The Caribbean is also the world's most important cruising area with about 60 percent of the global market. Although Panama is the largest flag state in the world, several other nations in the region also have important open-ship registries.

Consumption of fisheries products is high, particularly on the Caribbean islands. Aruba, Barbados, Dominica, and Guyana consume over 30 kg per person per year. In 2002, the Wider Caribbean countries (the U.S. excluded) exported fisheries products for a total value of about USD 2 billion. For some countries these products are major contributors to the total export of merchandise (Panama, 39 percent; Guyana, 11 percent).

The U.S. Commission on Ocean Policy estimated in 2003 that every year, the U.S. ports handle goods worth more than USD 700 billion; the cruise industry is valued at USD 11 billion; commercial fisheries, USD 28 billion; and offshore oil and gas production, USD 25–40 billion. Apart from such concrete contributions to the economies, ocean and coastal areas contribute ecosystem services not accounted for in national economies. Costanza et al. [1997] estimated the global economic value of

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[2] These are areas at sea where bigger tankers unload their cargo to smaller tankers which then will be able to reach ports with less depth.

17 ecosystem services to between USD 16–54 trillion annually, compared to the global GNP of about USD18 trillion. Out of this, about 63 percent comes from marine systems (about half from coastal areas and half from offshore oceans). These ecosystem services include nutrient recycling; gas regulation; disturbance regulation; and production of habitat, food, and raw materials.

Natural Disasters

Many of the region's highly populated coastal areas are vulnerable and regularly exposed to natural disasters. Every year, the Caribbean islands, as well as the continental states face death and socioeconomic consequences of natural hazard catastrophes such as hurricanes, storm surges, floods, earthquakes, and volcano eruptions [EM-DAT, 2005].

During the Atlantic hurricane season from June to November, an average of 10 storms (6 of them hurricanes) develops and threatens the Caribbean. The magnitude of the threats to human well-being and economies can be illustrated by the well-known flooding associated with hurricane *Mitch* in 1998, which caused about 10,000 deaths and USD 6 billion in damages in Central America making it the deadliest hurricane of the last 2 centuries. The much less-known tropical storm *Jeanne* caused thousands of deaths in Haiti in 2004.

Although less frequent, earthquakes and volcano eruptions can potentially generate tsunamis which within minutes to a couple of hours could reach any coastal area in the Caribbean. An example of such a threat is *Kick'Em Jenny*, an active submarine volcano, located between Grenada and Carriacou in the Lesser Antilles volcanic arc which has been erupting from time to time. A tsunami hit the coast of Honduras in 2002 affecting 1,700 persons. Other tsunamis (generated in the Pacific) have struck both Costa Rica in 1854 and Nicaragua in 1992.

Due to the small size of the Eastern Caribbean economies, catastrophic events caused by hurricanes or other natural disasters generate losses which easily reach double or triple digits as percentage of GDP. As an example, damages of hurricane *Mitch* equaled 80 percent of GDP in Honduras and 49 percent of GDP in Nicaragua; hurricane *Ivan* wiped out Grenada in 2004 by killing 39 persons, affecting the whole 60,000 population, and causing damages equal to 239 percent of its GDP. These damages also absorb scarce resources required for economic recovery and development. Hurricane *Andrew* in 1992 caused damages worth USD 27 billion in the U.S. alone.

Since the late 1980s, the Caribbean has also suffered from several incidents of coral bleaching due to increased sea surface temperature. Unprecedented coral bleaching events occurred in 1991 and 1998. These events may be related to the El Niño phenomena. In addition to the increase in sea surface temperature, frequent hurricanes also damage coral reefs in the region.

Harmful algal blooms occur in the Caribbean, and the incidence of *ciguatera* fish poisoning is quite frequent. Algae-eating fish concentrate toxin in their tissues which when eaten by humans cause gastrointestinal symptoms or neurologic problems. In the Virgin Islands, nearly 50 percent of the adult human population is estimated to have been poisoned by *ciguatera* fish poisoning at least once. Neurotoxic shellfish poisoning — causing tingling, numbness, throat irritation, and muscle aches — is reported in the Gulf of Mexico.

Traditionally, the typical responses to disasters consist of post-disaster governmental borrowing or fund raising from multilateral and bilateral donors for relief and reconstruction investment. Financial mechanisms aimed at pre-funding costs needed to reinstate property damage caused by disasters (for example, insurance) are also used widely, but since multibillion dollar damages are becoming more frequent, these options may not be easily available.

Much less is being done in impact and vulnerability mitigation measures adopted prior to a hazard event to reduce damage (for example, monitoring/forecasting, building codes, and construction setbacks). While disasters cannot be eliminated, the forecasting and impact mitigation are essential elements for coastal planning. Recently, some major projects in the region are addressing disaster mitigation and adaptations to climate change [IOC, 1999].

Degradation of Coastal and Marine Resources Caused by Human Factors

In addition to the threats from natural disasters, the coastal areas of the region are under increasing pressure caused by population density, unplanned coastal area development, and other man-induced factors resulting in [ECLAC and UNEP ROLAC, 2002; ECLAC, 2004]: *(1)* habitat alteration, degradation, and destruction; *(2)* direct loss and/or change in biodiversity; *(3)* changes in water quality; and *(4)* increased erosion and changed sedimentation processes.

The degradation of the marine and coastal environment in the Caribbean has been well documented by the Caribbean Environment Programme (CEP) and other organizations [UNEP, 1999]. Recently, as part of the Global International Waters Assessment (GIWA), the environmental status of four subregions in the Wider Caribbean have been assessed, including assessing the socioeconomic impact [UNEP, 2004a, 2004b].

Although different assessments define different categories of threats to the marine and coastal environment in the Caribbean, the major causal factors can be summarized as follows: *(1)* poorly planned development, including unmanaged growth in tourism; *(2)* untreated industrial/urban effluents; *(3)* inappropriate agricultural practices; *(4)* ship-generated pollution; *(5)* unsustainable exploitation of natural resources; *(6)* unsustainable fishing; and *(7)* natural disasters and climate change.

The high population densities and development pressure in coastal areas create a high demand for coastal land. Urban encroachment is rapidly replacing agricultural and natural areas throughout the region. Urban and industrial wastewater is often directly discharged into coastal waters with no or minimum treatment. Solid waste disposal is not environmentally sound. Quality of coastal waters is further reduced by nonpoint pollution from agricultural activities and by sedimentation due to soil erosion. Ocean-based sources of operational pollution from commercial ships, recreational boating, and offshore oil exploration remains a concern in the Caribbean. The risk for accidental spills is always present in the region due to the intensive tanker traffic and offshore oil exploration at more than 150 platforms. Both the worst tanker spill and the worst platform oil spill in the world occurred in the Caribbean. In 1979, a collision between the two supertankers *Aegean Captain* and the *Atlantic Empress* spilled 287,000 tons of crude oil off Trinidad and Tobago. That same year, the largest spillage from a single source ever recorded worldwide occurred at the *IXTOC I* well blowout in the Campeche Bay, Mexico, spilling over 470,000 tons of oil in the span of 295 days [ITOPF, 2003].

Many countries see tourism as the main economic opportunity and are actively promoting fast development. If well-managed, the Caribbean tourism, which can take advantage of the unique features of the region, offers great potential and will forever attract large numbers of visitors. This is a great “win-win” situation with regard to protecting and benefiting from the coastal and marine assets. However, tourism in the Caribbean is highly vulnerable due to the perception of the degrading environmental quality, increasing commodity prices, and safety and security threats (natural disaster, terror, and civil unrest). Sustaining the tourism industry and the economic benefits it brings, requires ensuring the integrity of the natural resource base on which the sector depends [UNEP, 1996a]. In the absence of sound protection and management of the marine and coastal assets, current trends in degradation of reefs and other coastal ecosystems, such as: beach erosion, depletion of fish stocks, and decline in, or loss of, livelihoods (particularly among the marginally employed agricultural and fishing populations), will eventually combine to result in an overall negative impact on the tourism industry. There are too many examples around the world (and within the region) where “predatory” tourism development has transformed booming areas into third class, cheap tourist destinations [Leeds Tourism Group, 2004; World Travel and Tourism Council, 2004].

The degradation of coastal and marine areas is seriously threatening the region's biological diversity. Five hundred years ago, Columbus reportedly had to push turtles aside with poles to make passage for his ship. The Cayman Islands, when discovered by Columbus, were literally covered with turtles and used to be America's most important turtle site. Today, wild nesting turtles are gone from many areas. Despite abundant initiatives to establish new protected areas in the Wider Caribbean (there are more than 100 marine protected areas), most countries do not have the capacity to manage them properly. Marine protected areas are also used as important tourism attractions. The balance between using them as living aquaria for tourists, and their use as management tools for protection and recovery of degraded areas and commercial fish stocks, must be carefully planned.

Globally, many commercial fish stocks are in crisis, and the Caribbean is no exception. Most of nearshore coastal fisheries resources are intensively exploited by large numbers of artisanal or small-scale fishers. Offshore resources are fully or overexploited. These resources are often shared between countries and efficient management depends on the success of regional cooperation schemes.

Opportunities for Cooperation

In a region as diverse as the Wider Caribbean, the factors described above raise huge challenges for international cooperation. Few, if any, countries in the region are able to address, on their own, the underlying root causes of these threats, namely: *(1)* demography and livelihood opportunities, *(2)* inadequate policy/legal framework, *(3)* weak institutional capacity and intersectoral coordination, *(4)* limited or no enforcement of existing laws, *(5)* weak advocacy for marine and coastal issues, *(6)* information and data gaps, and *(7)* limited human, financial, and material resources.

A range of regional cooperation arrangements (multilateral agreements, programs and projects, networks of organizations, and other instruments) to address these issues have evolved in the region dating back to the 1970s. However, building new regional cooperation mechanisms while maintaining traditional bonds have not been easy in the Caribbean. Although diversity is fascinating, it is also a challenge for cooperation which historically has resulted in relatively low interaction across the Caribbean. Only recently have the countries started to come together at the political level mainly due to the establishment of the Association of Caribbean States (ACS).

A particular challenge for cooperation in the Caribbean region is the difference of scale between nations in geographical extension, population size, strength of national economies, pace of development, institutional and human capacities, and political will.

Multilateral Environmental Agreements and International Organizations

The implementation of multilateral environmental agreements relevant to the marine and coastal environments has been an important driving force for fostering regional cooperation. The countries in the region also play an important role in fostering global initiatives related to the marine and coastal issues through cooperative arrangements among small island developing states (SIDS), the International Maritime Organization (IMO), the International Whaling Commission and other international or regional arrangements.

The marine environmental conventions of the IMO, such as the International Convention for the Prevention of Pollution from Ships (MARPOL 73/78), the International Convention on Oil Pollution Preparedness, Response and Cooperation, and other IMO conventions related to protecting the marine environment have always been important for the Caribbean. The Wider Caribbean has also received special protection under various IMO instruments such as the Special Area Status under MARPOL Annex V, and the declaration of the Sabana-Camaguey Archipelago as a Particularly Sensitive Sea Area in September 1997.

A regional project on disaster mitigation in the Caribbean, which is funded by the United States Agency for International Development (USAID) and executed by the Organization of American States (OAS) promoted the adoption of natural disaster mitigation and preparedness practices, and provided OAS with a framework for collaboration within the Caribbean region in establishing sustainable public- and private-sector mechanisms for natural disaster mitigation.

Caribbean countries have been very active on issues related to SIDS. The first Global Conference on the Sustainable Development of Small Island Developing States was held in 1994 in Barbados. In the Caribbean, the Barbados Programme of Action was coordinated by the Economic Commission for Latin America and the Caribbean (ECLAC), in collaboration with the Caribbean Development and Cooperation Committee and the Caribbean Community (CARICOM). Organizations such as the Caribbean Centre for Development Administration, the Caribbean Conservation Association, the Caribbean Council for Science and Technology, the Caribbean Disaster Emergency Response Agency, the Caribbean Environment Health Institute (CEHI), the Caribbean Tourism Organization, ACS, OAS, and the Organization of Eastern Caribbean States (OECS) have participated in the implementation of the program.

To comply with the requirements of the Convention on Biological Diversity, the Global Environment Facility (GEF) has supported the development of National Biodiversity Action Plans in most countries in the region. Major national GEF projects with marine and coastal biodiversity components are carried out in Central America, Colombia, Cuba, and the Dominican Republic.

The region is also host to the Secretariat for the International Seabed Authority (ISA). The ISA Secretariat, located in Kingston, Jamaica, was established under the Law of the Sea Convention in 1982 although two important countries in the region (namely, the U.S. and Venezuela) are not part of the Convention.

Thirteen out of the 60 member states of the International Whaling Commission are from the Caribbean region. Their voting powers and views have strong impacts for the future survival of the world's whale stocks.

Regional Organizations, Processes, and Projects Dedicated to Marine and Coastal Issues

The leading cooperation mechanism regarding marine and coastal environments in the region has been the United Nations Environment Programme (UNEP) Regional Seas Programme which, since 1981, backstopped the development and implementation of the Caribbean Action Plan [UNEP, 1996b, 2004c, 2004d]. The legal framework, that is, the Cartagena Convention for the Protection and Development of the Marine Environment in the Wider Caribbean Region was adopted in 1983, and three protocols have been developed, namely: *(1)* Cooperation in Combating Oil Spills, *(2)* Specially Protected Areas and Wildlife (SPAW), and *(3)* Marine Pollution from Land-based Sources and Activities (LBS).

The implementation of the Cartagena Convention is unique because of its governing structures: the Intergovernmental Meeting and the Meeting of the Contracting Parties to the Cartagena Convention. By 2004, 11 Intergovernmental Meetings and 8 Conferences of the Parties have been held.

The Caribbean Environment Programme (CEP) is supported by the Caribbean Trust Fund where the 28 Parties contribute directly to the operation of the regional secretariat in Kingston, as well as the specific activities implemented by the Convention. Apart from the contributions from Parties, CEP has been relatively successful in raising external funding from both bilateral donors and international agencies. The implementation of the activities is done through four regional activity centers in Cuba, Curacao, Guadeloupe, and Trinidad and Tobago. Today, the main CEP programs are: *(1)* Assessment and Management of Environmental Pollution; *(2)* SPAW; *(3)* Information Systems for the Management of Marine and Coastal Resources (CEPNET); and *(4)* Education, Training, and Awareness.

The ACS was founded in 1995 with the objective of facilitating consultation and cooperation among its 25 Member States and 11 Associated States and for promoting concerted action by them. The ACS is the first regional organization bringing the Caribbean countries together at the political level. It took the lead to seek recognition by the UN General Assembly in designating the Caribbean Sea as a special area in the context of sustainable development due to the vulnerability and vital importance of the Caribbean Sea and the critical need to develop a comprehensive scheme for its management.

The CARICOM was established in 1973 and consists of 15 Member States and 5 Associate Members. CARICOM is active in many areas related to sustainable development, environment, and fisheries [CARICOM, 2004]. Through the CEHI, several cooperative activities related to the coastal and marine environment are being implemented among the English-speaking Caribbean nations.

The Intergovernmental Oceanographic Commission (IOC) of the United Nations Education, Science and Culture Organization (UNESCO) has been promoting marine science in the Caribbean since the 1960s through three stages [IOC, 2004]. First, the Cooperative Investigations of the Caribbean and Adjacent Regions was established in 1968, followed by the Association of IOC for the Caribbean and Adjacent Regions in 1975. Lastly, the regional IOC subcommission for the Caribbean and Adjacent Regions (IOCARIBE) was established in 1982. It was the first regional subcommission of IOC and it operates as an international networking system for the coordination and promotion of marine and coastal sciences and associated operational services between member states in the region. Since 1986, IOCARIBE has a permanent secretariat in Cartagena, Colombia, and implements regional activities related to ocean sciences, ocean services, and operational observing systems in the Wider Caribbean region.

The OECS, through its Environment and Sustainable Development Unit is responsible for the provision of natural resource and environmental management services to its nine Member States. OECS is working on several issues related to sustainable development, such as: coastal resources management, fisheries management and development, watershed management, and sustainable tourism as contained in its *Environmental Management Strategy*.

The Latin American Organization for Fisheries Development promotes the rational exploitation of fisheries in the region and coordinates joint actions with its Member States. The Food and Agriculture Organization (FAO) Western Central Atlantic Fisheries Commission coordinates fisheries research, facilitates education and training, and assists in establishing rational management of fisheries resources that are of interest to two or more States. Two subregional organizations, namely the OECS and CARICOM, serve the fisheries needs of the Caribbean islands and seek to harmonize fisheries management and development approaches among its member countries through the establishment of common fishing zones and a coordinated regime for access to the fisheries resources of the region.

Based on a U.S. initiative, a new regional partnership initiative for the Wider Caribbean region, known as White Water to Blue Water, was established during the Johannesburg Summit. White Water to Blue Water promotes cross-sectoral approaches to the management of watersheds, coastal zones, and marine ecosystems, and improved regional communication and collaboration between the major stakeholders of the Wider Caribbean. Many of the leading organizations and agencies involved in marine and coastal issues in the Caribbean are now partners in the initiative, which also has received considerable financial support from outside donors such as Sweden.

The Implementation Deficit: Recognizing Problems Yet Lacking in Action

During the last decades, considerable progress towards promoting sustainable management of marine and coastal resources has been made through the cooperation mechanisms described above. Still, the implementing capacity for protecting the marine and coastal environments varies enormously from one country to another. Few, if any, countries can claim (even partially) to be successful in addressing their coastal and marine problems as the changes to address the root causes have not been achieved at the necessary pace. The statement by the Pew Oceans Commission: "America's oceans are in crisis and the stakes could not be higher," [Pew Oceans Commission, 2003] is also particularly true in the Caribbean where all the countries have more problems than people and other resources to handle them.

The lack of action is of particular concern, as the coupling between action and impact is not immediate. Even if remediation actions are taken today, there is a lag time until tangible environmental improvements can be noted. This issue is quite clear in the Baltic region where, despite tremendous investments and efforts to reduce nutrient discharges, no detectable improvements in nutrient levels in the Baltic Sea can be observed. In the Caribbean, most of the efforts still are at the stage of enabling activities (agreements, capacity building, strategies, and assessments) and not remediation. All problems related to the degradation of coastal areas and the marine environment identified decades ago are still around, and are even worse.

Below is an overview and examples of challenges and best practices in regional cooperation, within each of the major underlying root causes identified above.

Demography and Livelihood Opportunities

Population growth, mobility, density as well as poverty are important stress factors on coastal and marine resources. Unplanned development is continuously converting large areas of natural and agricultural lands to urban settlement and tourism locations contributing to the very high population density in many coastal areas of the region. While the economic opportunities may increase in these areas, the environmental vulnerability also increases. Destruction of coastal habitats such as through the removal of coral reefs, mangroves, and seagrass beds, and nearshore construction, may increase the erosion and exposure to catastrophic events. It may also seriously impact traditional livelihood opportunities for marginalized groups such as artisanal fishers as poor and marginalized settlements are often located in areas prone to natural disasters and are frequently exposed to coastal flooding, hurricanes, and landslides; these groups suffer most from the effects of water pollution and unhealthy seafood.

Poverty is widespread throughout the region. Exploitation of natural resources is often the last resort for poor communities especially in the coastal areas. Artisanal fisheries, charcoaling of mangroves, sand mining on beaches, collection of marine souvenirs, and so on, have implications for the marine and coastal environment. The involvement and interests of poor local communities must be taken into account for any policy reforms in coastal areas.

Population growth is high in the Latin American countries in general and in the Caribbean region as well. Several countries (Belize, Honduras, Guatemala, Nicaragua, and Haiti) are expected to double their population by 2050 [Table 1]. On the other hand, population growth is modest or even expected to decline in Cuba and mostly in the English-speaking Caribbean nations. Migration patterns are also impacting the already small resource base of skilled personnel. A constant flow of marine and coastal students and experts from the region to the U.S., other developed countries, and international organizations reduce the critical mass of experts at national and subnational levels. However, these human resources may not necessarily be "lost" in the long term as they may return after graduation, or become involved in research or projects benefiting the region.

Policy and Legal Framework

Commendable progress has been made in recent decades to strengthen policy and legal frameworks through regional cooperation. The most comprehensive cooperative effort is the Caribbean Environment Programme (CEP). Significant regional achievements are the geographical coverage, the legal framework, the governance structure with regular political and technical meetings, the regional trust fund, the multisectoral projects, and partnerships developed. Several large-scale regional projects addressing the policy frameworks for land-based sources of pollution, ship-generated pollution, integrated coastal zone management (ICZM), and living resources have been undertaken or are planned within the framework of the CEP.

In 1999, GEF funded a regional project, the Demonstrations of Innovative Approaches to the Rehabilitation of Heavily Contaminated Bays in the Wider Caribbean. This was a followup to a pilot regional project in Havana Bay (Cuba), Puerto Limon (Costa Rica), Cartagena Bay (Colombia), and Kingston Harbour (Jamaica). The project catalyzed national co-financing to help Cuba and Jamaica reduce nutrient contamination in national and adjacent international waters. The project also strengthened or created institutions for rehabilitating and managing the two bays.

To support a regional approach towards the implementation of the MARPOL Convention which deals with ship-generated pollution, funding from GEF was also obtained for the Wider Caribbean Initiative on Ship-generated Waste Project. While five additional countries ratified MARPOL as a result of the project, several others developed corresponding legislation to implement the international instrument. The Organization for Economic Cooperation and Development (OECD) funded the upgrading of facilities for solid waste management. Despite these efforts, ship-generated pollution remains a challenging issue in the region.

One of the major collaborative projects in marine and coastal areas with strong ICZM focus is the GEF-supported, USD 11–million Regional Meso-American Barrier Reef System Project which assists Mexico, Belize, Guatemala, and Honduras to strengthen and coordinate national policies, regulations, and institutional arrangements for marine ecosystem conservation and sustainable use. Another GEF project, the Integrated Catchment Area and Coastal Management in SIDS in the Caribbean, supports the CEP and CARICOM's CEHI to establish national inter-ministerial committees to develop projects addressing water-related reforms as well as the integrated management of watersheds and coastal resources.

In the area of fisheries management, the present cooperative, institutional, legal and policy frameworks at the regional level as well as mechanisms for managing shared living marine resources are inadequate. However, even if such regional frameworks were in place, the lack of

Table 1: Demography in Wider Caribbean Countries

	COUNTRY	Population 2003[a]	Population growth[a]	Projected population 2025[b]	Projected population 2050[b]	Population (density per km2)[a]	% Population within 100 km from coastline[a]
CARIBBEAN:	Antigua and Barbuda	0.08	3	0.1	0.1	164	100
	Bahamas	0.32	1	0.3	0.3	30	100
	Barbados	0.27	0	0.3	0.2	621	100
	Cuba	11.30	1	11.8	11.1	102	100
	Dominica	0.07	0	0.1	0.1	95	100
	Dominican Republic	8.70	1	11.1	13.4	172	100
	Grenada	0.10	1	0.1	0.1	298	100
	Haiti	8.40	2	11.7	16.0	288	100
	Jamaica	2.60	1	3.3	3.7	238	100
	Netherlands Antilles	0.22	1	0.2	0.2	269	100
	Puerto Rico	3.90	1	4.1	3.8	430	100
	St. Kitts – Nevis	0.05	0	0.1	0.1	123	100
	St. Lucia	0.16	1	0.2	0.2	255	100
	St. Vincent and the Grenadines	0.11	1	0.1	0.1	287	100
	Trinidad and Tobago	1.30	1	1.3	1.2	251	100
CENTRAL AMERICA:	Belize	0.27	3	0.4	0.6	11	100
	Costa Rica	4.00	2	5.6	6.3	75	100
	Guatemala	12.30	3	19.8	27.2	105	61
	Honduras	7.00	2	10.7	14.7	58	65
	Mexico	102.00	1	131.7	149.7	51	29
	Nicaragua	5.50	3	8.3	10.9	42	72
	Panama	3.00	1	4.2	5.0	38	100
SOUTH AMERICA:	Colombia	44.60	2	58.1	67.3	41	30
	Guyana	0.80	0	0.7	0.5	4	77
	Suriname	0.40	1	0.4	0.4	3	87
	Venezuela	25.70	2	35.3	41.7	27	73
NORTHERN AMERICA:	U.S.	291.00	1	349.4	419.9	31	43

NOTE: Population estimates are in millions
[a] The World Bank, World Development Indicators 2005
[b] Population Reference Bureau, 2004 World Population Data Sheet
[c] World Resources Institute, 2003 Earth Trends Country Profiles

% Infant mortality rate[a]	Life expectancy at birth[a]	GNI per capita 2003[a]	Country area (x 1,000 km^2)[a]	Length of coastline (km)[c]	Territorial sea (km^2)[c]	Claimed EEZ (km^2)[c]
11	75	9,160	0.40	289	7.1	103.0
11	70	na	13.00	11,238	283.0	369.0
11	75	9,260	0.40	97	3.4	183.0
7	77	na	111.00	14,519	123.0	222.0
12	76	3,330	0.70	152	3.8	24.9
29	67	2,130	48.70	1,612	14.0	246.0
18	73	3,710	0.34	251	4.5	20.3
76	52	400	27.80	1,977	40.1	86.4
17	76	2,980	11.00	895	16.0	235.0
na	76	na	0.80	361	12.0	
na	77	na	8.90	1,094	17.5	188.0
19	72	6,630	0.40			
16	74	4,050	0.60	166	3.7	11.5
23	73	3,310	0.40	264	6.1	32.3
17	72	7,790	5.10	704	13.0	60.7
33	71	3,370	23.00	1,996	18.5	12.8
8	79	4,300	51.10	2,069	24.2	542.0
35	66	1,910	109.00	445	7.7	104.0
32	66	970	111.00	1,878	36.5	201.0
23	74	6,230	1,958.00	23,761	292.0	2,998.0
30	69	740	130.00	1,915	31.6	
18	75	4,060	75.50	5,637	57.8	275.0
18	72	1,810	1,139.00	5,874	44.0	706.0
52	62	900	215.00	1,154	10.9	122.0
30	70	2,280	163.00	620	9.0	119.0
18	74	3,490	912.00	6,762	136.0	386.0
na	77	37,870	9,629.00		796.0	8100.0

national implementing capacity and lack of coordination within national regulatory and institutional system would seriously hamper its implementation. A new GEF project with an offshore focus, the Sustainable Management of the Shared Marine Resources of the Caribbean Large Marine Ecosystem and Adjacent Regions, will assist the countries in the region to address the shared living marine resources issues through an integrated management approach towards the WSSD target for sustainable fisheries.

Despite the large-scale activities described above, both within CEP and other regional instruments, there has been a certain political unwillingness by states to cede sufficient authority to the regional programs or even participate. During intergovernmental meetings, goals, objectives, and norms are often unrealistic and higher than existing financial, managerial, monitoring, and enforcement capabilities of implementing national agencies resulting in serious implementation difficulties.

In general, marine and coastal issues are not high on the political agenda, and due to the perceived political cost of urgently needed environmental legislation, these initiatives are not keeping pace with development. The implementation flaw can be seen at various levels, starting with the ratification process of international agreements. For example, it took 10 years to obtain the necessary nine ratifications for the SPAW Protocol to enter into force. The LBS Protocol which was negotiated in 1999 has, by the end of 2004, only been ratified by two countries (namely, Panama and Trinidad and Tobago). National legislation remains outdated and fragmented, and implementing legislation for recent global and regional treaties have not been put in place. Without forceful implementation at the national level, the ratification of global instruments mean very little towards addressing the real problems; the sustainability of regional cooperation mechanisms could then be at risk.

Institutional Capacity and Coordination

The institutional capacity for marine-related sciences in the U.S. is strong and many cooperation schemes and links are established with institutions in other Caribbean countries. The larger Latin American countries — Mexico, Colombia, Venezuela, and Cuba — also have a relatively large and diversified marine and coastal institutional capacity consisting of academic and naval institutions, research vessels, and so on. These countries also participate actively in international forums on marine related issues.

However, most of the smaller countries in the region do not have institutionalized knowledge. Commendable cooperation between neighboring countries and a small number of subregional institutions, such as the OECS Natural Resource Management Unit and the CEHI, provide a minimal pool of environmental expertise for the English-speaking Caribbean nations. Medium-sized Latin American countries (that is, Central America, Cuba, and the Dominican Republic) as well as Jamaica, Trinidad and Tobago, and Barbados, have an inadequate marine/coastal knowledge at academic institutions. In Trinidad and Tobago, the Institute of Marine Affairs is an outstanding example of a very rare, specialized marine scientific research institution in a small country.

With regard to cooperation on disaster preparedness, the Caribbean Disaster Emergency Response Agency was established in 1991 to serve 15 CARICOM Member States. The IOCARIBE Group of Experts on Physical Oceanography and Climate has also established a group on tsunamis, but no forecasting system is yet in place in the region. The project portfolio of international finance organizations in the Caribbean often addresses disaster management and preparedness related to infrastructure, environment, and economic recovery through projects like the World Bank/OECD Emergency Recovery and Disaster Management Project, and the World Bank St. Lucia Watershed and Environmental Management Project. There are also several recent cooperative activities related to vulnerability mitigation which are closely related to marine and coastal sciences such as the GEF Planning for Adaptation to Global Climatic Change and the OAS Caribbean Disaster Mitigation Project.

The limited capacity of national administrations is another serious problem. Government line agencies with responsibility for public works, wastewater, agriculture, and industry have a very ad hoc relationship with agencies responsible for coastal, marine, and fisheries management. The general crisis affecting the public sector in the region has resulted in a lack of suitable institutional structure, understaffing, and lack of financial resources. These factors persistently make it difficult for relevant authorities to keep up with and implement their international obligations, meetings, and reporting as well as direct attention to the need for policy reforms and enforcement at the national level.

Enforcement of Existing Laws

While traditionally, some Latin American countries have a tendency to over-legislate, existing legislation is often overlooked in the name of development. Legislation alone cannot guarantee that the intent of the legislator will be implemented in practice. Even with sufficient legislative and regulatory capacity, major problems result from the difficulty of establishing control and enforcement mechanisms to apply the legal provisions (due to lack of political will, political interference, corruption, or simply because of lack of resources).

An interesting regional cooperation initiative to establish a port state control system in the Caribbean has been started to address the issues on safety at sea and ship-generated pollution. Basically, the port state control schemes would enforce the implementation of internationally agreed maritime conventions such as MARPOL, SOLAS, and so on. However, the shipping sector still suffers from serious lack of institutional coordination at the national level. While the issues of ship-generated waste, oil spill preparedness, and port state control are being addressed in some regional forums, the region remains in the global spotlight as a safe haven for substandard shipping and flags of convenience, posing a serious threat to the marine environment worldwide.

Advocacy for Marine and Coastal Issues

Despite the values which are at stake, the voices for marine and coastal protection are absent or weak in the political debate compared to those advocating for issues related to development, economic growth, and poverty alleviation. Being voiceless often means being ignored. The lack of a strong advocacy means that marine science is often disregarded in the policy- and decisionmaking processes. A large discrepancy is created between far-reaching goals and political statements, strategies, action plans, and concrete national implementation measures such as policy reforms, institutional building, budget allocation, and investments in the management, protection, and rehabilitation of valuable coastal and marine areas.

In some fields, the debate on marine and coastal issues is almost "personalized" and brought forward in an ad hoc manner by a small number of champions or experts who enthusiastically and persistently are the driving force for regional activities. Examples are the IOCARIBE Group of Physical Oceanography which has been promoting the establishment of a regional real-time sea level monitoring system in the Caribbean and its importance as a tsunami warning system, the Caribbean Coastal Marine Productivity Programme (CARICOMP) on biological productivity, and the Coastal Beach Stability in the Caribbean Programme (COSALC) on beach dynamics.

Issues, such as the need to protect the marine and coastal environment and sustainable fisheries, are often advocated by nongovernmental organizations (NGOs) or small local community groups focusing on a specific issue. The NGO community and their interest in the oceans and coastal issues have grown strong and several good examples of region-wide cooperation or NGO cooperation in a smaller group of countries exist such as the Caribbean Conservation Association. The Wider Caribbean Sea Turtle Conservation Network (WIDECAST) is an international scientific network comprised of volunteer Country Coordinators, an international Board of Scientific Advisors, and Partner Organizations covering the whole Caribbean. It was founded in 1981 to prepare a Wider Caribbean Sea Turtle Recovery Action Plan and has proven to be one of the most successful advocacy groups for marine conservation in the region. Another successful and sustainable advocacy effort is the International Coastal Cleanup campaigns organized annually by the Ocean Conservancy in almost every Caribbean country.

Activities driven by the industry are rare, although within the tourism sector, initiatives like the Caribbean Alliance for Sustainable Tourism (CAST) which was established in 1995 show increasing corporate responsibility for environmental issues in the hotel sector. Some regional cooperation on marine and coastal environmental protection is also implemented by the oil industry through the Regional Association of Oil and Natural Gas Companies in Latin America and the Caribbean (ARPEL).

Information and Data Gaps

While the lack of scientific data should not be an excuse for not taking remedial actions, the information gap and difficulties to convey a clear message on the needs and benefits of improved marine and coastal management have not provided convincing socioeconomic justification for ICZM to government line agencies and private sector investors. As a result, these entities are reluctant to adopt ICZM best practices in conventional development projects.

Cooperation on environmental monitoring in the region has been supported by several organizations. One of the first regionwide marine pollution monitoring activities was the CARIPOL Programme which, since the 1980s, was implemented by IOCARIBE and started up by a small number of engaged scientists who established the first regional monitoring program of tar balls, floating tar, dispersed and dissolved hydrocarbons, and later on, marine debris. Apart from the monitoring activities, the program carried out considerable capacity building and intercalibration exercises, established a regional database, and has produced several publications.

The joint UNEP/IOC Regional Programme for the Assessment and Control of Marine Pollution (CEPPOL) was established in the early 1990s to include monitoring of other pollutants and discharges from land-based sources of pollutants. Later, CEP had further expanded their work on land-based sources of pollutants.

IOCARIBE is also carrying out several other projects to provide marine-related information, such as the Tsunami Warning System Project, the Global Ocean Observing System (GOOS) Project, the Global Sea Level Observing System (GLOSS) Project, the Whales of Eastern Caribbean

Project, Harmful Algal Blooms Project, Global Oceanographic Data Archaeology and Rescue Project, and the Hurricane Effects and Mitigation Project.

The CARICOMP, established in 1985, is a cooperative network of laboratories, parks, and reserves that compares the structure of three main coastal ecosystems: mangroves, seagrasses, and coral reefs. Monitoring has been ongoing since 1992 and a centralized data management center at the University of West Indies in Jamaica, serves as a clearinghouse for the Programme.

The COSALC Programme has, since 1985, supported cooperative efforts on beach dynamics between a wide range of agencies in the English-speaking Caribbean nations. In 1996, the Programme refocused its planning for coastline change.

Under the United Nations Framework Convention on Climate Change, the OAS, in cooperation with the University of West Indies (Barbados), executed the USD 7-million project, the Caribbean Planning for Adaptation to Global Climate Change. Financed by GEF, it supports 11 CARICOM member countries in capacity building for adaptation to cope with the adverse effects of global climate change, particularly on how to respond to sea level rise. The project developed a model for regional cooperation in vulnerability assessment, adaptation planning, and related capacity building. This project was immediately followed by the current Mainstreaming Adaptation to Climate Change Project, whose objective is to mainstream climate change adaptation strategies into the sustainable development agendas of CARICOM countries and SIDS.

The *Caribbean Sea Ecosystem Assessment*, a substudy under the Millennium Ecosystem Assessment, carried out by the University of West Indies, the Cropper Foundation, Institute of Marine Affairs, Island Resources Foundation, University of Florida, ACS, CARICOM, ECLAC, Caribbean Conservation Association, UNEP Regional Office for Latin America and the Caribbean (ROLAC), and Caribbean Agricultural Research and Development Institute, will improve the scientific and analytical basis for the protection of the ecosystem function of the Caribbean. It will also provide a regional framework and a set of policies and management actions to address threats to the Caribbean ecosystem, and improve capacity and public awareness on the values of the Caribbean Sea.

Financial, Material, and Human Resources

The Caribbean region and its marine and coastal assets are well-known globally and the needs of the region have generally received considerable international attention and funding from international donor organizations. Over time, much of this funding has gone into meetings and production of strategy documents without really building national capacity and undertaking the policy reform, technological upgrading, and infrastructure investment necessary to improve local conditions. Addressing the governance process is fundamental as strategies, action plans, and monitoring are of limited value if the existing institutional setting is not perceptive and able to trigger innovation or behavioral changes.

GEF is a major funding source for the region, and the Caribbean countries have been successful in securing over 100 GEF grants in the Biodiversity window. Also, under the International Waters and Climate Change windows, several larger projects with marine/coastal focus have been implemented or are underway in the region in partnership with different organizations.

Sustainable funding from local sources is a major impediment. For example, despite agreeing on over-ambitious work programs, the countries often have difficulties complying with their own financial commitments to the Caribbean Trust Fund, and the implementation of priority actions often depends on external assistance. In fact, the majority of the governments are not contributing and there are some whose arrears are extremely high. Traditionally, France is a major contributing Party to the CEP, but also external donors such as Sweden have from time to time contributed with up to 45 percent of the pledges to the Trust Fund. Too much dependence on external donors to fund marine and coastal protection activities increases the risk that national capacity building will not be given priority.

As described earlier, the lack of human resources is a major concern for advocating for the need to protect marine and coastal resources, produce scientific advice for decisionmakers, and implement policy reforms at the national level. Best practices to overcome these difficulties can be found in the creation of the subregional institutions in the English-speaking Caribbean nations such as the CEHI and the OECS Natural Resource Management Unit. Another issue related to human resources is the difficulty to attract skilled people from the region to work with national administrations and institutions, as better-paid opportunities exist overseas or with international organizations.

Conclusion

The particular characteristics of the Wider Caribbean region, such as national economies highly dependent on vulnerable coastal areas, large number of small countries with limited human and material resources, and big challenges in the field of marine and coastal management, make cooperation between countries imperative. As a result, the Wider Caribbean region has a long history of regional cooperation.

The regionwide cooperation schemes, spearheaded by the CEP have mainly been accomplished by international and regional organizations/ programs such as UNEP, IOC, FAO, IMO, ECLAC, and others. Sub-regional cooperation schemes, such as CARICOM and the Organization of Eastern Caribbean States, have emerged because of the need to pool limited resources to address priority areas. Other intergovernmental initiatives such as the work related to SIDS, have during the last decade boosted interregional cooperation on marine and coastal issues.

While technical cooperation on marine environmental issues goes back to the 1970s, only recently have countries in the region come together at the political level through the ACS. Political tension, maritime demarcation disputes, different levels of economic development, diversity in cultures and languages, and traditional bonds with former powers all slow down the political process of regionalization, as well as work towards a common vision on the sustainable use of the Wider Caribbean.

The discrepancy between far-reaching political goals and statements in international forums and concrete actions at the national and subnational levels is considerable. The main reason for this is that the implementing capacity at the national and subnational levels varies enormously from country to country, but is low in most countries due to the small size and consequent lack of marine and coastal advocacy, lack of marine and coastal policy, low technical and scientific capacity, lack of political will, and limited financial resources.

The region is heavily dependent on cooperation from international organizations and external donors for marine and coastal environmental projects and has been highly successful in raising such support. However, the political commitment to improve marine and coastal management at the national level in the form of policy reforms, enforcement of legislation, and budget allocations for investments in remediation is not keeping pace with development. As a result, the achievements made so far have been in improving the enabling conditions (assessments, capacity building, institutional strengthening, and so on). Most problems related to the degradation of the marine and coastal environment identified decades ago remain or have grown worse, posing a threat to the sustainable development of the region. Considering the huge socioeconomic importance of coastal and marine resources for the region, it would be short-sighted not to assign appropriate attention to these issues.

References

CARICOM. 2004. Caribbean Community Secretariat: Caribbean regional position on the implementation of the Programme of Action for the Sustainable Development of Small Island Developing States. Revised Draft.

Costanza, R., R. d'Arge, R. de Groot, S. Farber, M. Grasso, B. Hannon, K. Limburg, S. Naeem, R.V. O'Neill, J. Paruelo, R.G. Raskin, P. Sutton and M. van den Belt. 1997. "The value of the world's ecosystem services and natural capital." *Nature*, 387:253–260.

ECLAC. 2004. *Major issues in the management of enclosed or semi-enclosed seas, with particular reference to the Caribbean Sea*. LC/CAR/L.24. Economic Commission for Latin America and the Caribbean. 34 pp.

ECLAC and UNEP ROLAC. 2002. *The sustainability of development in Latin America and the Caribbean: Challenges and opportunities*. Economic Commission for Latin America and the Caribbean and United Nations Environment Programme Regional Office for Latin America and the Caribbean. United Nations, Santiago, Chile. 16 pp.

EM-DAT. 2005. The OFDA/CRED International Disaster Database, Universite Catholique de Louvain, Brussels, Belgium.

IOC. 1999. "Intra-Americas sea tsunami warning system, education, warning, management and research." A Project Proposal submitted to the Intergovernmental Oceanographic Commission of UNESCO by the IOCARIBE Tsunami Steering Group of Experts, Subcommission for the Caribbean and Adjacent Regions. IOC/INF1126.

IOC. 2004. Eighth Session of the IOC Subcommission for the Caribbean and Adjacent Regions (IOCARIBE), Recife, Brazil, 14–17 April 2004. IOC/SC-IOCARIBE-VIII/3s.

ITOPF. 2003. "Regional Profiles: A summary of the risk of oil spill and state of preparedness in UNEP Regional Seas Programmes: the Wider Caribbean." International Tanker Owners Pollution Federation Limited. Available at http://www.itopf.com/country_profiles/profiles/carribean.pdf. [Accessed January 2005].

Leeds Tourism Group. 2004. *Sustainable tourism and coastal marine management in the Wider Caribbean*. Leeds Metropolitan University, Leeds, UK.

Pew Oceans Commission. 2003. *America's living oceans — Charting a course for sea change. A report to the nation, recommendations for a new ocean policy*. Pew Oceans Commission. Available at http://www.pewtrusts.org/uploadedFiles/wwwpewtrustorg/Reports/Protecting_ocean_life/env_pew_oceans_final_report.pdf. [Accessed January 2005].

UNEP. 1996a. *Coastal tourism in the Wider Caribbean region: Impacts and best management practices*. CEP Technical Report No. 38. UNEP Caribbean Environment Programme, Kingston, Jamaica.
UNEP. 1996b. *Guidelines for integrated planning and management of coastal and marine areas in the Wider Caribbean region*. UNEP Caribbean Environment Programme, Kingston, Jamaica.
UNEP. 1999. *Assessment of land-based sources and activities affecting the marine, coastal and associated freshwater environment in the Wider Caribbean region*. UNEP/GPA Coordination Office and Caribbean Environment Programme.
UNEP. 2004a. *Caribbean Islands*. GIWA Regional Assessment 4. Written by A. Villasol and J. Beltran and edited by M. Fortnam and P. Blime. University of Kalmar, Kalmar, Sweden.
UNEP. 2004b. *Caribbean Sea/Small Islands*. GIWA Regional Assessment 3a. Written by M.C. Bernal, L.M. Londoño, W. Troncoso, P.C. Sierra-Correa and F.A. Arias-Isaza. University of Kalmar, Kalmar, Sweden.
UNEP. 2004c. "Draft workplan and budget for the Caribbean Environment Programme for the biennium 2004–2005." Doc. UNEP (DEC)CAR.IG.24/4, Annex I.
UNEP. 2004d. "Outline of strategy for the enhancing of the Caribbean Environment Programme within the framework of the Regional Seas Programmes and sustainable development 2005–2009." Doc. UNEP (DEC)/CAR IG.24/3.
World Bank. 1994. "Wider Caribbean initiative for ship-generated waste." Project Document. World Bank.
World Bank. 2005. World Development Indicators 2005. World Bank.
World Resources Institute. 2003. Earth Trends Country Profiles. Available at http://earthtrends.wri.org. [Accessed January 2005].
World Travel and Tourism Council. 2004. *The Caribbean: The impact of travel and tourism on jobs and the economy*. World Travel and Tourism Council, London, U.K. Available at http://www.wttc.org/measure/PDF/Caribbean.pdf. [Accessed January 2005].

CHAPTER 21

The Pacific Islands: Dynamics of Regional Cooperation on Oceans and Coasts

G. Robin South and John Low

Introduction

The region of the Pacific Island Countries (PICs) faces considerable economic challenges, although in recent years the concepts of responsible economic growth and sustainable development are being embraced. The PICs are frequently used as a model of regional cooperation within the UNEP Regional Seas Programme. For almost 60 years, the region has demonstrated the unequivocal advantages of regional cooperation. Since the establishment in 1947 of the South Pacific Commission (now the Secretariat of the Pacific Community), a number of intergovernmental bodies have been setup through various regional conventions and agreements and in response to global initiatives. These are generally apolitical and use a consensus approach to decisionmaking (or the "Pacific Way"). Various regionally endorsed action plans provide member countries with guidance on the development of their own national policies. A holistic approach has been taken with respect to international waters issues through the Strategic Action Plan for International Waters of the

South Pacific Regional Environment Programme (SPREP), and for ocean governance, with the adoption of the Regional Oceans Policy in 2002 and the development of a Framework for Integrated Strategic Action in 2004. Whereas regionalism has not been without problems, it has given a larger voice to the small countries and has accommodated their growing statures as independent nations. The failures of regionalization are certainly outweighed by the successes. Among the most important issues to address for the future is the need to create or improve on existing enabling environments at the global, regional and national levels, and to find mechanisms to provide the funding needed for their implementation. It is important that the region find ways to ameliorate or reverse the impacts of natural- and human-induced factors on the fragile ecosystems and communities of the Pacific Islands.

The Pacific Islands Region — An Overview

The most recent overview of the Pacific Islands region is contained in South et al. [2004] and UNEP [2004].[1] The region includes all of the island nations and/or territories of the tropical Pacific Ocean that are considered part of the "cultural areas" of Melanesia, Polynesia, and Micronesia [Table 1]. The region extends from Pitcairn Island in the east to Palau and Papua New Guinea (PNG) and Australia in the west. The region's 22 countries and territories consist of almost 10,000 islands, with a total land area of 551,000 km^2. PNG is the largest, with 84 percent of the land area. Only 2 percent of the region's total area is land, the remainder of the 33 million km^2 — over three times the area of the United States — is ocean.

There is great geographic, demographic, and developmental diversity within the region. Some countries like Easter Island, Guam, Kosrae, Nauru, and Niue, consist of one single small island. Some, like Fiji, Tonga, and French Polynesia are comprised of numerous large and small highly dispersed islands, and are archipelagic states. PNG is part of a very large, high continental island and includes countless large and small offshore islands. Major differences in climate, geological resources, topographical features, soil types, mineral and water availability, extent of coral reefs, and diversity of terrestrial, freshwater, and marine flora and fauna are also found in the area.

[1] Some sections of this chapter are modified from UNEP [2004].

The average annual rainfall varies from just over 1,000 mm in New Caledonia to 5,000 mm in Pohnpei and Kosrae States in the Federated States of Micronesia (FSM). Rainfall can vary dramatically on large islands (such as on Viti Levu island of Fiji, with 3,200 mm in the east, and 1,900 mm in the west), between different islands in the same archipelago, and annually (for example, the atolls of Kiribati, which may experience prolonged droughts). These variations in rainfall lead to variations in coastal productivity, with the highest being found in the lagoons and embayments of high islands [Dalzell et al., 1996]. Climatic seasonality is more pronounced in the higher latitudes, but even in the equatorial area seasonal differences occur, such as changes in prevailing winds and rainfall. For most of the year, the region is influenced by the Southeast trade winds, but for 4–5 months during the northern winter, by the Northwest monsoon [Dalzell et al., 1996].

Wauthy [1986] has summarized the hydrological characteristics of South Pacific marine environments. The surface waters of the tropical west and central Pacific enter into the trans-Pacific intertropical circulation from the eastern boundaries of two subtropical anticyclonic gyres. The surface waters are isolated from deeper layers by a well-established thermocline, and as they move from east to west they grow warmer and more nutrient deficient. This leads to a very clear blue oceanic water, where primary production ranges on average from 20 to 50 $gCm^{-2}yr^{-1}$ [FAO, 1972]. Upwelling can enrich these impoverished waters, and a shallowing of the thermocline allows nutrients to reach the euphotic zone at the edges of the equatorial countercurrents. Nutrient input from precipitation and runoff is possible only in the waters surrounding the large island archipelagos of Melanesia. The highest primary production in the region ranges from 90 to 180 $gCm^{-2}yr^{-1}$ on the shelf area of the Gulf of Papua, which receives much of the drainage from the PNG highlands region [Dalzell et al., 1996].

Nearly the entire Pacific Islands region falls within the tropics, and sea surface temperatures rarely fall below 20°C, and may rise as high as 30°C at times. The coastal biota are characterized by coral reefs, seagrass meadows, and mangrove forests. The biodiversity of these habitats diminishes eastwards from the Indo-West Pacific center of marine biodiversity.

Large-scale climatic events such as cyclones occur regularly in the western tropical Pacific, and up to 18 per year may form in the northwest Pacific. South of the equator, they occur from December to April, and average 4 per year [Wauthy, 1986]. The El Niño Southern Oscillation (ENSO) has a profound influence on the coastal and marine environments of the Pacific Islands [Dalzell et al., 1996]. The Southern Oscillation Index is a measure of the pressure difference between Darwin (Australia) and Tahiti (French Polynesia), which is positive in normal years. During an ENSO episode, this gradient reverses, with a resulting shift in climatic and oceanic

Table 1: Basic Demographic Features of Selected Countries of the Pacific

COUNTRY	Latest census year	Total population at last census	Mid-year population estimate 2004[a]
American Samoa	2000	57,291	62,600
Cook Islands	2001	18,027	17,400
Federated States of Micronesia	2000	107, 008	1,127,600
Fiji	1996	775,077	828,400
French Polynesia	2002	245,405	254,100
Guam	2000	154,805	164,900
Kiribati	2000	84,494	93,100
Marshall Islands	1999	50,840	55,400
Nauru	2002	10,065	10,400
New Caledonia	1996	196,836	236,700
Niue	2001	1,788	1,600
Northern Mariana Islands	2000	69,221	78,000
Palau	2000	19,129	20,700
Papua New Guinea	2000	5,190,786	5,617,000
Pitcairn Island	2002	48	48
Samoa	2001	176,710	182,700
Solomon Islands	1999	409,042	478,300
Tokelau	2001	1,537	1,519
Tonga	1996	97,784	98,300
Tuvalu	2002	9,561	9,600
Vanuatu	1999	186,678	215,800
Wallis and Futuna	1996	14,166	14,900

[a] These estimates are derived from the latest available analyses of national censuses, vital registration date, health record and surveys. Mortality and migration are averaged for several years where possible, in order to minimize the effects of annual fluctuations.

[b] Average annual growth rates are derived from the projections.

[c] The urban population (%) is derived from the latest census, and the urban and rural growth rates are based on the last two censuses (intercensal growth). Most urban growth is due to urban boundary changes.

Land area (km^2)	Population density mid-year 2003 (people/km^2)	Estimated annual population growth rate 2004–2015 (%)[b]	Annual intercensal urban growth rate (%)[c]	Annual intercensal rural growth rate (%)
200	313	2.0	3.7	-0.5
237	73	-1.2	1.6	-6.0
701	161	-2.4	-2.4	1.0
18,333	45	0.7	2.6	-0.5
3,521	72	1.8	1.6	2.1
541	305	1.5	n.a	n.a
811	115	2.3	5.2	-0.6
181	306	1.6	1.6	1.3
21	495	1.6	0.3	n.a
18,576	13	1.9	2.8	2.3
259	6	-3.8	-4.3	-3.6
471	166	3.3		
488	42	2.1	2.2	1.5
462,243	12	2.2	2.1	3.9
39	1	n.a	n.a	n.a
2,935	62	0.9	1.3	0.8
28,370	17	2.7	4.2	2.5
12	127	0.1	n.a	n.a
650	151	0.3	0.8	0.1
26	369	0.4	1.4	-0.2
12,190	18	2.7	4.2	2.2
255	58	0.8	0.0	0.8

Source: Demography/Population Section, Secretariat of the Pacific Community, 2004, Noumea, New Caledonia.

conditions. Important effects are unseasonable droughts in the western Pacific and unseasonable rains in the central and eastern Pacific. There is strong evidence that ENSO events can have both positive and negative impacts on the pelagic fishery, with stocks of migratory species (such as skipjack and yellowfin tuna) shifting eastwards during ENSO. The increasing occurrence of cyclones and ENSO events in recent years may be evidence of the impact of global change on the Pacific Islands region, although recent paleo-climatic analyses of corals indicate that ENSO events have been more frequent in the past.

There are distinct terrestrial ecosystems in the region, ranging from very diverse and highly endemic ecosystems in large mountainous islands to the west to ecosystems quite low in diversity and endemicity in small low islands and atolls to the east. For some islands, 80 percent or more of the resident species are endemic [Low, 2002]. The Western Pacific has perhaps the highest marine diversity in the world and the most extensive coral reef systems. It is estimated that over 3,000 species may be found on a single reef. The high endemicity, due to the isolated evolution of island species, renders these ecosystems vulnerable to disturbance, with a limited ability to recover due to small populations, if disturbed. Terrestrial, marine, and inland coastal habitats depend heavily on the health of native forests.

The corals and coral reefs of the Pacific Islands are summarized in Wells and Jenkins [1988] and Spalding et al. [2001]. The status of Pacific Island reefs is reported in Wilkinson [1998, 2000, 2002, and 2004]. Sulu et al. [2002] and Lovell et al. [2004] state that the coral reefs of the southwest Pacific are generally in good condition, but continue to degrade as a result of human pressures, and because of two widespread coral bleaching events in 2000 and 2002. In 2000, coral mortality in Fiji reached 40 percent [Sulu et al., 2002]. In Melanesia, biodiversity is high and diminishes towards the east. A 2004 survey of the species biodiversity of Solomon Islands reefs showed it to be equivalent to that of countries in the so-called coral triangle [Green, 2004]. The reefs of New Caledonia and Fiji are the best studied, but there remain vast areas of unexplored reefs [Spalding et al., 2001].

The majority of Melanesian reefs are under traditional stewardship and the reefs serve as important sources of food for subsistence fishers. Attempts to establish marine protected areas (MPAs) in Melanesia are becoming increasingly successful [Tawake, 2004], and the rights of villagers to manage their own nearshore resources are now widely recognized, leading to co-management regimes. The longest existing MPA in the Pacific, the Palolo Deep National Marine Reserve, was established in 1974 in Apia, Samoa [Skelton, 2000].

In Micronesia, reefs are well developed, except on coastlines affected by active volcanism. Palau lies closest to the center of reef diversity in the Indo-Pacific region. According to Spalding et al. [2001], there are considerable differences in the state of Micronesian reefs, and for those under the U.S., the impacts of humans are most marked. A breakdown of traditional systems has occurred in most countries following the shift from traditional village life to an urban lifestyle. Also, the impact of military activities has been critical, especially in those areas of the Marshall Islands used for intensive nuclear testing in the 1940s and 1950s. Away from areas of human impact, however, a large number of reefs remain in good to excellent condition. Polynesia comprises an enormous region of widely scattered islands from Wallis and Futuna to Hawaii (not included in this account) to French Polynesia and, to the south, Tonga. According to Spalding et al. [2001], Polynesia includes 11,000 km^2 of coral reefs, with every kind of island and reef type represented.

Traditional utilization and management of reefs are declining in many of the islands, following the breakdown of traditional lifestyles and the controls previously imposed through traditional systems. This has led to problems of overexploitation and pollution, although these are highly localized.

Mangrove forests are prevalent in estuarine areas of the high islands of the region, but poorly developed or scarce on atolls. Scott [1993] has prepared a directory of Pacific Island wetlands, while their distribution and ecology are reported in Woodroffe [1987]. Traditional cultures have utilized mangroves for firewood and construction, and have long recognized the importance of mangroves as nurseries for crustaceans and some lagoon fishes. Mangrove species biodiversity declines from west to east. The most extensive mangroves are found in PNG, Solomon Islands, and Fiji, with the natural easternmost limit in American Samoa. Mangroves are absent from Wallis and Futuna, Tokelau, and the Phoenix and Line Islands (Kiribati).

Seagrasses are common throughout much of the Pacific Islands region [Wells and Jenkins, 1988] and their distributions are summarized in Green and Short [2003]. They stabilize sediments and contribute to the detrital cycle of shallow lagoons. They are an important habitat for a number of commercially important species, and provide food for dugongs and turtles. The seagrass beds of Fiji are an important foraging area for sea turtles, but there are few studies of their extent and ecology.

The Pacific Islands have been inhabited for approximately 3,500 years in Fiji and for approximately 2,500 years or less in Polynesian countries (for example, Samoa). Colonization extends back no more than 200 years. Habitat and community modification were significant in precolonial times; Pacific cultures practiced agriculture and strongly modified their environment in order to establish their gardens. A percentage of the environment was, therefore, already altered prior to the arrival of European colonists. There is evidence to suggest, however, that the relatively small populations had a lesser impact on coral reefs and lagoons, even though studies showed that some of the stocks of fishes and invertebrates had been overfished prior to European contact [UNEP, 2004].

The current population of the region is approximately 8.3 million [CIA World Factbook, 2003], and PNG accounts for more than 63 percent. Population densities range from just over 8 persons per km^2 for Niue to 599 persons per km^2 for Nauru. If the "most populous islands" are considered, the figures rise to over 100 per km^2 for four islands, over 200 for three islands, 421 for Koror in Palau, 757 for Funafuti in Tuvalu, 1,179 for Majuro in Marshall Islands, and 2,190 for Tarawa in Kiribati. The estimated population for Betio Islet of Tarawa Atoll was 40,000 in the year 2000, which gives it a population density rivaling those of Hong Kong and Singapore. If we consider Ebeye, one of some 90 islets comprising Kwajalein Atoll in Marshall Islands, to where people have been relocated by the U.S. military to free the atoll's lagoon for intercontinental ballistic missile testing, the population density increases to over 25,000 per km^2!

Regional Issues and Problems

The economic performance of PICs is generally poor [Duncan et al., 1999]. The overall gross domestic product (GDP) contracted during the period 2000–2002 and with less than 1 percent growth in 2003–2004 [Table 2]. Despite high levels of foreign aid, there has been no parallel increase in real per capita incomes. Various factors — such as the Asian financial crisis, declines in world commodity prices, as well as problems associated with small economies and vast distances from markets, local socioeconomic issues, and lack of investment — have contributed to this situation.

In recent years, countries have embraced the concepts, if not the practice, of responsible economic growth and sustainable development, but economic issues often override environmental concerns in government planning and policies. There is a trend towards recognition of the need for more integrated planning to comply with global conventions and agreements through the development of appropriate national laws and regulations (including national sustainable development strategies[2]). A number of PICs have drafted or have even enacted (for example, in Cook Islands) new environmental laws, policies, and strategies which recognize

[2] A few countries like Tuvalu, FSM, Solomon Islands, Niue and the Cook Islands have embarked on the development of national sustainable development strategies, consistent with the global agreements such as the World Summit on Sustainable Development (the Johannesburg Program of Implementation) that called for the development of such strategies by 2005.

Table 2: Economic Indicators for Selected PICs

	GDP %/yr *2004*	GNP per capita *(USD) 2002*	ODA received (000 USD) *1995*	*2001*
Fiji	3.9	2,160	44,850	25,960
Kiribati	1.8	810	15,410	12,430
Marshall Islands	2.0	2,350	38,890	74,010
Federated States of Micronesia	-1.5	1,980	77,340	137,600
Palau			142,320	34,180
Papua New Guinea	2.8	530	371,040	203,100
Samoa	4.0	1,420	43,360	43,070
Solomon Islands	4.5	570	47,760	58,840
Tonga	2.6	1,410	38,880	20,270
Tuvalu	3.0			
Vanuatu	2.1	1,080	45,640	31,580

Sources: Asian Development Bank, ESCAP, World Bank Indicators 2003, and ADB Key Indicators 2003. For more details see Low [2002].

these needs (for example, the Fiji Government's draft Sustainable Development Bill and the Cook Islands' National Environment Strategic Action Plan).

These are, however, the exceptions. The sustainability ethic is widely spoken about, but in reality is an almost unachievable goal given the financial and socioeconomic constraints under which governments have to work. Small populations, inadequate funding, lack of the necessary human resources, and lack of political will are all contributing to the current situation that is leading to more and more unregulated destruction and modification of habitats and ecosystems in the Pacific Islands. There is also a long-standing dependency on donors (who are often the same countries that were once colonial governors). In addition, donor policies have in themselves been strong external root causes. There has also been, regrettably, a culture of corruption in some countries where government or private sector leaders have compromised standards or ethics in return for under the table deals with outsiders willing to fund major developments.

The PICs are among the poorest nations, and are strongly dependent on their renewable and nonrenewable resources for their economic survival. The cash economy has become a major driving force: populations desire living standards and lifestyles comparable to those they learn about from developed nations, yet, with the exception of a very privileged few, they do not have the resources to bring this about. Modern technology is brought into these countries through many different programs, but oftentimes the technology is inappropriate for small islands.

The island states are overwhelmed by the possibility that global change can result in a total loss of their territories (such as atoll states like Tuvalu and Kiribati). They have become effective global advocates of the importance of mitigating against those factors that are causing climate change and sea level rise.

The situation today with regard to habitat modification and destruction is a result of approximately 200 years of impacts by human populations, including those done by indigenous people during pre-colonization years. These impacts include deforestation, depletion of fish stocks, destruction of habitats (especially mangroves and other vulnerable coastal ecosystems) through urbanization, industry and infrastructure development, waste disposal, pollution, mining, and agriculture [Table 3]. Freshwater catchments are almost completely impacted by human activities and are no longer in their natural state, and areas of pristine forest and other habitats are becoming scarce. Government policies, whether those of the colonists or of the current regimes following their independence, have played a key role leading to the current situation.

Many Pacific Island cultures maintain much of their traditional lifestyles and value their traditions. However, they are afflicted by many of the same problems in other parts of the world, such as an alarming increase in the rate of HIV infections and sexually transmitted diseases, and by noncommunicable lifestyle diseases such as Type 2 diabetes. Religion has a major influence on the lives of the Pacific people; the church can be very effective in helping to deal with community-driven concerns. Yet religion and cultural traditions have also proved to be obstacles in areas such as using birth control methods and raising awareness on HIV, since human sexual issues may not be discussed either within the family or within the community, leading to ignorance, early pregnancies and high birth rates.

At the community level, traditional systems are breaking down with the change to the cash economy, urbanization, and the desire of the people to have a lifestyle comparable to what they witness daily through the media. This desire percolates throughout society up to the government level, where ministers of even the smallest countries aspire to the trappings of ministers in developed countries. This has led to a considerable degree of corruption in some countries, and the breakdown of society and the economy such as what happened recently in the Solomon Islands. Some segments of society remain disenfranchised, especially women and youth. Decisionmaking and planning may take place without considering the conditions of those who provide food for their families.

Traditional marine tenure has also been a factor in the potential for the development of MPAs in some countries, and was discussed in detail in South et al. [2004]. Where the initiatives come from the communities themselves, progress is likely to be made in this area. One trigger to the

Table 3: Environmental Issues in Selected Countries

COUNTRY	ENVIRONMENTAL ISSUES	CAUSES
Fiji	Deforestation. Land degradation. Soil erosion. Biodiversity loss. Water degradation and limited access to potable water. Depletion of coastal fisheries. Vulnerability to natural disasters. Endangered coral reefs.	Commercial logging. Uncontrolled fires. Encroachment on marginal lands. Mining. Impacts of climate change and increased cyclone frequency. Marine pollution. Lack of waste collection and disposal systems and deficiencies in rural and urban infrastructure. Overfishing.
Kiribati	Low forest cover. Water degradation and limited access to potable water. Coastal erosion. Vulnerability to droughts and floods. Urban pollution. Solid wastes, including all car bodies.	Groundwater salinization and over-extraction. Lack of waste collection and disposal system. Impacts of climate change.
Marshall Islands	Water degradation and limited access to potable water. Coastal erosion. Biodiversity loss. Vulnerability to droughts floods and cyclones.	Impacts of climate change. Groundwater salinization. Lack of waste collection and disposal system.
Federated States of Micronesia	Water degradation and limited access to potable water. Coastal erosion. Biodiversity loss. Vulnerability to droughts and floods and rising sea levels.	Impacts of climate change. Groundwater salinization. Inadequate solid waste management infrastructure.
Nauru	Land and soil degradation. Marine biodiversity and habitat loss. Coastal erosion. Water degradation and limited access to potable water. Vulnerability to natural disasters.	Mining. Pollution. Impacts of climate change. Overfishing. Groundwater salinization. Pressures on urban infrastructure.
Palau	Soil erosion. Degradation of inland and marine waters. Biodiversity and habitat loss. Local depletion of coastal fisheries. Vulnerability to droughts and floods.	Poor land management. Population growth and encroachment on marginal lands. Overfishing. Hunting particularly of endemic sea turtles. Sand and coral dredging. Inadequate facilities for solid waste disposal.

Table 3: (continued)

COUNTRY	ENVIRONMENTAL ISSUES	CAUSES
Papua New Guinea	Deforestation. Land degradation. Soil erosion. Biodiversity loss. Water degradation and limited access to potable water. Local depletion of coastal fisheries. Vulnerability to natural hazards.	Commercial logging. Land clearance. Mining. Impacts of climate change. Population growth and deficiencies in rural and urban infrastructure. Overfishing.
Samoa	Deforestation. Soil erosion. Degradation of inland and marine waters. Marine biodiversity and habitat loss. Local depletion of coastal fisheries. Vulnerability to droughts and other natural hazards.	Expansion of commercial agriculture and pollution from agricultural runoff. Encroachment on marginal lands. Overfishing. Hunting (sea turtles).
Solomon Islands	Deforestation. Soil erosion. Water degradation and limited access to potable water. Endangered, dead or dying coral reefs and wetlands. Biodiversity loss. Local depletion of coastal fisheries. Vulnerability to droughts and other natural hazards.	Commercial logging. Land clearance. Mining. Impacts of climate change. Population growth and deficiencies in rural and urban infrastructure. Overfishing (sea turtles). Impacts of climate change. Destructive fishing practices.
Tonga	Deforestation. Soil erosion. Degradation of inland and marine waters. Biodiversity loss. Local depletion of coastal fisheries. Vulnerability to droughts and natural hazards.	Expansion of commercial agriculture and pollution from agricultural runoff. Encroachment on marginal lands. Indiscriminate collection of coral and shells. Invasion of exotic species. Over-fishing, hunting particularly of endemic sea turtles.
Tuvalu	Marine biodiversity and habitat loss. Water degradation and limited access to potable water. Coastal erosion. Vulnerability to natural disasters. Inundation by seawater.	Impacts of climate change. Pollution. Overfishing. Deficiencies in rural and urban infrastructure.
Vanuatu	Deforestation. Land degradation/soil erosion. Water degradation and limited access to potable water. Biodiversity and habitat loss. Depletion of coastal fisheries. Vulnerability to droughts and natural hazards.	Commercial logging. Land clearance. Impacts of climate change. Overfishing. Deficiencies in rural and urban infrastructure.

Source: Derived from Low [2002]

realization by communities of the need for MPAs is when fish and invertebrate stocks are seriously depleted. Fiji's Locally Managed Marine Area (FLMMA) project is an excellent example [Tawake, 2004].

Apart from PNG, the most far-reaching constraint on development in the region is the small size of the countries, and their remoteness from the main trading centers. The GDP is very low for the smallest nations, around USD 500 per capita per year [Table 2]. Those with the highest GDP are states still under colonial rule, such as French Polynesia and Guam. The countries are also separated from one another by vast areas of deep ocean, resulting in isolation and high transportation costs. In addition, natural disasters such as cyclones, floods, tsunamis, and drought plague many of the countries. These problems are exacerbated by global problems in climate change and sea level rise. These phenomena threaten entire countries such as the low-lying atoll countries of Kiribati and Tuvalu, and the largely coastal populations of the high islands [South and Veitayaki, 1999].

In terms of current levels of development and potential for modern economic development, while some of the larger island groups with significant mineral, forestry, fisheries and agricultural land resources have some potential, most PICs and smaller outer islands and isolated rural communities, do not. Because of their small size, geographic isolation, and extremely limited natural resources, the options for modern economic development are extremely limited. Sutherland and Tsamenyi [1992] stated that of the 14-island Member States of the Forum Fisheries Agency, four had at that time a GDP of less than AusD 200 million (USD 170 million). For six others, the figure was less than AusD 100 million (USD 85 million). Consequently most island countries, territories, and local communities will, for the foreseeable future, have to depend on the sustainable use of their local resources as a basis for their survival and development.

The PICs are unique in that most of the islands of the region are inhabited by indigenous people who have close links with, and great cultural, economic, and spiritual dependence on, their islands' terrestrial and marine environments. In most cases, these indigenous people are the owners and users of these resources and ultimately control decisions related to their conservation and sustainable use. This situation contrasts with other archipelagic regions of the world such as those in the Indian Ocean and the Caribbean Sea, and continental areas where there are more private or public land.

The Pacific Islands is one of the most heavily aid-assisted regions in the world [see Table 2; Fairbairn, 1994; Low, 2002]. Approximately 90 percent of the aid comes from bilateral agreements with Australia, France, Japan, the European Community, and the U.S. being the leading donors. With decolonization and shifting allegiances of some of the newly independent states from their previous colonial masters, links are being strengthened with Asia and increasing amounts of aid are being provided from Japan, the People's Republic of China, Korea, and Taiwan. In addition, private sector investments from the countries of the Association of Southeast Asian Nations (ASEAN), particularly Malaysia, are changing the face of the consumer and investment markets in the region [South and Veitayaki, 1999].

For the Pacific Island States, the exclusive economic zone (or EEZ) is of critical importance. However, it also poses enormous problems with respect to management. All States have now declared their EEZ, which is of paramount importance with respect to fisheries exploitation. The Pacific Islands region contributes about 50 percent of the world's tuna catch. More recently, the importance of oil, gas, and mineral resources has taken more prominence.

Environmental issues are now recognized as critical in the promotion of sustainable growth and an improved quality of life. As stated by South and Veitayaki [1999]: "… Pacific Island environments are fragile and highly vulnerable. There is a need to incorporate integrated environmental principles in planning at all levels, specifically related to the forestry, mineral resources, agricultural and fishery sectors, but equally importantly in urban planning, waste disposal and the tourism industry."

Regional Responses: Global Initiatives and Workable Arrangements

Global initiatives have been important driving forces on regional cooperation and the evolution of workable arrangements in the Pacific Islands region. Among the important global initiatives include: the Regional Seas Programme, the United Nations Convention on the Law of the Sea (UNCLOS III), the United Nations Conference on Environment and Development (UNCED 1992), and the ensuing conventions and agreements arising from it. Within the framework of the various UN conventions and agreements to which many of the countries are signatory, many national activities have been initiated as part of the reporting requirements of such conventions and agreements. In addition, a number of countries have created new departments, divisions, or ministries, mandated with overseeing environmental issues, again in response to UN conventions and agreements, such as Agenda 21's Chapter 17 which concerns coastal issues. More recently, the countries have embraced the outcomes of the World Summit on Sustainable Development through the Johannesburg Programme of Implementation and the 10-year review of the Barbados Program of Action (BPOA) through the Mauritius Strategy for the Further Implementation of the BPOA.

A difficulty with international conventions and agreements is with the reporting requirements. For some, these requirements are substantial, and there are also degrees of overlap among reporting requirements for different conventions. For most of the Pacific Island states, the reporting places unrealistic requirements on limited staff resources, and there has been a call for assistance and streamlining of reporting requirements [IMPAC, 2003].

Politically, the PICs are all members of the South Pacific Conference that was first convened in 1947, and which includes the governments of New Zealand, Australia, and the U.S. [Dalzell et al., 1996; South and Veitayaki, 1999]. Fourteen independent states, with the addition of New Zealand and Australia, are members of the Pacific Islands Forum, established in 1971 and headquartered in Suva, Fiji.

The Pacific Islands Forum is a gathering of Heads of Government of the independent states of the region. The Heads of Government meet once a year to discuss a broad range of issues concerning political, economic, and social developments in the region. From an embryonic group consisting of only Samoa, Fiji, Tonga, Cook Islands, Nauru, Australia, and New Zealand, the Forum has grown to 16 independent States including two observers: New Caledonia and Timor-Leste. Unlike the South Pacific Commission (subsequently renamed the Secretariat of the Pacific Community), the Pacific Islands Forum is not established by a charter. Thus, because of its nonformal structure, it is able to respond rapidly and to deal flexibly with issues as they arise [Aqorau and Low, 2004].[3]

Organizationally, the Pacific Islands region has been frequently used as a model within the Regional Seas Programme. South and Veitayaki [1999] provided a detailed review of regional approaches to workable arrangements in the context of global initiatives in the Pacific. Intergovernmental bodies oversee regional programs on a sectoral basis (for example, the Forum Fisheries Agency for oceanic fisheries, the Secretariat for the Pacific Community for coastal fisheries and socioeconomic programs, the South Pacific Applied Geoscience Commission for nonliving resources and boundary delimitation, and the Secretariat of the Pacific

[3] To facilitate its work, and to ensure its decisions are carried through by the Pacific Islands, the Forum has an administrative arm (Secretariat). Initially the Secretariat was known as the South Pacific Bureau for Economic Co-operation (SPEC) and South Pacific Forum Secretariat. It is now called the Pacific Islands Forum Secretariat to accommodate membership from both northern and southern countries. The Secretariat supports the Forum and provides policy and technical advice on a broad range of political, economic, trade, and social issues. Initially, the Secretariat's work program was slanted towards trade and economic development. In recent years, however, the Forum has taken a more active interest in social issues such as HIV/Aids, education, health, and regional integration. Forum Leaders agreed to a renewed Pacific Vision in 2004 where they embraced sustainable development, economic growth, good governance, and security as important areas for the region.

Regional Environment Programme for environmental issues and the Regional Seas Programme). These intergovernmental agencies use a consensus approach or the "Pacific Way" (a term coined by Fiji's late Prime Minister Ratu Sir Kamisese Mara) to decisionmaking.

As a result of colonization, countries in the region have adopted legal systems based on those of the British, French, or U.S.; there is thus a lack of uniformity among legal systems within the region. Heathcote [1997] addresses the resulting problems experienced under maritime law in Forum countries, and has recommended ways of standardizing law in at least this sector. Traditional law also applies in some countries, and in Samoa, for example, a system of village rules governing fisheries management has been established [Fa'asili and King, 1997]. In Fiji, there are moves to legally recognize the *qoliqoli* (fishing area) owners and customary owners of foreshore areas [Aqorau, 2003].

With respect to the EEZs of the PICs, many agreements and regional initiatives have been agreed to, facilitated by the Forum Fisheries Agency and the Secretariat of the Pacific Community, under their oceanic program. Their most recent and important achievement has been an agreement to establish a new Commission, which oversees the management and conservation of highly migratory fish stocks such as tuna. In 2003, Pacific Island representatives attended a meeting sponsored by Environment Australia, to discuss the management and conservation of biodiversity on the high seas vis-à-vis those areas of ocean not included within EEZs.

Pacific Island nations are represented in various ways within the UN. Through the advocacy by their missions to New York, they have raised the profile of issues affecting island states globally. Pacific countries also work through the Alliance of Small Island States to advocate small islands issues. Finally, regional universities and nongovernmental organizations (NGOs) have played an increasingly important role in the Pacific Islands, especially at the community level.

A number of important regional agreements have also provided an operational framework for the island countries. These include:

- The Rarotonga Treaty or South Pacific Nuclear Free Zone Treaty (1985).
- The SPREP Agreement or the SPREP Action Plan to establish the South Pacific Regional Environment Programme, agreed at the Conference on the Human Environment in the South Pacific, 1982. The Agreement came into force on 31 July 1995.
- The SPREP Convention to protect the natural resources of the South Pacific region in compliance with Article VII of the London Convention. The Convention was signed in November 1986.
- The Forum Fisheries Agency Convention for the establishment of the Forum Fisheries Agency. The Convention was opened for signature in July 1979.

- The Multilateral Fishing Agreement with the U.S. was signed in 1987. The Agreement recognizes the rights of coastal states over highly migratory species, and the commitment to pay fees to fish for these species.
- The Wellington Convention for the Prohibition of Fishing with Long Driftnets in the South Pacific. The Convention was opened for signature in October 1990.
- The Niue Treaty for cooperation among countries for the control and enforcement of their regulations relating to fisheries use within their EEZs. The Treaty was opened for signature in July 1992.
- The Nauru Agreement concerning cooperation in the management of fisheries of common interest concluded in November 1981. The Agreement entered into force in December 1982.
- The Multilateral High-level Conference on Fisheries for the cooperation between Pacific Island States and Distant Water Fishing Nations in the conservation and management of highly migratory fish stocks. The Conference ended in 2002. It established a Commission based on the Federated States of Micronesia.
- The University of the South Pacific Charter for the establishment of the University of the South Pacific. The University opened in February 1968, and the Charter was formally granted by United Kingdom's Her Majesty the Queen on 10 February 1970.

Regional cooperation has been the hallmark of the Pacific Islands region since the founding of the then South Pacific Commission (SPC, which is now the Secretariat for the Pacific Community) in 1947 [Annex 1]. Other regional organizations have been established since then, including: the Pacific Islands Forum Secretariat (FORSEC) in 1971, the Forum Fisheries Agency (FFA) in 1979, the South Pacific Applied Geoscience Commission (SOPAC) in 1972, the University of the South Pacific (USP) in 1968, and the Secretariat of the Pacific Regional Environment Programme (SPREP) in 1980. The Council of Regional Organizations of the Pacific (CROP) includes representatives from each of the 10 regional organizations, and is chaired by FORSEC. Its purpose is to reduce overlapping of initiatives, encourage cooperation among the regional bodies, and to undertake initiatives of the Forum Leaders through a number of technical working groups. The Marine Sector Working Group has, for example, played a significant role in the development of the region's Ocean Policy.

Other mechanisms for regional cooperation include those established by UN agencies such as the Food and Agriculture Organization (FAO), which maintains a regional office based in Samoa, and the United Nations Development Programme (UNDP), which has a number of offices in the region. The FAO Subregional Office based in Apia serves Pacific Islands members of the FAO (namely, Cook Islands, Fiji, PNG, Samoa, Solomon Islands, Tonga, Vanuatu, FSM, Palau, RMI, Tuvalu, Kiribati, Niue, and Nauru), and assists these countries in the areas of fisheries conservation, management, and development. It also liaises with regional fisheries bodies such as the FFA and SPC. The UNDP offices in the region provide assistance in accordance with the UN Millennium Development Goals. The office in Suva, Fiji, under its environment thematic area, provides technical advisory support for the Global Environment Facility (GEF) projects in environment, conservation, and energy for nationally conducted projects. The UNDP Office in Apia, Samoa, serves four countries in the Polynesian subregion (namely, the Cook Islands, Samoa, Niue, and Tokelau) and partners with SPREP in projects, including the GEF-funded International Waters Project. Donor countries also maintain various levels of regional input and consultation in their program development and in the delivery of bilateral and multilateral aid.

During the past decade there has been a significant growth in the number of international, regional, and national NGOs established in the region, and the larger of these (such as the World Wide Fund for Nature) are working in close partnership with governments and communities. Their greater involvement with regional issues is a reflection of the growing recognition of the UN and the world community of the importance of the role played by NGOs.

Regionalism and the role of intergovernmental bodies have been the subject of a number of reviews [Ball, 1973; Fry, 1979, 1981; Herr, 1989, 1990; Neemia,1986; Sutherland, 1986; FFA, 1987; Cicin-Sain and Knecht, 1989; Haas, 1989; Hoadley, 1992, 1994; Tuqiri and South, 1993; Veitayaki,1995; South and Skelton,1999; South and Veitayaki,1999].[4] Herr [1989] commented that a regional organization in the South Pacific "… is both a product of the colonial era and a mechanism for dealing with the post-colonial international environment." Herr [1989] noted that the process of regionalism has been evolutionary rather than revolutionary. However, the recent and current rapid pace of change poses significant challenges for regional arrangements, especially in the oceans and coasts sector.

Herr [1989] noted that up to that time, regional cooperation in the Pacific Islands had been dominated by preoccupation with economic development. This is a reflection of the original role of FORSEC. The regional organizations have also steered away from political issues and as a general rule do not interfere in one another's political affairs including some of the major political upheavals in a number of countries in recent years. The concept of consensus approach, or the "Pacific Way," was a mechanism to ensure harmony between the Pacific Island governments.

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[4] We draw here from the text of South and Veitayaki [1999].

The regional harmony has not always prevailed and there have been some notable schisms that have disturbed the consensus [Neemia, 1986; Fry, 1979, 1981; South and Veitayaki, 1999], including:

1. The preferential location of regional bodies in some of the larger countries;
2. Differences between small versus large states;
3. Division between the Polynesian and Melanesian states. The Polynesian states, which became independent earlier, tend to be more politically conservative, whereas Melanesian states, which emerged later, developed a critical, anti-colonial doctrine sometimes referred to as Melanesian Socialism. Not all Melanesian states are comfortable being aligned with the other Pacific Island states in organizations such as SPREP;
4. Distancing of some island governments from extra-regional powers (that is, the United Kingdom, U.S., and France), and from inter-regional powers such as Australia and New Zealand. For example, the Melanesians suspected Australia of harboring hegemonic ambitions and of not being sensitive to island interests. More recently, however, the role of Australia as a peacemaker, and as head of FORSEC is alleviating some of these earlier suspicions although it is still seen as concealing hidden agendas; and
5. Because the independent states distinguished themselves apart from governments still dependent on the U.S. (for example, Marshall Islands, American Samoa) and France (New Caledonia, French Polynesia, Wallis and Futuna), this has resulted in some rivalry between FORSEC and SPC.

Decisionmaking is largely by consensus in the regional bodies, and annual workplans are usually agreed at meetings where governments are fully represented and technical experts are available for consultation. The rubric is that regional bodies are the servants of governments, and are reactive rather than proactive. In practice, however, the work of regional organizations is determined by availability of funding from donors. Donors invariably sit around the table with government and technical personnel. Major funding may drive much of the work of a regional body over a period of years, with the advantage that there are significant opportunities for capacity building and provision of essential services to member governments. It was expected that staff and resources of regional bodies will, as a consequence, expand exponentially during the implementation of these projects. Counterpart personnel from participating governments were expected to swell ranks at the national level as well. What happened, on the contrary, was that the senior technical positions have remained the sinecure of expatriate staff, some of whom have stayed in regional bodies for the better part of their entire career, whereas the proportion of staff from the region remained unexpectedly low (although this is increasing of late). Furthermore, small countries can rarely sustain the additional staff once aid funding runs out.

An anomaly of regional bodies in the Pacific Islands is that of membership [South and Veitayaki, 1999]. The SPC's membership defines the region, but the different memberships of the various agencies involved in the marine sector have been an impediment to achieving efficiency in institutions [Toupou et al., 1995]. The deep historical, legal, and political roots that have produced these differences cannot, however, be severed easily [South and Veitayaki, 1999]. As pointed out by Toupou et al. [1995], the difficulty arises from the distinction between those island countries eligible for Pacific Forum membership and those which are ineligible. A second problem is the participation of non-island members in regional bodies. There is a fundamental division between the Forum agencies (which include Australia and New Zealand as original non-island powers) and the non-Forum agencies, which include the metropolitan powers of France, the United Kingdom, and the U.S. This schism is critical with regard to obligations imposed on the region through UNCLOS, and the Agreement on High Seas Fishing introduced in 1995. A third aspect of divergent institutional memberships has been imposed from outside the region: the distinction between ACP (that is, Asia, Caribbean, and Pacific) countries associated with the European Union members and non-ACP countries with regard to development assistance. It could be argued that subregional groupings like these create internal tensions, and could be portrayed as dysfunctional to regional institutional efficiency [South and Veitayaki, 1999].

The changing mandates of the regional bodies have also led to an increasing degree of potential or actual overlap in work programs. For example, the SPC for a long time carried the full burden of cooperative marine sector development [Toupou et al., 1995]. In the early 1970s, the SPC's mandate was extended to more commercial inshore projects and later, to an ambitious decision to include most aspects of tuna and billfish research. This oceanic program continues to the present day, even though there were suggestions some years ago to combine the tuna database under the FFA. This has led to closer cooperation between SPC and FFA, but not without some rivalry. This parallel involvement of SPC and FFA in pelagic resource development has advantages and disadvantages. One disadvantage is with the different memberships of the FFA and SPC, although assistance is extended now by FFA to those countries not eligible for FFA membership.

Priorities and Actions

By the late 1990s, the region, through the Pacific Islands Forum, realized that oceans governance should be encompassed under an all embracing framework which would be consistent with the 1982 UNCLOS and the Agenda 21 Programme of Action for Sustainable Development's call to adopt a more holistic and integrated approach to ocean governance.[5] In 1999, the Forum:

- further urged members, which have not yet done so, to become parties to UNCLOS at the earliest opportunity;
- welcomed the recent initiatives taken by the Commonwealth Secretariat and the CROP agencies to assist Forum Island Countries (FICs) to understand their rights and obligations under UNCLOS and in providing FICs with a legal and policy framework to implement UNCLOS;
- endorsed the conclusions and outcomes of the recent South Pacific Regional Follow Up Workshop on the Implementation of UNCLOS which was held in Vava'u, Tonga, from 23–27 August 1999, in particular, the six priority areas identified by the workshop which are: national and regional ocean policy and legislation, marine scientific research and cooperation, delimitation of maritime zones including continental shelves, human resource development, special technical assistance, support and cooperation of regional institutions, ratification of UNCLOS and linkages to relevant treaties, and surveillance cooperation and exchange; and
- urged members which have already become parties to UNCLOS to implement UNCLOS, in particular, the outcomes and conclusions of the Follow Up Workshop and encouraged relevant CROP agencies to continue to provide assistance to FICs in implementing UNCLOS, particularly in the six priority areas identified [South Pacific Forum, 1999].

The Pacific Regional Ocean Policy was adopted at the Forum's 2002 meeting. The Regional Ocean Policy contains five key principles. These are:

- Improving our understanding of the ocean;
- Sustainably developing and managing the use of the ocean resources;
- Maintaining the health of the ocean;
- Promoting the peaceful use of the ocean; and
- Creating partnerships and promoting cooperation.

[5] Adapted from Aqorau and Low [2004].

In adopting the Policy, the Forum Leaders, *(a)* reiterated an earlier decision (in 1995) for members to ratify the 1982 UNCLOS as soon as possible; *(b)* welcomed recent developments in the area of "oceans and legislation" as a platform for developing an Action Plan in this important area for the region; and *(c)* approved the "Pacific Islands Regional Ocean Policy." The Forum also called for followup action plans for the region and for individual members in.

A Framework for Integrated Strategic Action was drafted during the Pacific Islands Regional Ocean Forum (PIROF) held in Suva, Fiji, in February 2004, by the more than 200 national, regional, and international delegates attending the Forum. This has been presented to the Forum Leaders. This approach is the most recent example of the success of the regional approach to ocean issues, and will lead to establishment of priorities and actions relating to ocean policy. The PIROF will also provide a general framework to assist national governments in the development of their own coastal and ocean policies. A summary of the Framework for Integrated Strategic Action is provided in Box 1.

Box 1: Pacific Islands Regional Ocean Framework for Integrated Strategic Actions (PIROF-ISA): Guiding Regional Ocean Governance for the Pacific Islands Region

Our Vision: A healthy ocean that sustains the livelihoods and aspirations of Pacific Island communities.

Pacific Islands Regional Ocean Policy Guiding Principles:

- Improving our understanding of the ocean — To improve our ability to effectively conserve marine biological diversity and predict the impact of climate variation and human use patterns on the health of the ocean.
- Sustainably developing and managing the use of ocean resources — To safeguard Pacific Island communities and maintain the health of our ocean in perpetuity, it is imperative that we adopt a precautionary management approach to ensure the use of the ocean and its resources are sustainable.
- Maintaining the health of the ocean — To sustain ocean and coastal health and productivity through improving water quality and maintaining resources.
- Promoting the peaceful use of the ocean — To promote peaceful use through discouraging and reducing unacceptable, illicit, criminal, or other activities contrary to regional and international agreements.
- Creating partnerships and promoting cooperation — To create partnerships and promote cooperation to maintain sovereign rights and responsibilities in providing an enabling environment to manage, protect, and develop the ocean.

The Global International Waters Assessment (GIWA) concluded that the most important concerns for the Pacific Islands region include freshwater shortage, habitat destruction, and resource over-utilization [UNEP, 2004]. They are increasingly causing severe impacts on the quality of life of Pacific Islanders. The root causes behind these concerns include an increasing population, market and economic trends, and poorly coordinated government planning and regulation. Whereas significant progress in government and community reactions to these issues are evident, they are slow and fraught with many pitfalls. These are frequent because of a lack of proper management tools such as data, proper understanding of the issues, and capacity within government and the stakeholder communities to manage, regulate, and enforce. These difficulties are exacerbated by burgeoning population growth in many of the countries, by a lack of funds, and by political expediency under pressure from developers, industry, and communities. Essentially the region looks good on paper, with so many of the countries having signed and ratified post-UNCED conventions and agreements. In reality, few have the capacity to follow through with the enactment of laws and regulations required for compliance, or with the capacity (or political will) to enforce them.

The GIWA [UNEP, 2004] identified the following issues of importance to the region in the next 2 decades:

1. All PICs urgently need to develop and implement laws and regulations necessary for their compliance with global conventions and agreements to which they are signatory. Existing legislation should be properly enforced, and where new legislation is required, this will require substantial outside assistance, since many countries lack the necessary legal expertise.
2. Capacity building in all areas of ocean, coastal, and watershed management is a priority for the subregion. This will require a concerted effort on the parts of national, regional, and international education and training institutions, and significant funding. All future projects should be required to include a capacity-building component and should engage local communities.
3. The raising of public awareness on all coastal and ocean-related topics is badly needed, from the level of the village to that of government, planners, and decisionmakers. Schools, NGOs and the media should all play a part in this process. For the schools, this would require a significant investment in the development of national school curricula that reflect local needs.
4. Integrated planning and decisionmaking is a necessity for all governments. This requires a new paradigm in government and involvement of all parties in the process, especially the stakeholders. For most countries, the development of an integrated coastal management plan should be a national priority.

5. There is a great need for research on and monitoring of the coastal and ocean environments of the subregion. The strengthening of research and monitoring capacity is an *a priori* need and, where necessary, regional and international cooperation and involvement of communities, NGOs, and the private sector should be encouraged. The need should be expressed in all future bilateral and multilateral aid projects, and funding sought to support it. The strengthening of the research and monitoring capacity of national and regional universities should be encouraged, as well as cooperation with developed country institutions through partnership arrangements.
6. The regional and global lobbying of the PICs is commendable, well organized and effective. This now needs to be brought down to the local community level, and proper feedback mechanisms between researchers, managers, government, and communities need to be developed.
7. Environmental sustainability needs to be given greater emphasis by governments, many of which lack a relevant ministry or department for the environment. Implementation of sustainability policies will require political will, cooperation, and the provision of appropriate resources.
8. All PICs developed National Environment Management Strategies (NEMS) as a lead-up to UNCED. Yet, many of the recommendations have yet to be implemented, and the NEMS are a decade out of date. The NEMS should be dusted off, revised if necessary, and translated into actions. The recommendations contained within NEMS could be linked to economic development plans, in the form of National Sustainable Development Plans.
9. PICs must take greater ownership of projects managed by regional organizations, as it is the countries themselves who will have to implement sustainable practices. Countries must strive and seek support to bring this about, because if they fail to do so it could be at their peril for the future.

The Strategic Action Plan for the International Waters of the Pacific Small Island Developing States was developed through an extensive consultative review [SPREP, 2001]. This review comprised national committees and formation of a regional task force, whose ultimate task was to prepare documentation for SPREP's International Waters (IW) Project, which commenced in 2001. The IW Project is tackling specific issues within the Strategic Action Plan, and a total of 14 demonstration projects are under development regionwide. Policy issues are paramount in the International Waters Strategic Action Plan.

The Strategic Action Plan identified three priority transboundary concerns related to international waters: *(1)* degradation of water quality; *(2)* degradation of critical habitats; and *(3)* unsustainable use of living and nonliving resources. These concerns closely relate to those identified under GIWA. SPREP summarized the principal issues needed to address priority environmental concerns among PICs [Table 4].

Table 4: Strategic Action Plan to Address Environmental Concerns in PICs

Goal	To achieve global benefit by developing and implementing measures to conserve, sustainably manage and restore coastal and oceanic resources in the Pacific region (Integrated sustainable development and management of International Waters).
Priority Concerns	Degradation of water quality: • Degradation of associated critical habitats • Unsustainable use of resources
Imminent Threats	Pollution from land-based activities: • Modification of critical habitats • Unsustainable exploitation of resources
Ultimate Root	Management deficiencies: • Governance • Understanding
Solutions	• Integrated coastal and watershed management • Oceanic fisheries management
Activity Areas (Coastal)	• Improved waste management • Better water quality • Sustainable fisheries • Effective marine protected areas
Activity Areas (Oceanic)	• Sustainable ocean fisheries • Improved national and regional management capability • Stock and bycatch monitoring and research • Enhanced national and regional management links
Targeted Actions	• Management/institutional strengthening • Capacity building/institutional strengthening • Awareness/education • Research/information for decisionmaking • Investment

Source: SPREP [2001]

Lessons Learned

For 60 years, the Pacific Islands region has demonstrated the unequivocal advantages of regional cooperation. The cooperation has developed during major changes at the national, regional, and global levels, spanning the period from the colonial era, to decolonization, followed by independence and the current neo-colonial era. The vestiges of colonization remain with the French and American territories and dependencies. The cooperation has given a larger voice to the small countries of the region, but at the same time it has accommodated their growing stature as independent nations with individual as well as collective voices in the corridors of the UN [South and Veitayaki, 1999]. Regionalism has also, while not without problems, allowed for collectivism while retaining individual ethnic and political independence. While the original colonial powers continue to play a significant role in the region, there is a growing trend for a gradual withdrawal, brought on by the rapidly changing priorities in the developed world, such as conflicts and natural disasters requiring considerable input of aid and resources elsewhere. Australia and New Zealand continue to play a significant role, since for them a peaceful "pond" is preferable to one that is divided.

The failures of regionalization are outweighed by the successes. South and Veitayaki [1999] summed up the lessons learned from regionalization as follows:

1. The South Pacific Ocean, while defying clear definition set in the context of the Regional Seas Programme, provides a good model for regional cooperation based on economic needs and common goals focusing on peaceful use of the oceans and on the management of marine resources.
2. The success of the regional approach in the Pacific has been predicated on the clear separation between socioeconomic issues and politics. In recent years, FORSEC has discussed difficult economic issues such as economic reform and integration. The "Pacific Way" has been a valuable tool for avoiding conflict between members.
3. The continued influence of past and current colonial powers has been a significant hindrance to the reaching of universal agreement on controversial issues such as the Nuclear Free Zone and on the management of transboundary, highly migratory fish stocks. Only after 60 years of regionalism have these and related issues been resolved.
4. Regionalism can proceed in parallel with decolonization and the advent of a neo-colonial era among 22 nations and dependencies with disparate culture, ethnic, and colonial origins. The regional

approach has allowed an effective response to the global initiatives of the UN system, and has added a collective regional voice to the individual voices of the member nations at the global level.

5. The differing memberships of the various Pacific Island regional bodies have been a cause of some difficulties, such as historic differences which remain and have the potential of leading to a fracturing of regional responses and to competition for increasingly scarce donor funds for program implementation.
6. The dependence of Pacific Island regional bodies on external funding, and the inability of the member nations to provide the necessary operating funds and human resources, is a growing concern. Solutions to this might include a scaling down of regional bodies, the elimination of duplicate or parallel programs, the injection of more funds by member nations, and the soliciting of funds from new donors, including from Southeast Asia. This will, in turn, have a potentially significant effect on the direction and extent of programs.
7. The dependence of the Pacific nations on assistance from regional bodies has led to a tendency to give low priority on national capacity building. It has also led to a tendency to support regional bodies instead of national institutions.
8. There has been a tendency among some metropolitan donors to hijack aid funds provided to regional bodies in support of their own consultants, or to run parallel programs.
9. The feeling within the region on the need for decentralization and a better distribution of the regional bodies among member nations. The hosting of regional organizations in a small number of centrally located and "better-suited" nations has proven to be very expensive, and does not always enhance the performance of the regional bodies. Apart from the rivalry between countries vying to host regional organizations, additional costs are incurred frequently because of the political decisions made regarding their location.
10. The countries of the region are benefiting from the operations of the regional organizations. There are, however, concerns over their commitment to the organizations. Some renege on their financial contributions, which are important if the regional organizations are to be sustainable. The metropolitan powers cannot be relied upon to continuously contribute as much, while the view of member states with regard the regional organizations as fountains of wealth and support must stop.
11. The collective regional organizations need an effective coordinating mechanism, otherwise there is a danger of duplication of work and the likelihood that different organizations will do as they

please with little concern as to whether they are meeting the needs of their member countries. Today, CROP is fulfilling part of this role. This remains to be seen with the development of the Pacific Plan and the focus on means of attaining deeper and meaningful regional cooperation and integration.

Prognosis

The best measures of the prognosis for the region are already outlined in the actions referred to in previous sections. They are also contained or reflected in various regional strategies and action plans of governments, the regional organizations, and international NGOs, and are enhanced and embellished in the Mauritius Strategy for the further implementation of the Programme of Action for Sustainable Development of Small Island Developing States (or BPOA), which resulted from the international meeting convened in Port Louis, Mauritius from 10–14 January 2005 [Mauritius, 2005].

The readily available BPOA, the Johannesburg Programme of Implementation and Mauritius Strategy make it unnecessary to repeat them here. Among the most important issues, however, is the need to create or improve on existing enabling environments at the global, regional, and national levels, and to find mechanisms to provide the funding needed for their implementation. Global issues are impacting on the Pacific Islands region at an accelerating pace, and time is now of the essence if the region is to ameliorate or reverse the impacts of natural and human-induced factors on the fragile ecosystems and communities of the Pacific Islands.

References

Aqorau, T. 2003. "Customary rights and the law." *Pacific Islands Ocean Forum*, 1(8):1–3.

Aqorau, T. and J. Low. 2004. "The role of the Pacific Islands Forum in ocean governance." Background Paper Presented at the Pacific Islands Regional Ocean Forum, 2–7 February 2004, Suva, Fiji.

Ball, M.M. 1973. "Regionalism in the Pacific Commonwealth." *Pacific Affairs*, 46:232–253.

CIA World Factbook. 2003. www.cia.gov/cia/publication/factbook. [Accessed in 2004].

Cicin-Sain, B. and R.W. Knecht. 1989. "The emergence of a regional ocean regime in the South Pacific." *Ecology Law Quarterly*, 16:171–211.

Dalzell, P., T.J.H. Adams and N.V.C. Polunin. 1996. "Coastal fisheries in the Pacific Islands." *Oceanography and Marine Biology: An Annual Review*, 34:395–531.

Duncan, R., S. Cuthbertson and M. Bosworth. 1999. *Pursuing economic reform in the Pacific*. Asian Development Bank, Manila.

Fa'asili, U. and M. King. 1997. "Community-based marine protected areas." Paper presented during the 6th South Pacific Conference on Nature Conservation and Protected Areas, 29 September – 3 October 1997, Pohnpei, Federated States of Micronesia.

Fairbairn, T.I.J. 1994. "Pacific Island economies. Structure, current developments and prospects," pp. 11–24. In: *Pacific Islands Yearbook*. 17th Edition. Edited by N. Douglas and N. Douglas. Fiji Times, Suva. vii + 767 pp.

FAO (Food and Agriculture Organization). 1972. *Atlas of the living resources of the seas*. FAO Fisheries Circular No. 126. Food and Agriculture Organization, Rome.

FFA (Forum Fisheries Agency). 1987. "Regional organisations in the South Pacific." FFA Report 87/43. Honiara, Solomon Islands.

Fry, G.E. 1979. *South Pacific regionalism: The development of an indigenous commitment*. Unpublished M.A. Thesis. Australian National University.

Fry, G.E. 1981. "Regionalism and international politics of the South Pacific." *Pacific Affairs*, 54:455–484.

Green, A. 2004. *Solomon Islands marine assessment — Key findings*. The Nature Conservancy. Unpublished. 2 pp.

Green, E.P and F.T. Short. 2003. *World atlas of seagrasses*. University of California Press, Berkeley. xii + 298 pp.

Haas, M. 1989. *The Pacific Way. Regional Cooperation in the South Pacific*. New York.

Heathcote, P. 1997. *Maritime law in the South Pacific — Towards harmonisation*. PhD Thesis. The University of the South Pacific, Suva. XII + 283 pp., Appendices.

Herr, R. 1989. "Organisations and issues in South Pacific regionalism," pp. 155–180. In: *New Zealand and the Pacific*. Edited by R. Alley. Boulder.

Herr, R. 1990. "Regional cooperation in the 1990s: An assessment," pp. 341–351. In: *The Forum Fisheries Agency: Achievements, challenges and prospects*. Edited by R. Herr. Institute of Pacific Studies, University of the South Pacific, Suva. xiii + 446 pp.

Hoadley, S. 1992. *The South Pacific foreign affairs handbook*. Allen & Unwin, Sydney.

Hoadley, S. 1994. "Intergovernmental organisations in the South Pacific," pp. 45–59. In: *Pacific Islands Yearbook*. 17th Edition. Edited by N. Douglas and N. Douglas. Fiji Times, Suva. vii + 767 pp.

IMPAC (International Marine Project Activities Centre). 2003. "Workshop on law and the environment in the Pacific: For countries and states of the Melanesian Spearhead Group, 29 March–02 April 2004." Unpublished report.

Lovell, A., H. Sykes, M. Deiye, L. Wantiez, C. Garrigue, S. Virly, J. Samuelu, A. Solofa, T. Poulasi, K. Pakoa, A. Sabetian, D. Azfal, A. Hughes and R. Sulu. 2004. "Status of coral reefs in the South West Pacific: Fiji, Nauru, New Caledonia, Samoa, Solomon Islands, Tuvalu and Vanuatu," pp. 337–361. In: *Status of Coral Reefs of the World*: 2004. Volume 2. Edited by C. Wilkinson. Australian Institute of Marine Science, Townsville.

Low, J. 2002. Paper presented to the SEAPOL Inter-regional Conference held in Bangkok on 21–23 March 2001. In: *Ocean governance and sustainable development in the Pacific Region*. Edited by N. Douglas, M. Johnston and A. Sirivinatnon. Southeast Asian Programme in Ocean Law, Policy and Management.

Mauritius. 2005. "Strategy for the further implementation of the Programme of Action for the sustainable development of small island developing states." International Meeting to Review the Implementation of the Programme of Action for the Sustainable Development of Small Island Developing States. Port Louis, Mauritius. 10–14 January 2005. 29 pp.

Neemia, U. 1986. *Cooperation and conflict: Costs, benefits and national interests in Pacific regional cooperation*. University of the South Pacific, Suva.

Scott, D.A. 1993. *A directory of wetlands of Oceania*. International Waterfowl and Wetlands Research Bureau and Asian Wetland Bureau. Slimbridge and Kuala Lumpur.

Secretariat of the Pacific Community. 2004. Statistics obtained from the Demography/Population Section, SPC, Noumea.

Skelton, P.A. 2000. *A floristic survey of the benthic marine algae of the Palolo Deep National Marine Reserve of Samoa*. M.Sc. Thesis. University of the South Pacific, Suva, Fiji. iv + 179 figures +173 pp.

South, G. R. and P.A. Skelton. 1999. *The Pacific Islands in the twenty-first century*. UNEP and IOI. San José, Costa Rica. 41 pp.

South, G.R., P.A. Skelton, J. Veitayaki, A. Resture, A. Carpenter, C. Pratt and A. Lawendrau. 2004. "The Global International Waters Assessment for the Pacific Islands: Aspects of transboundary, water, and coastal fisheries issues." *Ambio*, 33 (1–2):98–106.

South, G.R. and J. Veitayaki. 1999. "Global initiatives in the South Pacific: Regional approaches to workable arrangements." Asia Pacific School of Economics and Management Studies Online. Asia Pacific Press, Australian National University. 52 pp.

South Pacific Forum (Pacific Islands Forum), Forum Communiqués. 1999, 2000, 2002, 2003 and 2004.

Spalding, M.D., C. Ravilious and E.P. Green. 2001. *World atlas of coral reefs*. UNEP-WCMC, University of California Press, Berkeley. 424 pp.

SPREP. 2001. *Action Plan for managing the environment of the Pacific Islands region 2001–2004*. South Pacific Regional Environment Programme, Apia. 28 pp.

Sulu, R.J., R. Cumming, L. Wantiez, L. Kumar, A. Mulipola, M. Lober, S. Sauni, T. Poulasi and K. Pakoa. 2002. "Status of coral reefs in the Southwest Pacific region in 2002: Fiji, Nauru, New Caledonia, Samoa, Solomon Islands, Tuvalu and Vanuatu," pp. 181–201. In: *Status of Coral Reefs of the World*: 2002. Edited by C. Wilkinson. Australian Institute of Marine Science, Townsville. x + 378 pp.

Sutherland, W.M. 1986. "Coastal state co-operation in fisheries: Emergent regional custom in the South Pacific." *International Journal of Environmental Law*, 1(1):15–28.

Sutherland, W.M. and B.M. Tsamenyi. 1992. *Law and politics in regional cooperation: A case study of fisheries co-operation in the South Pacific*. Pacific Law Press. ii + 160 pp.

Tawake, A. 2004. "The Fiji Locally Managed Marine Area (FLMMA) Network experiences." Pacific Islands Regional Ocean Forum, 2–6 February 2004, Suva, Fiji. Microsoft PowerPoint Presentation, PIROF documents CD.

Toupou, S.T.T., J. Gabut, R. Herr, S. Nandan and S. Siwatibau. 1995. "Review of regional arrangements in the marine sector." Final Report. Nuku'alofa, Tonga. July 1995. (Mimeographed).

Tuqiri, S.K. and G.R. South. 1993. "South Pacific regional development: The role of the International Ocean Institute." International Ocean Institute Pacem in Maribus Conference XXI. Takaoka, Japan [Unpublished].

UNEP. 2004. *Global International Waters Assessment. Pacific Islands.* GIWA Regional Assessment 62. Written by G.R. South, P.A. Skelton, J. Veitayaki, A. Resture, A. Carpenter, C. Pratt and A. Lawendrau. University of Kalmar, Sweden. 100 pp.

Veitayaki, J. 1995. "The peaceful management of transboundary resources in the South Pacific," pp. 491–506. In: *The peaceful management of transboundary resources.* Edited by G.H. Blake, W.J. Hildesley, M.A. Pratt, R.J. Ridley and C.H. Schofield. International and Environmental Law Policy Series. Graham and Trotman/Martibus Nijhof, London.

Wauthy, B. 1986. *Physical ocean environment in the South Pacific Commission area.* UNEP Regional Seas Reports and Studies 83. United Nations Environment Programme, Nairobi.

Wells, S.M. and M.D. Jenkins. 1988. *Coral reefs of the world: Central and Western Pacific.* Volume 3. United Nations Environment Programme and International Union for the Conservation of Nature, Nairobi and Gland. xlix + 329 pp.

Wilkinson, C.R. 1998. *Status of coral reefs of the world: 1998.* Global Coral Reef Monitoring Network and Australian Institute of Marine Science, Townsville, Australia. 184 pp.

Wilkinson, C.R. 2000. *Status of coral reefs of the world: 2000.* Global Coral Reef Monitoring Network and Australian Institute of Marine Science, Townsville, Australia. 363 pp.

Wilkinson, C.R. 2002. *Status of coral reefs of the world: 2002.* Global Coral Reef Monitoring Network and Australian Institute of Marine Science, Townsville, Australia. 378 pp.

Wilkinson, C.R. 2004. *Status of coral reefs of the world: 2004.* Global Coral Reef Monitoring Network and Australian Institute of Marine Science, Townsville, Australia. Volumes 1 and 2. xiii + 557 pp.

Woodroffe, C.D. 1987. "Pacific Island mangroves: Distribution and environmental settings." *Pacific Science*, 41:166–184.

ANNEX 1: Membership, Year of Foundation, and Headquarters of Pacific Islands Regional Organizations

	Pacific Islands Forum Secretariat 1971: Suva, Fiji	University of the South Pacific 1968: Suva, Fiji	Pacific Islands Forum Fisheries Agency 1979: Honiara, Solomon Islands	Pacific Applied Geoscience Commission 1972: Suva, Fiji	Secretariat of the Pacific Regional Environment Programme 1980: Apia, Samoa	Secretariat of the Pacific Community 1947: Noumea, New Caledonia
American Samoa				•	•	•
Cook Islands	•	•	•	•	•	•
Federated States of Micronesia	•			•	•	•
Fiji Islands	•	•	•	•	•	•
French Polynesia				•	•	•
Guam				•	•	•
Kiribati	•	•	•	•	•	•
Marshall Islands	•	•	•	•	•	•
Nauru	•	•	•	•	•	•
New Caledonia				•	•	•
Niue	•	•	•	•	•	•
Northern Mariana Islands					•	•
Palau	•		•	•	•	•
Papua New Guinea	•		•	•	•	•
Pitcairn Islands						•
Samoa	•	•	•	•	•	•
Solomon Islands	•	•	•	•	•	•
Tokelau		•	•		•	•
Tonga	•	•	•	•	•	•
Tuvalu	•	•	•	•	•	•
Vanuatu	•	•	•	•	•	•
Wallis & Futuna					•	•
Australia	•			•	•	•
France					•	•
New Zealand	•			•	•	•
United States of America					•	•

CHAPTER 22

The Evolving Partnership Model in Coastal and Ocean Governance in the Seas of East Asian Region — PEMSEA's Role

Chua Thia-Eng, Danilo Bonga, and Stella Regina Bernad

The majority of the regions of the world (as presented in this volume) opted to undertake UNEP's Regional Seas Model as the mechanism to implement coastal and ocean governance. The Model was fundamentally anchored on legally binding conventions and agreements and primarily driven by government actions. The Seas of East Asian region is one of the few which did not forge a regional convention [Bernad et al., 2006]. It has chosen to take another path: the Partnership Model. The term "partnership" is defined here as a relationship between two or more entities to collectively undertake an activity or several activities, and is not bound by legal agreements to achieve a common goal or vision. Instead, the Model is founded on moral obligations and premised on a "conduct of a good neighbor." A good partnership program is built upon the strength of each partner in terms of resources, expertise, and skills. They share benefits as well as risks in the process. In the context of ocean and coastal governance, the Model puts partnership among different stakeholders (State and non-State) at the center; recommends the integrated approach; and moves away from the current emphasis on project orientation to a more process- and result-oriented mode of operation [Kullenberg et al., 2006].

East Asia decided to undertake the Partnership Model because of two reasons [Bernad and Chua, in press]: the huge disparity in capacities among the countries in the region renders ineffective the conventional approach of equal accountability; and the realization that the responsibility to take care of coastal and marine environments must lie with national and local governments as well as with other stakeholders (acting as partners) including members of the civil society, the private sector, the academe, and international groups and institutions.

This chapter discusses the experiences of the Regional Programme on Building Partnerships in Environmental Management for the Seas of East Asia (PEMSEA). Since 1993, PEMSEA is funded by the Global Environment Facility (GEF) with the United Nations Development Programme (UNDP) and the International Maritime Organization (IMO) serving as the implementing and executing agencies, respectively.

The Seas of East Asia

The Seas of East Asia play a significant role in the livelihood, economic prosperity, and aspiration of the approximately 2 billion people of which more than 1.5 billion live 100 km from the coasts. Composed of six subregional seas or large marine ecosystems (LMEs), namely: Yellow Sea, East China Sea, South China Sea, the Gulf of Thailand, Sulu-Celebes Seas and the Indonesian Seas, the Seas of East Asia are bordered by the Korean Peninsula, Japan, and China in the north and surrounded by Vietnam, Cambodia, Thailand, Malaysia, Singapore, Philippines, Brunei Darussalam, Indonesia, and Timor-Leste towards the south [Figure 1]. Covering a total of 7 million km^2 of sea areas and drained by 8.6 million km^2 of major river basins (Mekong, Yangtze, Yellow, and Red), the Seas of East Asia are constantly enriched by the large amount of nutrients from land. A large part of the Seas of East Asia sits on the relatively shallow Sunda shelf which is rich in oil deposits. The Seas support one of the world's centers of marine biodiversity and sustain a third of world's coral reef and mangrove ecosystems, as well as a large area of mudflats and seagrass beds. The Seas, in fact, support no less than 40 percent of world fish production and 80 percent of world aquaculture production.

The East Asian economy is closely linked with maritime trade and activities related to shipping, energy, fisheries, manufacturing industries, and tourism development. The region's share of the global tourism industry is at 12 percent, valued at USD 85 billion. Being a major hub of maritime trade with a significant number of international and domestic seaports situated along the coastline — including 13 of the world's 20 largest seaports — the region harbors one of the busiest shipping lanes in the world. Half of the world's merchant fleets sail through the Straits of Malacca, Singapore, Sunda, and Lombok.

Figure 1: The Seas of East Asia and Major River Basins, Including the Major Ocean Currents

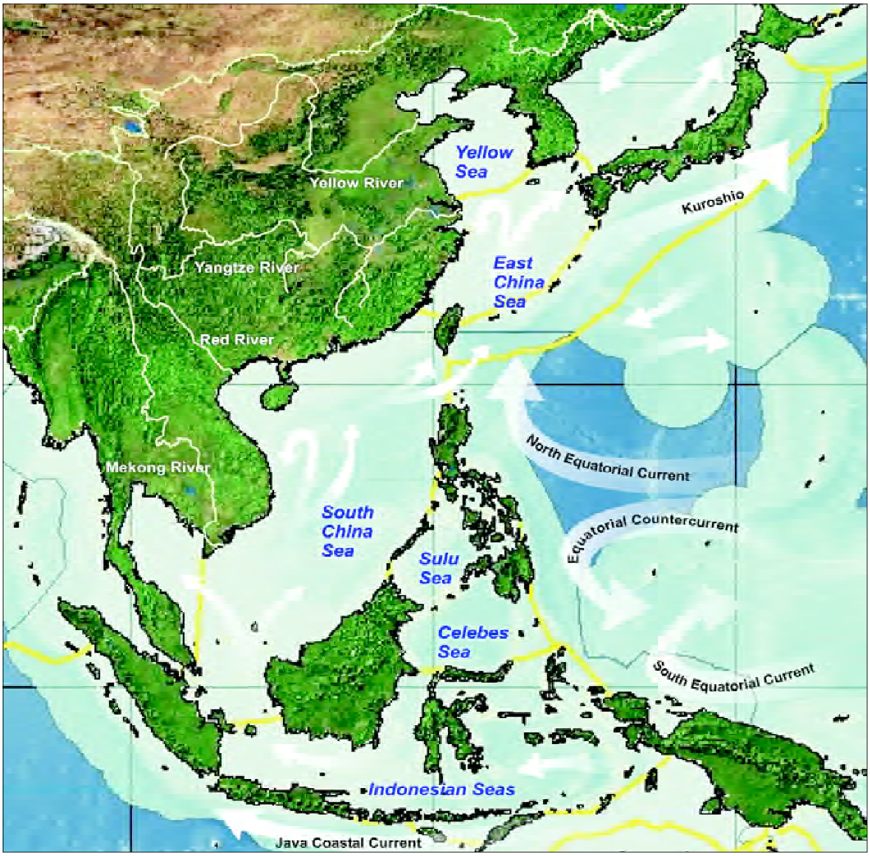


Table 1: International Conventions Relating to Marine Pollution Ratified by East Asian Countries (as of 30 September 2006)

CONVENTION / COUNTRY	MARPOL					London Convention		Intervention		CLC	
	1973/1978	Annex				Conv	Prot	Conv	Prot	Conv	Prot
	Annex I/II	III	IV	V	VI	1972	1996	1969	1973	1969	1992
Brunei Darussalam	86									D	02
Cambodia	94	94	94	94						94	01
China	83	94		88	06	85		90	90	D	99
DPR Korea	85	85	85	85							
Indonesia	86									78	99
Japan	83	83	83	83	05	80		71		D	94
Lao PDR											
Malaysia	97			97						D	04
Myanmar	88										
Philippines	01	01	01	01		73					97
RO Korea	84	96	03	96	06	93				D	97
Singapore	90	94	05	99	00					D	97
Thailand											
Timor-Leste											
Vietnam	91										03

NOTES: Numbers represent year of ratification; D = denounced; *For application in Hong Kong SAR only

MARPOL – International Convention for the Prevention of Pollution from Ships
London Convention – Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter
Intervention – International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties
CLC – International Convention on Civil Liability for Oil Pollution Damage

	FUND			Salvage	OPRC	OPRC-HNS	HNS	Bunker Oil	Anti-fouling	Ballast Water
	Conv 1971	Prot 1992	Prot 2003							
	D	02		1989	1990	2000	1996	2001	2001	2004
		01								
	D	99*								
				94	98					
	D									
	D	94	04							
					95				03	
	95									
					97					
		97								
	D	97								
		97			99					
					99	03		06		
					00					

FUND – International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage

Salvage – International Convention on Salvage

OPRC – International Convention on Oil Pollution Preparedness, Response and Cooperation

HNS – International Convention on Liability and Compensation for Damage in connection with the Carriage of Hazardous and Noxious Substances by Sea

Bunkers – International Convention on Civil Liability for Bunker Oil Pollution Damage

Anti-fouling – International Convention on the Control of Harmful Anti-fouling Systems on Ships

Ballast Water – International Convention for the Control and Management of Ships' Ballast Water and Sediments

"The Asian Century"

Looking back at the changes that have taken place over the last 50 years, the East Asian Seas region has made tremendous strides in the development of its economy. No other region can match its growth rate, effectiveness in reducing poverty, literacy eradication, and improving the standards of living of its populace. Countries of the region, despite a variation in terms of socioeconomic and political situations, have achieved varying degrees of economic growth. Some countries like Japan, Republic of Korea (RO Korea), and Singapore have transformed into economically developed nations and together with Brunei Darussalam, have a per capita income comparable with that of developed nations in the West. The region still has a large population earning under USD 2 per day [World Bank, 1998; World Bank, 2002]; however, many developing nations like Malaysia, Thailand, and China have effectively reduced the level of poverty in most parts of their coastal areas. The remarkable and vastly improved socioeconomic growth trends in Asia may well be the reason some prominent people consider the 21st century as the "Asian century" — in much the same way the 20th century is called the American century and the 19th century as the British century.

The Seas of East Asian region has demonstrated its capacity to cope with the recent financial crisis and the collective wisdom to refrain from boundary disputes [Valencia, in this volume]. The increasing accession to international conventions [Table 1 and 2] as well as support to nonbinding regional agreements indicates the commitment of national governments to comply with international codes of conduct.

Countries in the region have been working together through regional or international frameworks — such as the Association of Southeast Asian Nations (ASEAN), Asia-Pacific Economic Cooperation (APEC), the East Asian Seas Regional Coordinating Unit (EAS/RCU) which acts as the Secretariat for the Coordinating Body on the Seas of East Asia (COBSEA), the Mekong River Commission, the Intergovernmental Oceanic Commission/Subcommission for the Western Pacific (IOC/WESTPAC), the Southeast Asian Fisheries Development Center (SEAFDEC), the Network of Aquaculture Centres in Asia-Pacific (NACA), and the Action Plan for the Protection, Management and Development of the Marine and Coastal Environment of the Northwest Pacific Region (NOWPAP) — thus laying a good foundation for regional and subregional cooperation. Tan [2003] lists more than 12 regional programs and organizations run by UN agencies and other groups in the East Asian region.

As the region is situated in very risky areas, natural hazards in the form of earthquakes, typhoon, tsunami, haze, SARS virus, and avian flu virus have galvanized regional actions into mitigating the impacts of these

Table 2: International Conventions Relating to the Marine Environment Ratified by East Asian Countries (as of August 2006)

CONVENTION / COUNTRY	UNCLOS 1982	UN FCCC 1992	Biodiversity 1992	Ramsar 1971	CITES 1973	Migratory Species 1979	World Heritage 1972	Whaling 1946	Basel Convention 1989	Basel Protocol 1999	GPA* 1995	Biosafety Protocol 2000**
Brunei Darussalam	96				90				02			
Cambodia		95	95	99	97		91	06	01		Y	03
China	96	93	93	92	81		85	80	91		Y	05
DPR Korea		94	94				98					03
Indonesia	86	94	94	92	78		89		93		Y	04
Japan	96	93	93	80	80		92	51	93		Y	03
Lao PDR	98	95	96		04		87					04
Malaysia	96	94	94	95	77		88		93		Y	03
Myanmar	96	94	94	05	97		94					
Philippines	84	94	93	94	81	94	85	W	93		Y	
RO Korea	96	93	94	97	93		88	78	94		Y	
Singapore	94	97	95		86				96			
Thailand		94	04	98	83		87		97		Y	05
Timor-Leste												
Vietnam	94	94	94	89	94		87		95			04

NOTES: Numbers represent year of ratification/accession
* Participated in the Conference (23 October 1995)
W = Withdrawn
** As of 23 June 2006

UNCLOS – United Nations Convention on the Law of the Sea
UNFCCC – United Nations Framework Convention on Climate Change
Biodiversity – Convention on Biological Diversity
Ramsar – Ramsar Convention on Wetlands of International Importance
CITES – Convention on International Trade in Endangered Species of Wild Fauna and Flora
Migratory Species – Convention on the Conservation of Migratory Species of Wild Animals
World Heritage – Convention Concerning the Protection of the World Cultural and Natural Heritage
Whaling – International Convention for the Regulation of Whaling
Basel Convention – Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal
GPA – Global Programme of Action for the Protection of the Marine Environment from Land-based Activities

agents of disaster. A number of agreements to address these issues were signed, including: ASEAN Agreement of Transboundary Haze Pollution and a core program — the Flood Management and Mitigation Programme — through the Agreement on the Cooperation for the Sustainable Development of the Mekong River Basin.

The region has also demonstrated its concern for the environment as demonstrated by the vigorous national and regional activities (for example, collaborative research and monitoring and exchange of scientific information) that occurred in the last 2 decades. If these efforts are further reinforced with national coastal and ocean policy, the chances of attaining sustainable use of the marine resources and conserving the remaining ocean heritage will be many times greater.

Unfortunately, despite the impressive economic growth and a host of regional coastal and ocean management initiatives, generally, the environmental quality of the region has not shown any signs of improvement. Based on current environmental reports [GESAMP, 2001; ESCAP and ADB, 2000], the situation has actually worsened. A number of areas has been declared as models in the protection of their environment, but they are being eclipsed by the increasing number of pollution hotspots and widespread habitat destruction particularly in urban coastal cities and highly embayed bodies of water.

According to scientific reports [Chou, 1998; Bryant et al., 1998; Fortes, 1994; UNEP, 1998] the region loses about 10 percent of its mangrove wetlands each year and if left unchecked, the region would have lost all its mangroves by 2030. In the same vein, all coral reefs would collapse in 20 years, while most seagrass beds, which are abundant in many coastal areas, would have disappeared due to pollution, dredging, land reclamation, and by the effects of global climate change.

More than a Decade of Regional Efforts — The Role of PEMSEA

From 1993 to 2007, the major goals of PEMSEA were: *(1)* formulation and adoption of integrated approaches to managing land and water uses among participating countries; *(2)* development of human resources in areas of planning and sustainable management of coastal and marine areas; *(3)* demonstration of integrated coastal management (ICM) as a systematic and effective approach to managing land and water uses in coastal areas, especially at the local level; and *(4)* development and adoption of a sustainable regional mechanism to augment the national and regional commitment to protect and manage the coastal and marine environment of the East Asian Seas. Table 3 encapsulates the major achievements of PEMSEA in its almost 14 years of existence. A brief discussion of these is given below.

Pollution Prevention and Management Efforts (1993–1999)

During the pilot phase (1993–1999), PEMSEA was initially known as the Regional Programme for the Prevention and Management of Marine Pollution in the East Asian Seas (MPP-EAS). The initiative was a concerted regional effort to address marine pollution problems participated in by 11 countries in the region: Brunei Darussalam, China, Cambodia, Democratic Republic of Korea (DPR Korea), Indonesia, Malaysia, Philippines, RO Korea, Singapore, Thailand, and Vietnam. These countries are represented during the annual intergovernmental Programme Steering Committee (PSC) meetings during which time countries are able to thresh

Table 3: Major Milestones and Impacts Resulting in the Implementation of PEMSEA's Program of Activities

<table>
<tr><th>YEAR</th><th>MAJOR ACTIVITIES/MILESTONES</th><th>MAJOR OUTCOMES/IMPACTS</th></tr>
<tr><td colspan="3">Phase 1 (1993–1999)
Regional Programme for the Prevention and Management of Marine Pollution in the East Asian Seas (MPP-EAS)</td></tr>
<tr><td>1994</td><td>• Xiamen and Batangas Bay ICM Demonstration Projects launched
• 1st Programme Steering Committee (PSC) Meeting, Manila, 10 Countries attended</td><td rowspan="6">• Platform for regional cooperation and collaboration established
• Platform for regional information sharing established
• Network of regional experts established and strengthened
• Working models of ICM (Xiamen, China and Batangas, Philippines)
• Capacity building through training and infrastructure
• Sustainable financing developed and pilot-tested
• Working model for subregional/trans-boundary management (Malacca Straits)</td></tr>
<tr><td>1995</td><td>• First regional training course on ICM
• 2nd PSC meeting, Phuket</td></tr>
<tr><td>1996</td><td>• Malacca Straits Development Project launched
• 3rd PSC meeting, Kuala Lumpur</td></tr>
<tr><td>1997</td><td>• Local ICM Legislation approved by the People's Congress of Xiamen, PR China
• 4th PSC Meeting, Hanoi</td></tr>
<tr><td>1998</td><td>• Regional workshop to draft proposal of Marine Electronic Highway Demonstration in Straits of Malacca
• 5th PSC Meeting, Bali</td></tr>
<tr><td>1999</td><td>• International Conference: Challenges and Opportunities in Managing Pollution in the East Asian Seas
• 6th PSC Meeting, Manila</td></tr>
</table>

Table 3: (continued)

Phase 2 (1999–2007) Regional Programme on Building Partnerships in Environmental Management for the Seas of East Asia (PEMSEA)		
2000	• PEMSEA launched • 7th PSC Meeting, Dalian, 11 Countries attended	• Increase in the number of stakeholder (State and non-State) partnerships and cooperation • SDS-SEA adopted » common concerns » shared vision » framework for cooperation » building of trust » time-bound and focused on results • Replication of ICM model • Integrated management in larger water bodies • Environmental investment • Integrated information management system • Capacity development • Integrated regional mechanism • Financial support for PEMSEA Resource Facility (PRF) Secretariat Services by China, Japan, and RO Korea • GEF contribution of USD 80 million implemented through the World Bank's Nutrient Reduction Project (as part of implementation of the SDS-SEA)
2001	• Regional Network of Local Governments Implementing ICM established • 5 National ICM demonstration sites launched • 2 ICM parallel sites launched	
2002	• Manila Bay Declaration • Gulf of Thailand Project launched • Japan official joined PEMSEA • 8th PSC Meeting, Busan, 12 Countries attended	
2003	• EAS Congress 2003/Ministerial Forum • Putrajaya Declaration of the SDS-SEA adopted • 9th PSC Meeting, Pattaya	
2004	• Programme of Activities for the SDS-SEA Implementation proposed • 10th PSC Meeting, Xiamen	
2005	• Draft Partnership Agreement/Partnership Operating Arrangements prepared • GEF Concept Proposal on SDS-SEA Implementation approved • 11th PSC Meeting, Siem Reap	
2006	• Gulf of Thailand Joint Statement signed • Philippines National ICM Policy declared • EAS Congress 2006/Ministerial Forum • EAS Partnership Council launched • Haikou Partnership Agreement signed • Partnership Operating Arrangements finalized • 12th PSC Meeting, Davao • Cost-sharing Agreement between UNDP and the Government of Japan, RO Korea and China signed	
2007	• 1st EAS Partnership Council Meeting, Manado (Indonesia) • Construction of PEMSEA office building by the Government of the Philippines completed • PEMSEA 3rd phase — Implementation of SDS-SEA approved by GEF	• Partnership meeting between State and non-State partners • New head office for PEMSEA (operational) • Establishment of PRF Secretariat Services

out concerns and forge commitments and decisions in the implementation of the Programme activities. PEMSEA's flagship projects include demonstration sites in Xiamen (China) and Batangas (Philippines) and the initiatives in the Malacca Straits.

Through the years, the regional project has made significant achievements in demonstrating how environmental issues could be effectively addressed at the local level through the application of integrated coastal management (ICM). It developed two ICM programs in Xiamen and Batangas as working models for local governments. The two demonstration projects have made much progress and have integrated the ICM approach in their respective planning and economic development frameworks.

Today, Xiamen Municipality has become one of the cleanest cities in China and continues to achieve high economic growth (17–19 percent annual average GDP growth) without compromising its environmental quality [Chua, 2006b; PEMSEA, 2006a, 2006c]. It had effectively cleaned the degraded Yuandang "Lagoon," removed the obstructive cage and oyster farms in navigational channels, implemented sea-use zoning schemes, rehabilitated wetlands, protected endangered species, improved waterfront management, and implemented international and national environmental instruments [Chua et al., 2006; PEMSEA, 2006a, 2006c]. Xiamen has made great strides towards the goals of sustainable development. Xiamen is a good ICM model which has been demonstrating the integration of environmental concerns into its long-term economic development plans.

The ICM project in Batangas Province demonstrates a similar model of approach as that of Xiamen Municipality but under a different political and socioeconomic setting. Like Xiamen, it developed long-term strategic environmental management plans and successfully integrated the ICM approach into the provincial environmental management system. It became a major vehicle for interagency dialogue, consultation, and involvement through various project activities. Local capacity was developed in terms of integrated planning, environmental monitoring, and integrated environmental impact assessment, with stakeholders heavily involved in the development of action plans and their execution [PEMSEA, 2006b]. Nongovernmental organizations (NGOs) and the private sector operating in the bay area played a very significant role. A private sector-supported foundation known as the Batangas Coastal Resource Management Foundation (BCRMF) was established and worked closely with the provincial government to ensure environmental concerns were being addressed. The Batangas Bay project demonstrated how the private sector can fulfill its corporate responsibility by working together with the public sector and the NGOs.

The Straits of Malacca and Singapore were selected to demonstrate how the three countries bordering the Straits, namely: Indonesia, Malaysia, and Singapore, could collectively address the navigational safety and environmental issues of the Straits. Being one of the world's busiest international waterways with heavy traffic of oil tankers and container vessels crossing the narrow Straits each day and with hundreds of small- to medium-sized fishing vessels criss-crossing, navigational safety is certainly a major concern. The Project mobilized experts from the three countries to examine the environmental problems; undertook assessment of the economic values of the Straits as well as the risks associated with public and ecosystem health; and prepared a comprehensive profile of the Straits and a computerized information management system which includes relevant environment, socioeconomic, and demographic databases [MPP-EAS, 1998, 1999a, 1999b].

The outputs of the Straits of Malacca and Singapore project gave rise to new efforts to develop an information system integrating shipping information with environmental information in a computerized system [Chua and Ross, 1999]. This information system is known as the Marine Electronic Highway (MEH). The preparatory phase of the MEH, which was implemented by World Bank and IMO and participated by the three littoral countries, has been pilot-tested with funding by GEF. The project began its operation in 2004 [Hamzah, in this volume].

In addition to the above activities, the Regional Programme placed considerable emphasis on capacity building through the implementation of training courses, an internship program, and workshops. It also initiated the development of appropriate sustainable financing mechanisms — for example, the public-private partnerships — that could help local governments investing in environmental improvement projects.

Building Partnerships for Environmental Management (1999–2007)

In October 1999, the Regional Programme, renamed as "Building Partnerships in Environmental Management for the Seas of East Asia (PEMSEA)" became operational. The Regional Programme continued to be operated by GEF, UNDP, and IMO, but co-financing from the participating governments and donors was aggressively pursued to initiate ownership by governments and stakeholders. PEMSEA's activities have covered the following tasks:

- Developing additional ICM demonstration sites and their replication;
- Addressing environmental risk issues of pollution hotspots and subregional seas;
- Building capacity in environmental governance especially at the local level;

- Forging regional networking and developing a regional task force;
- Creating environmental investment opportunities;
- Providing scientific support to decisionmakers;
- Developing an integrated information management system (IIMS);
- Enhancing communication to promote stakeholder collaboration;
- Promoting the development of national marine policy; and
- Developing appropriate regional collaborative arrangement.

The pilot phase built a lasting working relationship among the participating countries, but it became apparent that environmental issues require a lot more funds and high-level political commitment in the execution of management interventions. It was also realized that governments alone cannot resolve environmental management issues, more so in reversing the damages caused by environmental threats. Further work was built on forging partnerships with all stakeholders. Many environmental issues — especially those that are transboundary in nature — require intergovernmental, interagency, as well as intersectoral partnership and collaboration. Thus the follow-on project placed "building partnerships" as the main target.

Intergovernmental Partnerships

The Partnership Programme began its operation in October 1999 with the same 11 participating countries while Japan participated in 2001. The partnership arrangement includes co-financing the Programme activities with in-cash and/or in-kind contributions; joint undertaking of training courses; and collaboration in special projects or contribution of expertise in training and/or as resource persons for workshops or conferences organized by the Programme.

Intergovernmental partnerships at the local government level were facilitated through the PEMSEA Network of Local Governments for Sustainable Coastal Development (PNLG). PEMSEA promoted the development of ICM demonstration sites and their replication through the establishment of ICM parallel sites in each participating country. A demonstration or a parallel site develops and implements a set of ICM programs based on the standard framework and processes developed and tested by PEMSEA. The establishment of the PNLG has so far created close working relationships, synergies, and linkages among sites. The 23 local government members of the network take turns in hosting the annual workshop for sharing of experiences, lessons of achievements, and challenges. Such local government partnership, based on common goals and interests, has laid a good foundation for regional collaboration.

Interagency Partnerships

A major focus of the Regional Programme is to forge interagency partnerships at all levels of government. This is a very difficult task as interagency conflicts among government line agencies have been the main cause for duplication of efforts, intensification of bureaucratic red tape, and difficulty in law enforcement. In fact, government agencies' actions (or inactions) contribute a large part in environmental degradation and resource overexploitation.

PEMSEA has promoted interagency partnerships through the following activities:

- **Involving concerned government agencies in the development and implementation of ICM at the local government level.** In all of PEMSEA's ICM projects at its demonstration and parallel sites in nine countries, namely: Bali and Sukabumi (Indonesia), Bataan, Batangas, and Cavite (Philippines), Chonburi (Thailand), Danang and Quang Nam (Vietnam), Nampho (DPR Korea), Port Klang (Malaysia), Shihwa (RO Korea), Sihanoukville (Cambodia), and Xiamen (China), government agencies and other stakeholders are part of Project Coordinating Committees (PCCs) that provide policy direction and inputs for the implementation of the ICM project. Partners from several agencies usually include: fisheries, agriculture, forestry, environment, planning, marine, ports and harbors, tourism, public health, drainage, and mining. Through the PCCs, specific activities can be undertaken by the relevant line agencies such as activities related to risk assessment or environmental impacts assessment, zoning schemes, coastal profiles and strategies, economic valuation of natural resources, and so on. A similar coordinating committee was set up for the management of Manila Bay in the Philippines.
- **Strengthening interagency participation in addressing issues of common interest.** A good example is the oil spill risk assessment and response project for the Gulf of Thailand, Manila Bay, and Bohai Sea. The projects in each site involve a number of agencies (environment, fisheries, ports, marine, navy/coast guards, legal) in response to a pre-determined risk to oil or chemical spills. The preparation of oil spill response contingency plan, deployment of response equipment, training of personnel, air surveillance, the identification of economic impacts and damage recovery claims, and so on, require multiagency and multidisciplinary participation.

Over the years, PEMSEA has acquired good working experience in building interagency partnerships. The coastal strategies that are developed at each demonstration site present a very effective and useful environmental management framework and platform, where each concerned line agencies can find their niches and specific roles towards achieving a common vision or development objectives.

Intersectoral Partnerships

A major objective of forging multisector partnerships stems from the increasing conflicts arising from the multiple uses of natural resources. Multiple-use conflicts between sectors have severely undermined national and local efforts towards achieving sustainable use of natural resources. PEMSEA has involved relevant sectors of the economy especially the private sector, the NGOs, the academe, and the media through forging partnerships with and among them in the formulation and implementation of action plans in environmental management activities.

In Bataan Province, where an ICM program has been developed and enforced, the private sector, the media, and the academe play very significant roles in the development and implementation of various activities of the ICM program. In fact, a strong partnership has been forged between the provincial and municipal governments with the industries — through the Bataan Coastal Care Foundation — to support government initiatives. The Foundation shoulders half of the total cost of the ICM program. Such partnership was further reinforced by the heavy involvement of the local media, which kept the public of the province regularly informed. This has resulted in a well-informed public that is more sympathetic of and willing to cooperate with government initiatives. The usefulness of such partnership is well recognized and has contributed to several national and international awards for the province.

The level of multisector partnership arrangement depends on the socioeconomic, political, and cultural conditions of each country. PEMSEA's experience shows that it is much more effective when forging such partnerships at the local level instead of at regional and national levels. Multisector cooperation and collaboration was successful in many ICM projects such as those in Bali, Sukabumi, Batangas, and Chonburi. In some countries such as China and DPR Korea, multiple sector partnership is less obvious due to the nature of the political system.

Role of ICM: Linking Local Initiatives with National and International Prescriptions

It is apparent from the previous discussion that PEMSEA put particular significance in applying the ICM framework to implement its program of actions. This impetus was created as part of an international trend: ICM was widely prescribed, accepted, and implemented compared to other integrated frameworks. (And primarily because seed and grant monies were widely lobbied and channeled into ICM initiatives in the 1980s and 1990s.) Many international conventions endorsed and chose ICM as a management framework, namely: Agenda 21 and the Rio Declaration; Convention on Biological Diversity; Framework Convention on Climate Change; Global Programme of Action on the Protection of the Marine Environment from Land-based Activities; Barbados Programme of Action for Sustainable Development of Small Island Developing States; International Coral Reef Initiative; Code of Conduct for Responsible Fisheries; and Plan of Implementation for the World Summit on Sustainable Development.

The rhetoric to use ICM well into the 1990s and in recent years was also based on the imperative to ease the "bottleneck" which resulted in tremendous increase in the number of policy reforms and directions to effect coastal and ocean governance whereas many of these policies remained unimplemented on the ground. It was realized that although most prescriptions and decisionmaking and planning processes were derived and carried out at the national, regional, and international levels, it is now agreed that the accomplishment of management interventions must rely on local implementation, regardless of the level at which the plans and decisions were made. The mantras: "all politics are local;" "all (economic) developments are local;" and "all disasters are local" are underpinned by the impetus driven by local concerns and stakeholders. In other words, the success of reforms in policies and their implementation depend on how local policymakers and executives conduct themselves. In the same token, business — and how an area develops and flourishes — is based on local norms and behaviors. In the case of disaster risk reduction, we know that the ramifications of disasters are global, but they first and foremost affect a specific, unique culture, environment, and locality.

Thus, the principle of subsidiarity — according to which decisions are evaluated from the macro to lowest possible level, given the wide range of problems to be addressed — is made fully operational through an ICM program. ICM practitioners are known as the *de facto* neutral brokers in the overall scheme of coastal and ocean governance because they create the much needed platform for interdependence: its experts and practitioners have grounded their action on processes that balance the peculiarities of the political, economic, and civil/social actors thereby optimizing economic and development gains within a culture of stewardship, care for the environment, and community well-being. In addressing disparities of views and objectives, ICM creates a platform for communicating effective and nuanced local responses to coastal management concerns.

The SDS-SEA: "Think globally (and regionally); act locally"

PEMSEA committed to the following before the completion of its second phase [UNDP, 1999]:

- A policy framework for building partnerships in environmental protection and management of the Seas of East Asia;
- A regional arrangement for implementing international conventions in the East Asian Seas including mode of operation and a sustainable mechanism;
- Establishing a regional marine environment resource facility to implement regional initiatives in coastal and ocean governance;
- Conducting a policy conference on regional arrangements for implementing international conventions in the East Asian Seas; and
- Developing a functional regional mechanism to sustain existing coastal and ocean management efforts.

The abovementioned objectives were the driving force in the completion of one of the biggest achievements of PEMSEA: the development and adoption of the region's policy instrument — the Sustainable Development Strategy for the Seas of East Asia (SDS-SEA). It is a document that outlines a shared vision as well as the collective strategies and approaches to achieve the goals of sustainable development in the region [PEMSEA, 2003b].

The inspiration in the development of the SDS-SEA came as a result of a decade of efforts and activities undertaken by PEMSEA as well as the parallel paradigm shifts in governance coming from the prescriptions arising from international initiatives.

The development of the SDS-SEA followed the process of consensus building and consultation [PEMSEA, 2005; Lowry and Chua, in this volume]. From 2000 to 2003, and during the PSC meetings [PEMSEA, 2000, 2002, 2003a], the participating countries progressively deliberated and approved the development of the SDS-SEA [Bernad and Chua, in press].

The SDS-SEA began as the environmental strategy for the region ensuring the management of the marine pollution and protection of the coastal environment. Through the iterative consultations and meetings, it later became a full-blown sustainable development strategy: it now encompasses a broader, comprehensive view in coastal and ocean governance, integrating cross-cutting issues on environmental, socioeconomic, and political concerns.

The SDS-SEA incorporated relevant international conventions and agreements, as well as lessons learned from the coastal and ocean governance experiences in the region [Chua, 2006a; Bernad and Chua, in press]. The SDS-SEA is a package of principles, relevant regional and international action programs, agreements and instruments, as well as implementation approaches for achieving sustainable development. It does not create a new set of obligations, but rather implements existing ones. The strategy offers guidance, references, and examples for assisting stakeholders in the development of their respective strategies, policies, integrated implementation of plans and investment approaches, in order to address specific national, local, and sectoral needs [Chua, 2006a].

Some of SDS-SEA's additional strengths and features include:

- The strategy does not reflect any individual country, international organization or sectoral interests, but represents a regional perspective, principles and guidelines, providing a platform for each stakeholder to play a contributing role and to cooperate with one another in addressing common issues and concerns [Chua, 2006a].
- The difference between the SDS-SEA and other regional strategies and programmes of action is the fact that it is primarily founded on the principles of sustainable development, and primarily based on existing partnership experiences within and among the countries of the East Asian region.
- It is a regional strategy for implementing both the relevant provisions of Agenda 21 and those of the WSSD Plan of Implementation, in effect directly implementing the Millennium Development Goal (MDG) on environmental sustainability and indirectly, the other goals pertaining to poverty, gender equality, health, and global partnership for development [Bernad and Chua, in press].
- It offers a regional framework for governments and other interested parties to implement, in an integrated or holistic manner, the commitments that they have already made. It addresses linkages among social, cultural, economic, and environmental issues and embodies a shared vision formulated by the countries and other major stakeholders in the region [Chua, 2006a].

In December 2003, during the Ministerial Forum of the EAS Congress in Malaysia, the Putrajaya Declaration was signed and has served as the ultimate instrument by which participating governments and collaborative partners served notice of their adoption of the SDS-SEA. The Putrajaya Declaration committed countries, on a voluntary basis, to regional cooperation and collaboration for the implementation of the SDS-SEA. It established the SDS-SEA as a common platform among the countries for regional cooperation, and as a framework for policy and program development at the national and local levels.

Next Step: SDS-SEA Implementation

With the adoption of the Putrajaya Declaration, what follows is the implementation of the SDS-SEA which requires a long-term commitment, policy reforms, strategic management interventions, and significant financial resources [PEMSEA, 2007]. To begin implementation of the SDS-SEA, an institutional regional mechanism was required to oversee and coordinate the long-term implementation of the Strategy.

In the process of reaching the decision on a regional mechanism, PEMSEA was recognized as the *de facto* implementing mechanism for the SDS-SEA. As such, countries endorsed the transformation of PEMSEA from a project-based entity into a regional partnership mechanism.

The regional mechanism is not legally binding, as is the case with regional conventions. Rather it is an innovative regional arrangement founded on the principles of partnership [Box 1] and dedicated to the achievement of the shared vision and objectives of the SDS-SEA. As a partnership, the regional arrangement is outcome-oriented, meaning that the partnership ceases when the respective objectives of the partners have been achieved, individually and/or collectively. PEMSEA envisions a partnership approach that will: *(1)* allow transparency and move away from "least common denominator" results common among rules-based governance mechanisms; *(2)* innovate the institutionalization of stakeholder involvement; and *(3)* forge the habit of cooperation until partners become comfortable with the idea of an institutionalized mechanism, which calls for binding instruments.

The Haikou Partnership Agreement and Partnership Operating Arrangements — prepared over a 3-year consultation period with governments and partners, in order to outline the institutional arrangements and terms of operation of the new mechanism — were adopted during the East Asian Seas (EAS) Congress held in Haikou, China in December 2006.

The Partnership Agreement was developed as a nonbinding agreement among governments to transform PEMSEA into an effective, self sustaining regional collaborative mechanism for the implementation of the SDS-SEA [Figure 2]. The institutional arrangements that are identified in

Box 1: The Partnership Approach

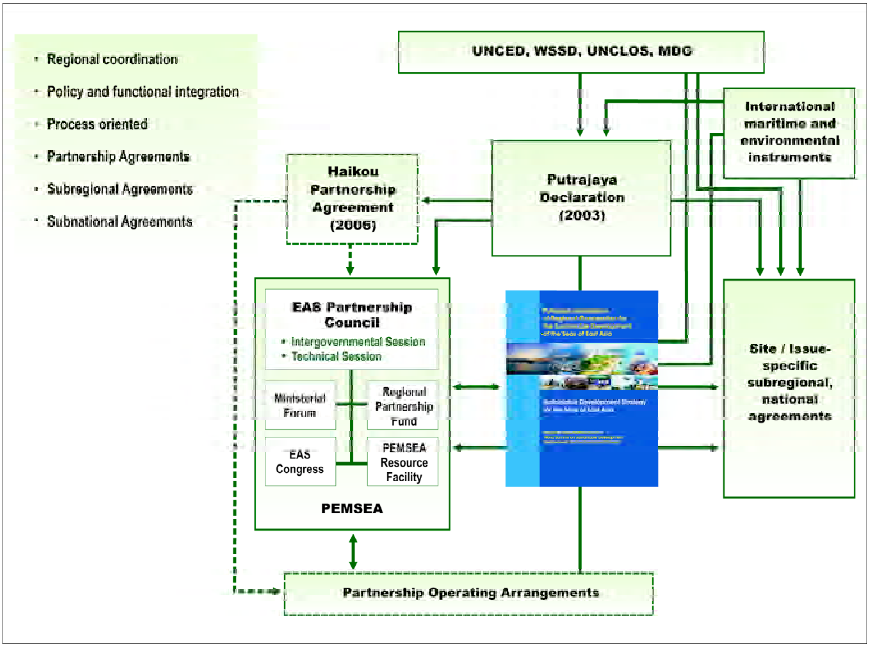
- ***Widely endorsed*** in international instruments such as Rio Declaration and the Johannesburg Plan of Implementation to allow the creation and promotion of partnerships to incorporate and mobilize various stakeholders from the local, national, regional and global level to join hands. Principle 27 of the Rio Declaration states that "States and people shall cooperate in good faith and in the spirit of partnership in the fulfillment of the principles embodied in this Declaration and in the further development of international law in the field of sustainable development" (Rio Declaration on Environment and Development, 1972).
- Partnerships ***fosters cooperation and collaboration*** *among governments* and with other nontraditional parties or stakeholders in coastal and ocean governance; to effectively address the growing concerns of the coastal and ocean environment, multisectoral, interagency and intergovernmental cooperation is necessary.
- Partnership entails ***building of trust and understanding***. This element enables the establishment of cooperation and collaboration even with conflicting or disparate parties, leading to a paradigm shift in coastal and ocean management by providing a ***more open and flexible*** means of cooperation.

Source: Bernad et al. [2006]

the Partnership Agreement, and detailed in the Partnership Operating Arrangements, are composed of the following interrelated components [Figure 3; Chua, 2006a; Bernad and Chua, in press; PEMSEA, 2007]:

- The **East Asian Seas Partnership Council** is the governing body. It is composed by governments of the region, as well as other stakeholders, including UN and international agencies, regional programmes and projects, donors, the private sector, and NGOs. The council is to be conducted in two sessions. A *Technical Session*, which will be attended by government representatives as well as concerned stakeholder partners, shall focus on technical matters relating to the implementation of the SDS-SEA. The *Intergovernmental Session* will be limited to government representatives. This Session will be responsible for policy matters and adoption of the recommendations of the Technical Session. Both Sessions will elect their own chairs. A Council chair will be elected under a joint session. The chairs shall comprise the Executive Committee.
- The **PEMSEA Resource Facility (PRF)** is a package of services and resources mobilized by PEMSEA to facilitate the implementation

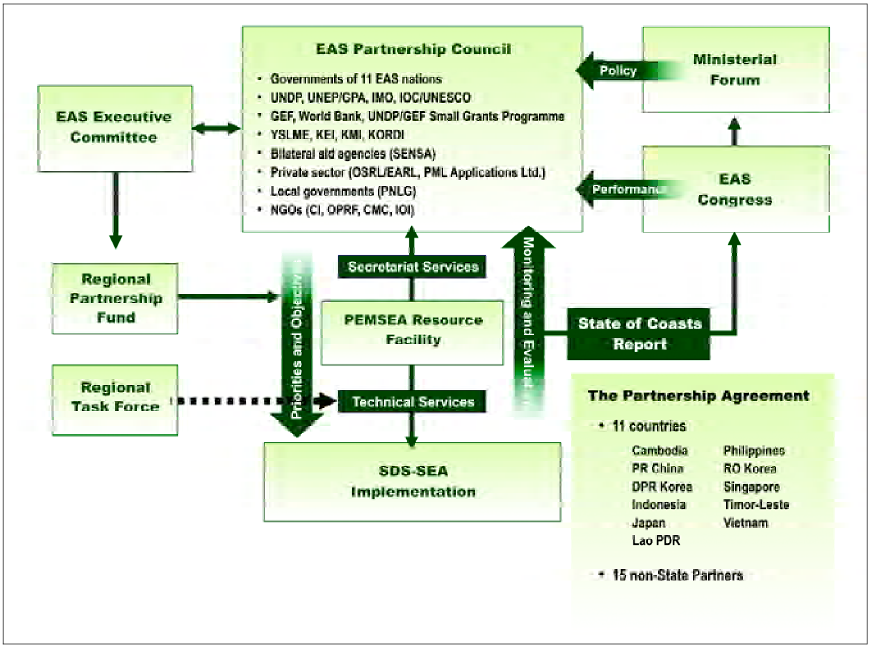
Figure 2: A New Paradigm in Regional Cooperation



of the SDS-SEA. It is made up of two functional units: *Secretariat Services* and *Technical Services*. The PRF Secretariat Services will act as the Secretariat to the Partnership Council and the Executive Committee. It will organize the Partnership Council and Executive Committee meetings, coordinate SDS-SEA implementation at the national level, coordinate various networks setup by PEMSEA, facilitate information dissemination and capacity building, and prepare the triennial EAS Congress, Ministerial Forum, and other major workshops. The PRF Technical Services will implement projects and programs, conduct training courses, and provide technical assistance to interested countries and other technical supports. It will be funded through the implementation of projects and services.

- The Regional Partnership Fund (RPF) is a type of a trust fund. It will address capacity disparities among and within countries regarding the implementation of the SDS-SEA. It will be built from donor contributions and other income arising from sale of goods (publication, software) and services from PRF Technical Services. The Fund will be used for specific activities for attaining the goals

Figure 3: Major Operating Mechanisms for the Implementation of the SDS-SEA



and objectives of PEMSEA. By operationalizing the RPF, PEMSEA will gradually shift from being fully dependent on GEF to future reliance on multiple sources of financial incomes. The SDS-SEA and the Programme of Activities can provide a framework through which donor communities can identify the projects and activities they want to support.

- The EAS Congress will become a regular event on the region's calendar. It will be held every 3 years as a means of bringing stakeholders, experts, and partners together to share and discuss areas of concern, performance, and achievements regarding sustainable development of the seas. The event will include an international conference, a ministerial forum, exhibits, a youth forum, and other side events. *A State of the Coasts* report will be issued during the congress.
- The Ministerial Forum will be held as an integral part of the EAS Congress. It will be attended by ocean-related ministers from the participating countries of PEMSEA. The Forum allows ministers to review the status of implementation of the SDS-SEA, renew commitments, and set new policy directions.

In 2006, the Governments of China, Japan, and RO Korea signed a cost-sharing agreement with UNDP formally providing financial support to the PRF Secretariat Services. In early 2007, the Government of the Philippines constructed a new PEMSEA office building and signed a new Memorandum of Agreement through the Department of Environment and Natural Resources to continue hosting PEMSEA in the Philippines. In June 2007, the GEF Council approved Phase 1 of a 10-year project (2007–2017) to implement the SDS-SEA, which facilitates the transformation of PEMSEA into a self-sustaining regional operating mechanism.

A Decade of Awareness and Confidence Building

PEMSEA places considerable importance in building public awareness at local, national, and regional levels by implementing target-oriented communication plans to build understanding and support from policymakers, government officials, local leaders, the private sector, and communities. Public awareness activities include: coastal cleanups, mangroves replanting, public forums, local media and regular radio programs, and activities involving school children, youth, and women. These activities build environmental awareness and increase local involvement and support for government ICM efforts. ICM demonstration and parallel sites such as those in Xiamen, Batangas, Chonburi, Bali, Bataan, Danang, and several others also play another role in convincing local and national leaders of what partnership could do in achieving economic and environmental sustainability.

The triennial EAS Congress is not only an international marketplace for exchange of information and experiences but also promotes regional solidarity and international cooperation and partnerships. This and other activities described above contribute to the process of building confidence in partnerships among the stakeholders. It is an indispensable element for the success of the Partnership Model.

Lessons Learned

Based on what PEMSEA has achieved using the Partnership Model, several key lessons are very apparent.

1. The Partnership Model allowed stepwise, incremental, cumulative, and evolutionary processes to coastal and ocean governance

PEMSEA was initially participated by 11 countries surrounding the Seas of East Asia. During the second phase of the Programme, with the participation of Japan in 2001 and since the Haikou Partnership Agreement, when Lao People's Democratic Republic and Timor-Leste have joined, PEMSEA has completed its intergovernmental partnership with all countries of the region collaborating in the implementation of the activities of the Regional Programme. The partnership among participating countries and partners allowed the articulation of each partner's strengths which were used as entry points and leverages in the successful completion of program interventions. For example, the GEF funding was matched with co-financing from governments and other donors; to date about USD 25 million was leveraged against GEF's USD 24-million contribution [PEMSEA, 2007; Lowry and Chua, in this volume]. Weaknesses in terms of capacity were identified and appropriate measures were subsequently utilized (for example, regional training using the network of experts in the region). Financing mechanisms have evolved through the years and allowed creation of public-private partnership, as what was piloted for sewage and sanitation facilities.

PEMSEA was able to implement international conventions and agreements through the years. During the first phase, the ratification and implementation of international conventions on marine pollution was pursued; during the second phase, and with the adoption of the SDS-SEA, the scope extended over international instruments relating not only to marine pollution but to the whole coastal and marine environment [Bernad and Chua, in press]. During the first phase, the international instruments were treated individually, particularly with regard to national government obligations; during the second phase, the need for a more integrated approach was acknowledged, as was the role of local governments in their implementation [Bernad and Chua, in press].

The evolutionary process of a Partnership Model is very apparent in the transformation of PEMSEA from a project-based mechanism to a functional regional mechanism. What is learned is that one action is used to build on to another initiative and is integrated to the whole scope of coastal and ocean governance.

However, bureaucratic difficulties and political setbacks are expected in the process of building partnerships. A partnership has a beginning but also an end when benefits or added values run out or when there is a change of political or agency leadership. From PEMSEA's experiences, such difficulties manifested during a change in concerned ministers/mayors and national focal points; or misinformation that resulted in misunderstanding of the objective of the regional mechanism; or concern over the financial commitments needed. This has resulted in temporary suspension or delays of some activities or even participation in the regional mechanism by a few countries. Considerable amount of effort have to be devoted to cultivate or "rekindle" relationships in order to continue the partnership arrangement. In short, the path to regional partnerships is rough; patience and persistence are needed to build trust and understanding. Thus the Partnership Model requires a long-term perspective as it takes time for the incremental gains to consolidate into confidence and strength.

2. The Partnership Model strengthened the principles-based governance

PEMSEA followed international prescriptions and principles and applied it on the ground. The gradual progressive move from environmental management (particularly marine pollution management and habitat protection) to a broader sustainable development framework was made following on what is being advocated internationally through the years.

The transformation in practice between the Rio (UNCED) and Johannesburg (WSSD) meetings and other prominent conferences is very apparent. The shift in approach was governed by incremental paradigm changes in principles (or the highlighting of a particular principle through the years). The 1980s saw marine pollution, environmental protection, and the conservation of key species become important issues. The 1990s saw the emergence of adaptive and ecosystem-based management, sustainable livelihood, and partnerships approaches. More recently, the onslaught of natural disasters gave impetus to the formulation of principles concerning vulnerability and resilience.

The tenets of how local, national, regional, and international institutions view the evolving challenges of governance in relation to our coasts and oceans have tremendously changed. Some refer to this phenomenon as "the basic cultural act of reframing. That is … [providing] a different lens (paradigms) and values to which to view and act in the world" [see Paul Ray Cultural Creatives in Perlas, 2000]. Refocusing the lens of coastal and ocean governance must now include not only protecting biodiversity and ecological integrity, and sustaining livelihoods, but also of saving human lives — the whole gamut of issues in the concept of "securing the oceans."

PEMSEA was successful because it added value to what is being prescribed internationally. It operationalized sustainable development principles through ICM: long-held principles of ocean and coastal governance such as adaptive management, integration, and ecosystem-based management were transformed from vague, abstract concepts into operable, concrete approaches [Chua, 2006b, in this volume]. This early, PEMSEA, through ICM, was able to operationalize the principle of scaling up in the context of three dimensions: *(1)* geographic expansion through the increase in numbers of ICM demonstration and parallel sites; *(2)* functional expansion through the linking of coastal management and watershed and river basin management; and *(3)* temporal consideration, when ICM is institutionalized and is now an integral part of more and more governments, not just something that is implemented in scattered projects.

3. The Partnership Model is inclusive, has a multiplier effect and builds on strategic partnerships and past experiences and achievements

During the last 4 decades, national efforts focused on establishing or restructuring national environmental and natural resources institutions such as the ministry/department of environment/environment and natural resources, building institutional capacity, addressing localized environmental issues, and undertaking knowledge-driven research projects and programs. Concurrently, the economic contribution of the marine sector and the increasing reliance on the seas and oceans for future economic development has led coastal nations in the region (such as China, Indonesia, Japan, Philippines, RO Korea) to develop national coastal and ocean policies. The interest in the exploitation of the exclusive economic zone and the high seas is certainly an obvious intention of the larger coastal nations but the increased impacts of the seas and oceans on human lives and property have also been the driving force for the policy shifts. More importantly is the increasing realization that the seas and oceans are a unified whole and in the East Asian Seas region, the political, socioeconomic, cultural, and ecological interconnectivities demand no less than a regional collaboration for sustainable use of the resources in the regional seas. These actions, therefore, were tied to what were agreed upon as activities to implement the SDS-SEA. Given the present disparity of national capacities, any inadequate resources can and hopefully will be supplemented by a network of partners in the region.

On the other hand, international efforts have made substantial contributions in building a better knowledge-base of the marine environment and the resources therein, especially the fishery resources and the habitats and ecosystems. Oceanographic studies, resource assessment, sensitivity mapping, pollution monitoring, and many other outputs from regional or subregional collaboration (such as Yellow Sea, South China Sea, and the Sulu-Celebes Seas) provide a wealth of information about the Seas of East Asia. These information provide the database upon which management strategies and interventions are undertaken.

Table 4: PEMSEA's Programme of Actions across and within Scales

	REGIONAL	SUBREGIONAL/NATIONAL	LOCAL
Agenda Setting	• Ministerial Forum • PSC Meetings • EAS Partnership Council		
Commitment	• SDS-SEA • Putrajaya Declaration • Haikou Partnership Agreement • Partnership Operating Arrangements	• Joint Statement for Oil and Chemical Spill Preparedness, Response and Cooperation in the Gulf of Thailand by Cambodia, Thailand, and Vietnam • Manila Bay Declaration • Bohai Sea Declaration	• Strategic Environmental Management Plan: Xiamen, Batangas • Coastal Strategy: Bataan, Danang, Bali, Chonburi, Klang, Nampho, Sihanoukville
Information- and Knowledge-sharing	• International Conference: Challenges and Opportunities in Managing Pollution in the East Asian Seas (1999); • EAS Congress (2003) • EAS Congress (2006)	• Regional Task Force • Regional Experts • National Task Force • Areas of Excellence	• PEMSEA Network of Local Governments for Sustainable Coastal Development (PNLG) • Technical Working Groups
Coordinating Mechanism/ Institutional Arrangement	• PEMSEA Regional Office • PEMSEA Resource Facility	• National Focal Points	• Project Coordinating Committee • Project Management Office • Sustainable Development Councils
Capacity Building	• Regional workshop to draft Proposal of Marine Electronic Highway Demonstration in Straits of Malacca • Regional ICM trainings • Specialized trainings (risk assessment, economic valuation, damage assessment, port safety) • Study tours • Internship and fellowship programs		

4. The Partnership Model strengthens simultaneous top-to-bottom and bottom-to-top approaches to coastal and ocean governance

Table 4 shows why PEMSEA is unique and in more ways, has achieved significant progress. It operated across and within levels of governance which is rarely seen in other regions. The initiatives are "nested" within levels but are streamlined with the guidance coming primarily from SDS-SEA. At the same time, regional policy directions are evaluated through the feedbacks made by national and local actions.

Lowry and Chua [in this volume] further articulated the simultaneous top-to-bottom and bottom-to-top approaches. PEMSEA has been able to optimize these approaches by: *(a)* building the needed arrangements at local, national, and regional levels to implement their comprehensive sustainable development action plans; *(b)* continuing to provide opportunities for interagency and multisectoral cooperation and partnerships at local and national levels as well as intergovernmental cooperation at the regional level; and *(c)* allowing sufficient time for developing trust among State and non-State partners as well as other stakeholders. Unlike most international aid projects which are generally short-term and lack institutional memory, PEMSEA stays long enough with its partners in implementing their action programs at various levels.

Conclusion

PEMSEA's regional mechanism (based on the Partnership Model) is unique because it focuses on a well-defined geographical area and scope of activities and identifies the partners' strengths, weaknesses, and capacities thus increasing its efficiency and cost-effectiveness. As the focus is to implement international conventions already ratified by the concerned governments, the usual lengthy legal process in enacting a new protocol/agreement is greatly reduced.

Given the environmental concerns of the region and the shared vision on the Seas of East Asia and its vast maritime potentials, the regional mechanism ensures that its objectives — to manage the regional seas as a regional center for maritime trade and its sea lanes for increasing sea communication in the region — could be achieved without compromising the integrity of the coastal and marine environment.

Chua [in this volume] introduced the process-oriented system of frameworks for the sustainable development of coastal areas. Through ICM implementation, the integrated common framework for governance, focused action programs, partnerships, State of the Coasts reporting, monitoring and evaluation, and the ICM Code and certification is envisioned to provide a complete guide to attain sustainable development. PEMSEA is advocating that each participating country follow the framework to enable a streamlined and fast-tracked mechanism. Through this, the partnership approach is institutionalized, and partners and countries are gradually eased into the significance of following a culture of monitoring and evaluation and into a rules-based governance. In effect, PEMSEA is now evolving a new Partnership Model which is both principles-based and rules-based. The new approach in regional cooperation for the Seas of East Asia will thus [Bernad and Chua, in press]:

1. shift coastal and ocean governance from being government–centered to a more inclusive approach involving both governments and stakeholder partners;
2. consolidate regional efforts in achieving target-focused action programs;
3. mobilize the human and financial resources of stakeholder partners through a common platform and framework for coastal and ocean governance;
4. re-orient existing fragmented projects and programs related to coastal and ocean management through a common program framework; and
5. instill a dynamic process to enable advocacy, monitoring, and evaluation of progress and impacts.

References

Bernad, S.R. and T.-E. Chua. (In press). "The Sustainable Development Strategy for the Seas of East Asia (SDS-SEA): Policy implications at local, national, and regional levels." In: *Integrated regional and national ocean policies: Comparative practices and future prospects*. Edited by B. Cicin-Sain, D. VanderZwaag and M.C. Balgos. United Nations University Press.

Bernad, S.R., K.R. Gallardo and T.-E. Chua. 2006. "Regional arrangement for the implementation of the SDS-SEA: A partnership approach." *Tropical Coasts*, 13(1):57–65.

Bryant, D., L. Burke, J. McManus and M. Spalding. 1998. *Reefs at risk. A map based indicator of threats to the world's coral reefs.* World Resource Institute (WRI), International Center for Living Aquatic Resources Management (ICLARM), World Conservation Monitoring Centre (WCMC) and United Nations Environment Programme (UNEP), Washington, DC. 55 pp.

Chou, L.M. 1998. "Status of Southeast Asian coral reefs," pp. 79–87. In: *Status of coral reefs of the world: 1998.* Edited by C. Wilkinson. Global Coral Reef Monitoring Network and Australian Institute of Marine Science, Queensland. 184 pp.

Chua, T.-E. 2006a. "Challenges, responses, strategies, and actions for the implementation of the Sustainable Development Strategy for the Seas of East Asia (SDS-SEA)." Paper presented at the Second Ministerial Forum during the EAS Congress in December 2006 in Haikou, China. 8 pp.

Chua, T.-E. 2006b. *The dynamics of integrated coastal management: Practical applications in the sustainable coastal development in East Asia.* GEF/UNDP/IMO Regional Programme on Building Partnerships in Environmental Management for the Seas of East Asia, Quezon City, Philippines. 468 pp.

Chua, T.-E., D.A. Bonga and N. Bermas. 2006. "The dynamics of integrated coastal management: PEMSEA's experience." *Coastal Management,* 34(3):303–322.

Chua, T.-E. and S.A. Ross. 1999. "The Marine Electronic Highway: Concepts and challenges." Paper presented at the Conference on Navigational Safety and the Control of Pollution in the Straits of Malacca and Singapore: Funding and Managing International Partnerships, April 1999, Singapore. Institute of Policy Studies, Singapore and International Maritime Organization, London, UK.

ESCAP (Economic and Social Commission for Asia and the Pacific) and ADB (Asian Development Bank). 2000. *State of the environment in the Asia and the Pacific.* ST/ESCAP/2087. United Nations, New York.

Fortes, M. 1994. "Seagrass resources of ASEAN," pp. 106–109. In: *Living coastal resources of Southeast Asia: Status and management.* Edited by C.R. Wilkinson. Australian Institute of Marine Science, Townsville, Australia.

GESAMP (IMO/FAO/UNESCO-IOC/WMO/WHO/IAEA/UN/UNEP Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection). 2001. *A sea of troubles.* GESAMP Reports and Studies No. 70. 35 pp.

Kullenberg, G., T.-E. Chua and M.C. San. 2006. "What drives regional cooperation in coastal and ocean governance?" *Tropical Coasts,* 13(1):4–9.

MPP-EAS. 1998. *Benefit-cost analysis of tourism development and sustainability in the Malacca Straits*. MPP-EAS Technical Report No. 17. GEF/UNDP/IMO Regional Programme for the Prevention and Management of Marine Pollution in the East Asian Seas, Quezon City, Philippines. 44 pp.

MPP-EAS. 1999a. *Natural resource damage assessment and the Malacca Straits*. MPP-EAS/Info/99.191. GEF/UNDP/IMO Regional Programme for the Prevention and Management of Marine Pollution in the East Asian Seas (MPP-EAS)/Partnerships in Environmental Management for the Seas of East Asia (PEMSEA), Quezon City, Philippines. 52 pp.

MPP-EAS. 1999b. *Total economic valuation: Coastal and marine resources in the Straits of Malacca*. MPP-EAS Technical Report No. 24/PEMSEA Technical Report No. 2. GEF/UNDP/IMO Regional Programme for the Prevention and Management of Marine Pollution in the East Asian Seas (MPP-EAS)/Partnerships in Environmental Management for the Seas of East Asia (PEMSEA), Quezon City, Philippines. 52 pp.

PEMSEA. 2000. *Proceedings of the Seventh Programme Steering Committee Meeting: Dalian, P.R. China, 26–29 July 2000*. PEMSEA Meeting Report 1. GEF/UNDP/IMO Regional Programme on Building Partnerships in Environmental Management for the Seas of East Asia, Quezon City, Philippines.

PEMSEA. 2002. *Proceedings of the Eighth Programme Steering Committee Meeting: Busan, Republic of Korea, 19–22 March 2002*. PEMSEA Meeting Report 2. GEF/UNDP/IMO Regional Programme on Building Partnerships in Environmental Management for the Seas of East Asia, Quezon City, Philippines.

PEMSEA. 2003a. *Proceedings of the Ninth Programme Steering Committee Meeting: Pattaya, Thailand, 6–9 August 2003*. PEMSEA Meeting Report 3. GEF/UNDP/IMO Regional Programme on Building Partnerships in Environmental Management for the Seas of East Asia, Quezon City, Philippines.

PEMSEA. 2003b. *Putrajaya Declaration of regional cooperation for the sustainable development of the Seas of East Asia: Sustainable Development Strategy for the Seas of East Asia: Regional implementation of the World Summit on Sustainable Development requirements for the coasts and oceans*. GEF/UNDP/IMO Regional Programme on Building Partnerships in Environmental Management for the Seas of East Asia, Quezon City, Philippines.

PEMSEA. 2005. *Consensus-building for the formulation of the Sustainable Development Strategy for the Seas of East Asia*. GEF/UNDP/IMO Regional Programme on Building Partnerships in Environmental Management for the Seas of East Asia, Quezon City, Philippines.

PEMSEA. 2006a. *A perspective on the environmental and socioeconomic benefits and costs of ICM: The case of Xiamen, PR China*. PEMSEA Technical Report No. 17. GEF/UNDP/IMO Regional Programme on Building Partnerships in Environmental Management for the Seas of East Asia, Quezon City, Philippines. 132 pp.

PEMSEA. 2006b. *Securing the future through ICM: The case of the Batangas Bay region*. PEMSEA Technical Report No. 19. GEF/UNDP/IMO Regional Programme on Building Partnerships in Environmental Management for the Seas of East Asia, Quezon City, Philippines. 72 pp.

PEMSEA. 2006c. *Xiamen: An ICM journey*. PEMSEA Technical Report No. 18. GEF/UNDP/IMO Regional Programme on Building Partnerships in Environmental Management for the Seas of East Asia, Quezon City, Philippines. 93 pp.

PEMSEA. 2007. *PEMSEA: Partnerships in Environmental Management for the Seas of East Asia (1994–2010): A regional mechanism facilitating sustainable environmental benefits in river basins, coasts, islands and seas*. PEMSEA IEC Material 2. GEF/UNDP/IMO Regional Programme on Building Partnerships in Environmental Management for the Seas of East Asia, Quezon City, Philippines. 80 pp.

Perlas, N. 2000. *Shaping globalization: Civil society, cultural power and threefolding*. Center for Alternative Development Initiatives (CADI) and Global Network for Social Threefolding (GlobeNet3), Pasig City, Philippines. 274 pp.

Tan, A. 2003. "Review of regional mechanisms for coastal and ocean governance in the Seas of East Asia." Unpublished Report commissioned by PEMSEA. GEF/UNDP/IMO Regional Programme on Building Partnerships in Environmental Management for the Seas of East Asia, Quezon City, Philippines.

UNDP (United Nations Development Programme). 1999. "UNDP-GEF project document: Building partnerships for environmental protection and management of the East Asian Seas." UNDP.

UNEP (United Nations Environment Programme). 1998. *Report of the thirteenth meeting of the Coordinating Body on the Seas of East Asia (COBSEA) on the East Asian Seas Action Plan*. UNEP, Bangkok. 69 pp.

World Bank. 1998. *East Asia: The road to recovery*. The International Bank for Reconstruction and Development/The World Bank, Washington, DC. 138 pp.

World Bank. 2002. Data by topic. Available at http://worldbank/data/databytopic.html.

CHAPTER 23

Ocean Governance in the Arctic: A Canadian Perspective

Janelle Kennedy, Arthur J. Hanson, and Jack Mathias

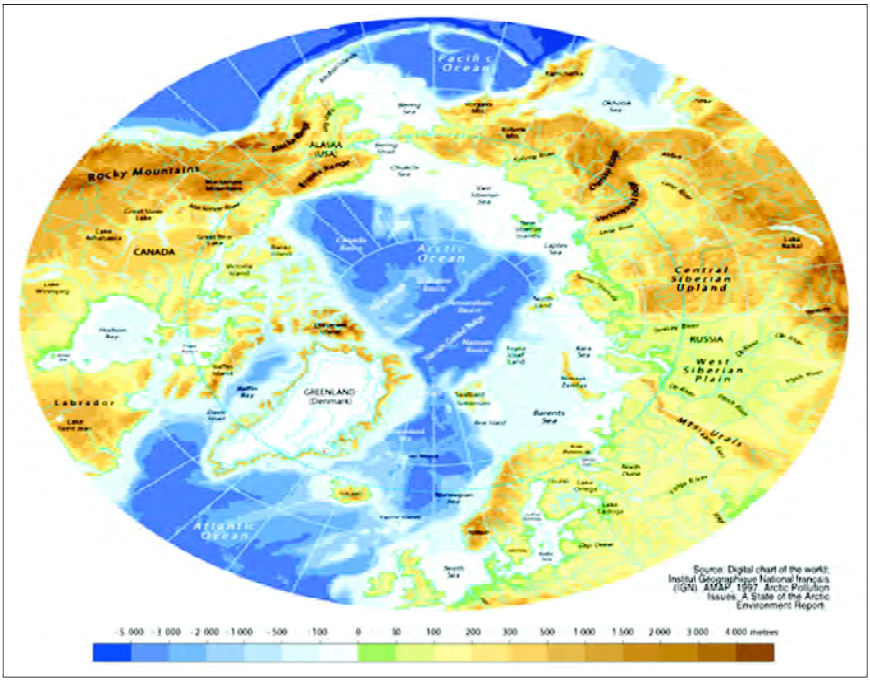
Introduction

If there still exists the notion that the Arctic is some faraway place, some distant frozen unspoiled land, it would only take a glimpse of rusting fuel drums, fishing gear debris, Arctic haze, an offshore oil platform, or wildlife scampering away from a low-flying aircraft to realize that the Arctic has been transformed. A deeper look at the Arctic would also reveal that this transformation is impacting the rest of the world through changes in ocean circulation, melting permafrost, sea ice and glaciers; not to mention the potential threats that exist, such as, oil spills and leaking nuclear waste from submerged reactors. Idly standing by as an area of the globe undergoes and imposes great ecological, economic, and social change is not an option.

The Arctic Ocean, only 4 percent of the world's ocean area, is bounded by six coastal states: the U.S., Canada, Greenland and the Faroe Islands (Denmark), Iceland, Norway, and Russia. "Common denominators for the area are fragile ecosystems, harsh climatic conditions, resource-based economies," political vulnerability, and a region challenged by limited infrastructure at a time of rising demand for Arctic mineral and other resources [Samstag and Nordic Council of Ministers, 1993]. The Canadian Arctic includes its "coastal ocean" (from 0 miles up to the 200 mile limit of Canada's exclusive economic zone) and the landmass north of the tree line [Birnie and Stein, 1975]. In addition to the large marine area, a close look at Figure 1 will show that the Arctic Ocean is surrounded by nations that are not as far apart as typically thought. This view from the top of the world reminds us how central the Arctic Ocean is to life and landscapes in the North.

The coastline of the Arctic is approximately 86,900 km long (based on general shoreline length) and approximately 4 million people live in the Arctic, 80 percent of whom live in coastal areas [Salmona, 2002; Ahlenius et al., 2005]. The culture and traditions of Northern people today are still very survival-based, with a long history and extremely high dependence on local resources [INAC, 2004; Macnutt, 2004]. In the Yukon, Canada, there is archaeological evidence that Northern people have relied on caribou for up to 25,000 years without diminishing the population [Kendrick, 2003]. As

Figure 1: Topography and Bathymetry



Source: Ahlenius et al.[2005] *(Diagram: Hugo Ahlenius, UNEP/GRID-Arendal) Available at http://maps.grida.no/go/graphic/arctic_topography_and_bathymetry3. [Accessed 12 January 2008].*

articulated by Welch [1995], aboriginal people are the world's "original ecosystem ecologists." And though relatively few in number compared to other places in the world, Northerners occupy a large portion of their country of origin. Indigenous people in the Russian Arctic utilize an area for subsistence living that is approximately 60 percent of Russian Federation territory [Vlassova, 2006].

Throughout the long history of Arctic people, they have depended on local natural resources to feed their families, build their homes and clothe their bodies. They have seen foreigners over-harvest the whales, missionaries impose foreign beliefs, foreign diseases, like tuberculosis, and new ways of living that included health care, modern weapons and schooling [Ahlenius, et al., 2005]. In more recent times, pollutants from a variety of sources have soiled their food and water supplies, even passing from mother to child through breast milk in concentrations far above the allowable limits. Despite an often troubled history and uncertain future, Arctic people have shown incredible resilience and adaptability by using their knowledge and experience to cope with a harsh climate and a modernized world [Berkes and Arctic Institute of North America, 2005]. Culture and identity are very important to Northern people and part of their vision for the North is that their "language, traditional knowledge, and way-of-life is recognized and encouraged" [INAC, 2004].

Marine and terrestrial flora and fauna are also uniquely adapted to living in the Arctic. The North provides a critical habitat to both local and migratory species, such as caribou, reindeer, polar bears, and a large number of birds. The connection between the land and sea is exemplified among these animals, which depend on large expanses of undisturbed habitat for their survival [Ahlenius et al., 2005; UNEP/GRID-Arendal, 2005]. However, survival is becoming more and more difficult and the number of species at risk or of special concern is rising, most of which are marine species [Hebert and Wearing-Wilde, 2002].

Appreciating and understanding the breadth and depth of interconnectedness that exists within and among Arctic ecosystems, which include the human element, is often difficult for non-Northern people. Non-Arctic residents must come to appreciate and understand the uniqueness of the North and the people who live there. Such differences include social and cultural issues, land claims, the cold climate, technology used and available, the provision of basic services (for example, sewage treatment), the age of institutions, and the significance of the area to global climate, ocean currents and the atmosphere. And yet, while these differing world views and regional issues may be uncomfortable to understand and deal with, they are also opportunities to blend the best of both worlds.

Issues and Use Conflicts

The evolution of an Arctic regime is being superseded by the rapid pace of change experienced in the North, driven largely by external factors. These include significant climate change leading to increased mineral development, hydrocarbon exploration, tourism, emerging fisheries, and transcontinental Arctic shipping. Equally serious are the inordinate burden of contaminants accumulating in the Arctic, the impact of past military activities, bio-security concerns, access to traditional Arctic food supplies, and the loss of Northern culture under rapid development.

Contaminants are a very prominent issue which has been addressed to a certain extent among Arctic states and within the international community (for example, Stockholm Convention on Persistent Organic Pollutants, or POPs); the Arctic Council being very active on contaminant issues. Contaminants in the Arctic originate from a variety of sources: long-range atmospheric transport, ocean currents, rivers, vehicles, vessels, mining, burning garbage, diesel generators, military installments and even via migratory animals [Gamberg et al., 2005]. The marine environment is significantly impacted due to primary contaminant pathways (for example, rivers) and exposure to coastal development (for example, mining) and marine activities (for example, vessel traffic). Contaminants also impact the daily lives of Northern people by heightening food insecurity concerns and degrading their quality of life. Because of the widespread occurrence, persistence and variety of contaminants, dealing with them requires extensive and substantial innovation (for example, bio-venting technology), monitoring, remediation, funding and cooperation [Filler and Carlson, 2000]. New research is also needed to identify emerging sources of contaminants and their effects [Gamberg et al., 2005].

Climate change, however, is by far the dominant issue that contextualizes all other issues in the Arctic. The effects of climate change threaten almost every aspect of Northern life: human and non-human, marine and terrestrial. In addition, as a contemporary threat, it is one of those "global issues, which threaten human security as well as state security," it knows "no national borders" and will be one of the root causes of conflict, for example, over scarce natural resources [Abbott et al., 2006].

Effects of climate change range from loss of sea ice, sea level rise, shifting vegetation zones, shrinking of habitat and ranges for Arctic wildlife, increased storm exposure and coastal erosion, increased maritime traffic, broader and more frequent accessibility to Arctic areas, thawing of frozen ground, impact on the culture of Northern people, and increased exposure to UV radiation [Hassol, 2004]. Some of these impacts are being felt right now, like changes in the ice regime and coastal erosion, while others, like sea level rise, are still being considered as near-future scenarios.

Ice is like a "fifth element" in the Arctic [Pielou, 1994]. It is part of the sacred balance of elements that make this planet habitable: earth, air, water, and fire. However, this balance is tipping quickly and dramatically. Byers and Lalonde [2005] estimate that if sea-ice extent trends continue as they have been then sea ice could be gone from the Arctic as early as 2030. In the next few years, it is also predicted that the open water season for the Beaufort Sea could increase from an average 60 days to 150 days [Shaw et al., 1998a]. This kind of rapid change threatens lives and livelihoods, wildlife populations and the ability of human and natural systems to adapt to change. Unlike such activities as mangrove restoration to protect a shoreline, we have no means of recreating ice in order to maintain its services (for example, reflecting solar radiation and supporting traditional hunting methods). Substantial modeling has taken place in attempts to predict ice regime changes and how those changes will impact not just the Arctic, but global systems [Manson et al., 2005; Shaw et al., 1998b; Solomon and Gareau, 2003; Leont'yev, 2004; Solomon, 2005; Murton, 2005]. However, there are many knowledge gaps, especially in regard to permafrost. There is also an immediate need for more monitoring stations in the North and an overall increase in science activities [Tucker et al., 2004].

Climate change discussions are also focusing on the potential for thawing permafrost (onshore and offshore) to be a positive feedback on climate change. There are large amounts of methane and oxidizable carbon (greenhouse gases) trapped in permafrost that can be released back into the atmosphere due to thawing and erosion; creating a positive feedback loop for global warming [Cooper, 2003; Rachold et al., 2005; Abrahams, 2002]. Considering that 24 percent of the northern hemisphere is permafrost — not including sub-sea — [Tucker et al., 2004], determining what the total potential is for the release of greenhouse gases from both onshore and offshore sources of permafrost would be an important contribution to assessing the impact of thawing permafrost on climate change.

Coastal erosion is a very visible impact and will need considerable management attention and resources because the majority of development in the North, such as oil and gas, ports, settlement and tourism, occurs in coastal areas. The Varandei oil terminal on the coast of the Pechora Sea in Russia is now only meters away from the sea and will have to be relocated [Ogorodov, 2005]. In Shismaref, Alaska, the community created the Shishmaref Erosion and Relocation Coalition in reaction to severe erosion. The location of their bulk fuel tanks was once 300 ft from the sea and as of 2003 was only 35 ft away [Bryan, 2003]. The residents voted to relocate their community and are working with various levels of government to secure the funding to do so [Bryan, 2003]. Coastal erosion is impacting communities and infrastructure all across the Arctic [Couture et al., 2002] and, as articulated by Airioldi et al. [2005], "the dilemma facing coastal managers is whether to defend an eroding coast, how to defend the coast, and at what socioeconomic cost."

Coastal erosion will be exacerbated by sea level rise as changes in climate proceed. Sea level rise is an "integrated effect" of factors that are directly and indirectly linked to a warming Arctic [Proshutinsky et al., 2001]. These factors are: warmer Atlantic waters, decreases in the extent of the Greenland ice sheet, sea ice and glaciers, changes in the circulation of the Arctic Ocean, changes in the intensity and direction of atmospheric circulation, increased exposure of coasts to coastal erosion, coastal submergence and permafrost thawing [Proshutinsky et al., 2001]. Sea level rise has the potential to cause the displacement of people, damage to infrastructure and a "redrawing of the world map" [Abbott et al., 2006] — enough reasons to consider sea level rise a threat to security and sustainability.

Climate change is also opening doors to development, including: oil and gas, mining, tourism and shipping. Increased accessibility to the North via ships and roads, advances in technology and increasing capacity among Northerners (for example, skilled labor) is enabling many industries. However, the mining industry, in particular, is responsible for many and varied environmental, social and economic impacts, including: noise, dust, roads, ports, seasonal workers, invasive species, habitat loss, artificial habitat (for example, rock piles and gravel pads), infrastructure (for example, housing), contaminants, poor air quality, changes in microclimate, and a shift away from traditional ways of life [Smith et al., 2005].

The impacts of mining are also long term. Larsen et al. [2001] found that lead and zinc are still negatively affecting the environment, especially marine life, around Maarmorilik, West Greenland, even though the mine has been closed since 1990. In Ny Alesund, and several other sites, on the coast of Spitsbergen Island, Norway, there is significant ongoing environmental damage from coal mining (for example, wastes, heavy metals, radionuclides and abandoned machinery) that has resulted in the contamination of vegetation and metal and radionuclide enrichment of the soil [Dowdall et al., 2004; Walker et al., 2003]. Russia is a particularly unique case in that the Cold War has left behind a veil of secrecy about many contaminated sites, primarily nuclear waste. Were it not for international cooperation and encouragement, Russia may have never revealed some of these sites (for example, Andreeva) and allowed other countries, like Norway, to help fund their cleanup [Reistad et al., 2003]. We need to take a long hard look at cases like these and use the lessons learned if we are to act on current and future mining and contaminated site issues [Larsen et al., 2001]. In addition, coastal and ocean areas are unique, especially in the Arctic, and there needs to be a degree of separation between how mining is managed and governed within a terrestrial/freshwater environment and a marine or coastal environment.

However, hydrocarbon and nuclear energy security issues are dominating world politics and resources. Hydrocarbon development and consumption has the potential to cause serious environmental impacts and the desire for energy security will likely override concern for the environment. This dichotomy is described as:

> *"So important is the concern over energy security that a sense of urgency or even panic exists in some countries leading to uneconomic or risky investments in an attempt to gain access to energy"*
> [Dorian et al., 2006].

> *"Less appreciated is the extent to which the environmental impacts of energy use can lead to international security threats, especially when those impacts are as severe and wide-ranging as climate change"*
> [Gleick, 2006].

The Arctic is bordered by countries that consume vast amounts of hydrocarbons, especially the U.S., Russia, Norway and Canada, who would benefit greatly from a secure and proximate source of oil and gas. In addition, the majority of the exploitable Arctic reserves —now made even more available by technology and climate change — lie within the national jurisdictions of a few states, which gives them exclusive economic rights to those resources. Russia is particularly "important to world energy markets because it holds the world's largest natural gas reserves, the second largest coal reserves, and the eighth largest oil reserves. Russia is also the world's largest exporter of natural gas, the second largest oil exporter, and the third largest energy consumer" (Energy Information Administration, 2006).

However, it is not just circumpolar countries with large appetites for hydrocarbons. Dorian et al. [2006] argue that "no country will have more impact on the future world energy industry than China, with 1.3 billion persons now and a rapidly growing economy." To this end, the quest for energy security is going to see states looking at all the energy options available and oil and gas companies migrating to all areas of the globe that can supply hydrocarbons. Without proper planning and management, the rush to energy security could see environmental standards downgraded to accommodate development in the Arctic. Evaluating the potential for an oil spill will therefore be an increasingly important assessment for Arctic areas. Leopold [2006] describes the most recent oil spill catastrophe in the U.S.:

> *"In March, the worst spill in the history of oil development in Alaska's North Slope forced the closing of five oil processing centers in the region. Alaskan state officials said that as much as 260,000 gallons of crude*

oil leaking out of a pipeline in an oil field jointly owned by Exxon Mobil, BP, and ConocoPhillips blanketed two acres of frozen tundra near Prudhoe Bay — just a short distance from where President Bush has proposed opening up ANWR to drilling. The oil spill went undetected for about five days before an oilfield worker noticed the scent of hydrocarbons while driving through the area on March 2."

Can we afford spills to go undetected for five days?[1] Could accidents like these be prevented or at least better mitigated through comprehensive risk assessments? The threat of oil pollution in the Arctic, whether from oil exploration (for example, blowouts) or from shipping (for example, accident/collision and intentional discharges), is a global one. Bederman [1987] describes the magnitude of such a threat as "truly apocalyptic" where a major spill in the Arctic marine area "could reduce the albedo, or reflectivity, of the ice, inhibit new ice formation, and promote greater heat absorption. The result would be a melting of the pack-ice and potentially widespread climatic changes." In addition to the catastrophic effect of a spill, imagine the problems of cleaning up such a spill. What if it occurred when the Arctic is in 24-hour darkness? What if the oil gets trapped or hidden by the ice? There are many limiting factors associated with the Arctic marine area and in such a difficult climate these factors may be "insurmountable environmental dangers" [Bederman, 1987].

As much as hydrocarbons still dominate energy discussions and environmental concerns, nuclear energy is being resurrected as an affordable and clean alternative to our carbon-based economy. Nuclear energy is seen as a viable solution to depleting or inaccessible stores of hydrocarbons. However, nuclear energy is an option that has "imminent and dire" consequences should anything go wrong [Schrad, 2006].

The Arctic has been particularly hard hit by the past and present use of nuclear energy. There are several sources of radioactive pollution in the Arctic: nuclear power plants, nuclear weapons testing in the atmosphere, accidents, storage (for example, underground), nuclear powered vessels (military and commercial), long-range atmospheric transport and intentional dumping (for example, in the Barents, Kara and Bering Seas) [Samstag and Nordic Council of Ministers, 1993]. A particularly sensitive area of the Arctic is the resource rich and increasingly accessible Russian Arctic via the Northern Sea Route. This region stands out compared to other Arctic

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[1] AMAP [2007] reported an even worse spill which occurred in 1994 when a 52-km section of pipeline in the Komi Republic in the Russian Federation ruptured, ultimately releasing more than 100,000 tonnes of oil and contaminating 116 ha, with an additional 164 ha damaged during the response effort. Although it occurred fairly far inland, it did affect a number of waterways, some of which flow into the Arctic Ocean.

areas because it is highly industrialized, significantly populated and faces many unique environmental challenges [Andreeva, 1998; Eglington et al., 1998; Plink, 1998]. There are several alarming facts about the nuclear waste situation in the Russian Arctic [Eaton, 1995; Dawson and Darst, 2005; Eglington et al., 1998]:

- Russia is home to 60 percent of the world's nuclear reactors, which generate waste.
- Russia's ships produce 20,000 m^3 of liquid radioactive waste and 6,000 tons of solid radioactive waste every year.
- Large numbers of decommissioned nuclear powered ships and submarines are rusting and leaking in Arctic ports.
- Many land-based storage facilities for nuclear waste are at capacity and are considered to be unsafe.
- Fishers in Russia and Norway worry that the submerged nuclear warheads and reactors will one day leak substantially enough to destroy the fisheries.
- "In total, the radioactivity dumped into the Russian Arctic seas constitutes two-thirds of all radioactive waste ever dumped in all the oceans of the world" [Eglington et al., 1998].

The most alarming of all is the legislation that was passed in 2001, whereby Russia permits the import of nuclear waste from other countries that are anxious to ship nuclear waste to Russia, where it can be centrally stored in a deep underground facility somewhere in Siberia [Dawson and Darst, 2005]. This is an incredibly controversial subject and there are two sides to the debate. One side strictly opposes the import of nuclear waste into a transitional, largely unstable, country like Russia and feels it is an infringement on the rights of the Russian people. The other side thinks this new form of trade would bolster the Russian economy (to about USD 30 billion per year) and that the involvement of the international community would aid Russia in creating state-of-the-art storage facilities and cleanup procedures [Nowlan, 2001; Dawson and Darst, 2005]. The latter side of the debate has a strong case as long as it assumes that technology, security, corruption, accidents, funding and public support are not obstacles. However, it would be irresponsible to think that such obstacles do not pose a threat to national and international security when it comes to importing large amounts of nuclear waste while still trying to deal with a long history of nuclear waste issues (for example, stored waste, old reactors, and abandoned nuclear submarines).

Russia may be a focal point when it comes to discussions of nuclear energy and waste, but all states interested in using nuclear energy or supplying the nuclear industry (for example, uranium mining) should be evaluating their energy strategies from a security and sustainability point of view. Nuclear energy is also one of those issues that bridges the gap between strictly environmental and strictly military types of security in that nuclear resources can be misappropriated and used as an element of warfare. In addition, the Arctic is an area of concern because it could become a corridor of vulnerability to nuclear strike as the struggle intensifies between the world's current superpower, and the world's emerging superpower. Many questions will need to be asked regarding this issue, such as: What are the future implications? Will it lead to regional defense networks? How will it affect international cooperation in the Arctic, and the coalescing needed for regionalization? Perhaps these questions are not yet even being acknowledged.

Building an Arctic Regime

Current Arctic governance and management systems are not adequate to address these challenges. The current system of Arctic governance is not comprehensive enough and the continued degradation of the Arctic environment is a clear indication that efforts to date have been inadequate [Nowlan, 2001]. Similarly, global multilateral agreements appear to be inadequate for many environmental issues, including: land-based sources of marine pollution, long-range atmospheric transport of pollutants, seabed exploration, protecting marine biodiversity, invasive species, non-catastrophic oil spills, climate change, and controlling hazardous wastes [Johnston and VanderZwaag, 2000; UNEP/GRID-Arendal, 2005].

The result is that there are a great number of institutional arrangements related to managing activities in the Arctic, but "the umbrella isn't open and everyone is getting wet." The crucial part missing is the vitality and direction that a coherent and comprehensive regime can bring to collective action. Such a regime must be effective and enforceable while also dealing with the internalities and externalities that require changes in the regime (for example, new technology) or oppose it in some way (for example, needs of a developing country) [Rothwell, 1996].

A basic definition of a regime is that it "… is a set of principles (explicit or implicit), norms, rules and decisionmaking procedures around which the expectations of actors converge in order to coordinate actors' behavior with respect to an issue of concern to them all" [Rothwell, 1996; original text from Haas, 1983]; while an expanded view of a regime with respect to their function is that its "… major function is to facilitate the making of specific agreements on matters of substantive significance within the issue-area covered by the regime. International regimes help to make governments' expectations consistent with one another. Regimes are developed in part because actors in world politics believe that with such arrangements they will be able to make mutually beneficial agreements that would otherwise be difficult or impossible to attain" [Brunnee and Toope, 1997; original text from Keohane, 1982].

There are many benefits to a legal regime, including: limiting institutional overlap; clarification of Article 234 of the United Nations Convention on the Law of the Sea [UNCLOS, 1982]; the creation of obligation and timeline and target setting; the taking of issues more seriously by states; greater political commitment; the addressing of funding issues; initiatives are more stable; raising of the profile of issues of the Arctic; addressing the need for technology transfer; the opening of doors to issues not currently on agendas; and the provision of opportunities to create a secretariat [Nowlan, 2001; Brubaker, 2001]. It would also provide the opportunity to settle navigational and maritime boundary issues. For example, the issue of the U.S. claiming that the North West Passage is international waters, as opposed to Canada's claim that it is internal waters. In this respect, Canada and Russia (that is, the Northern Sea Route) face the same problem: having an internationally important passageway within their national jurisdiction that is not recognized by the world's current superpower [Brubaker and Østreng, 1999].

An essential part of effective regime formation is having a coordinating and decisionmaking body. The Arctic Council is the most logical body to be coordinating efforts, promoting and negotiating an Arctic Treaty, as well as becoming a decisionmaking body [Box 1]. To do this would require the Arctic Council to shift gears from being a decent clearinghouse, but a rather weak international organization with limited funding, to an organization that has much more of a presence in domestic and international programs, as well as a stronger and more vocal position on Arctic issues. Such a shift would give buoyancy to issues like resolving maritime boundaries, technology transfer, funding and navigation in Arctic waters. An Arctic Treaty would also be a natural step in expanding Article 234 of UNCLOS, a way of starting a conversation on Arctic high seas governance and a stronger mechanism for international cooperation. It would also reinforce domestic regulations like Canada's Arctic Waters Pollution Prevention Act [1985].

Some would argue that an Arctic Treaty, or hard law arrangement, will not produce the desired results that people expect and in some ways may undermine efforts and cooperative arrangements [Young, 2000]. This should not be a one or the other choice; instead, it should be a combination of binding and non-binding arrangements that complement the environmental, social, political and economic state of the Arctic that is desired. In addition, no state should consider the absence or presence of a treaty or Arctic convention to be an excuse to have weak domestic policies and programs with respect to the sustainability and security of the Arctic.

Box 1: The Arctic Council

The Arctic Council is an intergovernmental forum established in 1996 for cooperation, coordination, and interaction between Arctic states, indigenous communities, and other Arctic residents. Member states are Canada, Denmark (including Greenland and the Faroe Islands), Finland, Iceland, Norway, the Russian Federation, Sweden, and the U.S. In addition, six international organizations representing many Arctic indigenous communities have the status of Permanent Participants. The Arctic Council is a regional forum for sustainable development, mandated to address environmental, social, and economic issues.

Decisions within the Arctic Council are taken at meetings of Foreign Ministers or the designates of the member states and the political leaders of the Permanent Participants. The chairmanship of the Council and accompanying Secretariat rotates among member states on a two-year basis. Norway currently holds the chairmanship (2007–2008) and has established a Secretariat in Tromsø.

The scientific work of the Arctic Council is conducted under five working groups, each with its own Secretariat. These are: *(1)* the Sustainable Development Working Group (SDWG), concerned with economic, social, and cultural aspects of sustainable development; *(2)* the Arctic Monitoring and Assessment Programme (AMAP), concerned with monitoring and assessment of pollution in the Arctic environment, climate change, and human health impacts; *(3)* Protection of the Marine Environment (PAME), covering policy and non-emergency pollution prevention and control measures from land- and sea-based activities; *(4)* Conservation of Arctic Flora and Fauna (CAFF), which promotes conservation of biodiversity and the sustainable use of living resources; and *(5)* the Emergency, Prevention, Preparedness and Response (EPPR) Working Group, which exchanges information on best practices for preventing spills and responding to them if they occur, but is not a response agency.

For further information, visit: http://arctic-council.org/

The strength of domestic regulatory structures and activities and their ability to fulfill international obligations is an important aspect of successful international cooperation [Downie and Fenge, 2003]. Without strong leadership at the national level, it becomes that much more difficult to move forward on issues at the international level or to influence the direction of international efforts. It must also be recognized that the extent to which a nation addresses an issue is largely driven by the economic benefit to be derived; for example, designating maritime boundaries or allocating resources. Issues may also be addressed because the level of concern forces international cooperation or integrated management, in other words, managing a crisis.

Building an Arctic regime and achieving effective regional cooperation will require top-down and bottom-up approaches to ocean governance. For example, initiatives of the Arctic Council, like the Arctic Climate Impact Assessment, Arctic Human Development Report and the Arctic Marine Shipping Assessment, need to be harmonized with regional approaches such as the identification of large marine ecosystems (LMEs) in the Arctic. These will be informed by fledgling integrated management approaches; such as, Norway's Integrated Management of the Marine Environment of the Barents Sea Program and Canada's Large Ocean Management Area (LOMA) Program in the Beaufort Sea.

Canada's Oceans Act and Northern Foreign Policy are opportunities to provide linkage with the Arctic Council, which they have much in common. Commonalities include: *(1)* sustainable development, conservation and environmental protection; *(2)* commitment to involving indigenous people, as well as social and cultural renewal; *(3)* strong science backbone; *(4)* focus on ecosystem-based management; *(5)* focus on communication and sharing information; *(6)* regional good governance and regional development; *(7)* Northern sovereignty and security; *(8)* bilateral relations; and *(9)* consultative processes and national unity [Melnyk, 2000].

In addition to policy alignments, individual government sectors and departments should also be aligning themselves with the Arctic Council to facilitate international cooperation. The Department of Fisheries and Oceans is an ideal sector, especially the Central and Arctic Region group. In 2000, a report was published by the Department of Fisheries and Oceans (DFO), Canada, outlining existing and potential linkages between DFO and the Arctic Council. Existing linkages are characterized by programs that share information, data collection methodologies or objectives. These linkages include: *(1)* the Protection of the Arctic Marine Environment program (PAME) and DFO with respect to Regional Programs of Action for the protection of the marine environment from land-based activities; *(2)* the Arctic Monitoring and Assessment Programme (AMAP) and DFO with respect to contaminants, monitoring and data compilation; *(3)* the Conservation of Arctic Flora and Fauna Program (CAFF) and DFO with respect to the conservation of biodiversity and the monitoring of species (for example, the Species at Risk Act); *(4)* the Emergency Prevention, Preparedness and Response Program (EPPR) and DFO with respect to sharing data for the mapping of resources that are at risk if there were an oil spill to create a circumpolar map; and *(5)* EPPR and the Canadian Coast Guard with respect to sharing information from the Coast Guard's Rescue, Safety, and Environmental Response Program [Melnyk, 2000].

The report also identified many potential linkages, which included: *(1)* PAME and DFO with respect to integrated management and the coastal zone; *(2)* PAME and DFO with respect to marine environmental quality (MEQ), its monitoring and data compilation; *(3)* AMAP and DFO with respect to the MEQ program in the oceans sector, as long as DFO began aligning data collection protocols with AMAP; *(4)* AMAP and DFO Science with respect to monitoring the marine environment (fish and mammals) where DFO could feed data into the AMAP program; *(5)* CAFF, AMAP and DFO with respect to climate change (Climate Change Action Fund); *(6)* CAFF and DFO with respect to strengthening existing linkage on biodiversity conservation; *(7)* CAFF and DFO with respect to Marine Protected Areas (MPAs) and integrated management; *(8)* EPPR and Coast Guard with respect to coordinating similar programs like creating a standard for shoreline cleanup; and *(9)* Sustainable Development Working Group (SDWG) and DFO with respect to advancing sustainable development in the Arctic [Melnyk, 2000].

Several recommendations have been made for Canada that have not yet been implemented: *(1)* focus on aligning the Central and Arctic Region's Ocean Group with the Arctic Council; *(2)* allow Canada's Foreign Policy to provide part of the framework for DFO and the Ocean Group; *(3)* identify the links that the Ocean Group and the Arctic Council have for the benefit of the Oceans Group Management Framework; *(4)* promote and encourage increased alignment with DFO and the Arctic Council; and *(5)* have a DFO national representative on the Arctic Council [Melnyk, 2000]. In addition, it is recommended that coastal and ocean management responsibilities be consolidated into as few departments as possible and ensure that those departments are supported by legislation. Canada currently has too many departments involved in ocean issues; for example, Heritage Canada overseas the Marine Conservation Act; the Department of Natural Resources and Environment Canada have mandates for ocean issues (for example, parks and protected areas), and yet it is DFO that is tasked with implementing the Oceans Act [Juda, 2003]. The amount of overlap in responsibility deepens existing "institutional turf" issues and also dilutes the capabilities of any given department to carry out its mandate [Olsen, 2000]. While there are also problems with having a lead agency, it is clear that the unconsolidated approach currently being taken is not working and it becomes a hindrance to integrated management and international cooperation.

Building an Arctic regime will require linking current policies, programs, and organizations within and among Arctic states. An Arctic Treaty, the International Polar Year (IPY) and the Arctic Council are primary means for establishing a sustainable framework for international cooperation. All Arctic states must assess how they can contribute and how they can converge on issues and activities. Everything from mining, maritime transportation, traditional user rights, climate change, coastal development and wildlife management. It is also important to identify divergences in an effort to seek out unsustainable practices, as well as innovative strategies for coastal and ocean management. Land claims are a good example of where states diverge and it is worth examining what other countries do in the absence of land claims and consider a diversity of strategies for securing indigenous rights.

The 2007–2008 IPY will also be a catalyst for many countries to create a convergence of activities and action — an opportunity for regional cooperation in the Arctic, and the further integration of knowledge about the Arctic. Overall, an Arctic regime must be built "upon ecological criteria" to "ensure the security of the environment itself" [Brunnee and Toope, 1997].

Next Steps

The social, economic and environmental character of the Arctic presents unique challenges and opportunities for regime building and regional cooperation. Arctic states cannot expect to follow in the footsteps of the Antarctic Treaty and must be prepared to evolve the patchwork Arctic regime currently in place. Four considerations are critical for the evolution of an Arctic regime:

- The current definition of Northern security must be broadened to include environmental, food and collective security issues, as well as sustainability.
- Knowledge-bases for making decisions must be broadened and integrated.
- Regional approaches to governing coastal and ocean areas must be encouraged.
- International cooperation must be the catalyst and the means for making Arctic Ocean and coastal issues feasible to address.

Northern Security and Sustainability

The argument that there is an environmental and sustainability element to national and international security concerns has been building since the early 1970s [Schrad, 2006]; although there has been an ongoing difficulty in defining security in these terms [Levy, 1995; Homer-Dixon, 1991]. In the most basic terms, threats to a state's environment and sustainable development are threats to its security and sovereign control [Beesley, 1971] and a state has the right, indeed the necessity, to protect its peace, good order and security [UNCLOS, Article 19, 1982; Smith, 1982]. In addition, many forerunning threats like climate change go beyond the level of state security and must be considered global threats to global security [Abbott et al., 2006; Chalecki, 2002]. This is the context in which sustainability and sustainable development are tied to security concerns in the Arctic; a complex but inescapable relationship.

Sustainability is complemented by the security concept and these two linked elements will be of growing significance in all parts of the Arctic. They present an overarching framework that will become central to expressions of sovereignty, ecological and human use, and perspectives on how we can minimize the need for crisis-based management. These have not been the focus of sufficient attention and funding, and certainly not in a coordinated fashion.

Security itself is a spectrum that includes social, environmental, energy and food security [Kullenberg, 2002; Schrad, 2006; Levy, 1995]. In the Arctic, security will include matters related to sovereign control, defense considerations, energy security, rights of use, including movements of people and goods by land, sea and air, natural disasters and protection of archeological sites [Newton et al., 2005]. In addition to these more traditional views, there are expanded security concerns that are becoming especially relevant to the Arctic as a place exposed to rapid environmental, economic and social change. These include: the instability of key physical environmental conditions and ecosystems; impact of past military activities; physical infrastructure of all types; the inordinate burden of pollutants accumulating in the Arctic; invasive species; bio-security concerns such as those associated with avian flu and migratory birds nesting in the Arctic; access to and contamination of traditional Arctic food supplies; social dynamics of Arctic communities; conditions for protection of Northern heritage under rapid development; offshore and onshore mineral development, tourism and new pressures for fisheries; and transcontinental Arctic shipping.

The current definition of Northern security must be broadened to include environmental, food and collective security issues, as well as sustainability. There are very logical and timely reasons for expanding our definition of security even if the result is uncomfortable and complex. We need to free ourselves of sectoral strategies and deal with the broad range of sustainability and security concerns that are presenting themselves across scales. As articulated by Abbott et al. [2006]:

> *"Over the next decade, a shift from a "control paradigm" to a "sustainable security paradigm" will be hugely important. If there is no change in thinking, Western security policy will continue to be based*

on the mistaken assumption that the status quo can be maintained: an elite minority can maintain its position, environmental problems can be marginalized, and the lid can be kept on dissent and insecurity."

Security concerns from this point on will require greater commitment to international cooperation, a more regional focus for planning and management, and become increasingly inseparable from sustainability concerns. Security issues are also very close to home when it comes to the social and food security of Northern people. Paci et al. [2004] provide a useful summary of the food security issue: "Indigenous peoples are suffering the increased risk of uncertainty caused by climate change. The availability and predictability of the range of traditionally harvested and consumed foods, as well as the quality and quantity of these foods being impacted."

However, food insecurity is not entirely related to climate change. Other factors include the ongoing persistence of pollutants in Arctic food chains, the transition of some communities to eating more imported foods and the lower quality of those foods, development impacts (for example, hydrodams), availability of key species (for example, species becoming threatened or endangered), invasive species becoming food sources (for example, salmon and deer populations moving north), degradation of ecosystems and habitat loss [Berkes and Arctic Institute of North America, 2005; Paci et al., 2004]. To illustrate the impact of these factors, it is estimated that 50 percent of adults in some Canadian Arctic communities have Type 2 diabetes because of poor diets linked to imported foods and more sedentary lifestyles [CARC, 2006]. Russia has a particularly unique food security issue, that is, poaching. There are several groups that participate in poaching (for example, trophy hunters and the military) and they can have a devastating impact on local resources, especially reindeer. Migrant residents (for example, oil and gas workers) in the Murmansk Oblast are estimated to account for a large portion of natural resource loss, mainly reindeer. This poaching is affecting the availability of traditional food sources of the Saami people [Vlassova, 2006].

Arctic people are often at the mercy of global economic trends. In the recently published Millennium Ecosystem Assessment [UNEP, 2006], several considerations were made regarding subsistence and commercial economies in the North. It stated that:

"In polar regions, products derived from locally available fish and wildlife resources often offer important sources of cash that supplement wages and transfer payments from governments. However, subsistence economies are vulnerable to declines in global markets for these commodities; examples include seal or muskrat pelts (as changes in cultural values reduced global demand for furs), salmon (as fish farming increased alternative supplies), and reindeer antler (as cultural

change in Asia reduced demand). When world market prices are high, regional resource management institutions may be unable to respond to the increased incentives for unregulated or illegal harvest (for example, Kamchatka salmon and Greenland cod) or overgrazing by reindeer. On the other hand, government policies to conserve stocks may prevent Arctic people from taking advantage of the only viable commercial activities available."

The combination of environmental, social and economic factors influencing food security in the North is a formidable challenge in achieving sustainability and security. In addition, adaptation in the current political, environmental, social and economic climate will not guarantee sustainability or security.

The Arctic is a bioregion that is increasingly demanding and receiving international attention, which means Arctic states need to be actively demonstrating their ability to monitor, enforce and respond to issues and activities in all regions of their Northern territory. Acting on a comprehensive sustainability and security approach is dependant upon many factors, including: political will, public pressure, management capacity, adaptive capacity, resources, and short- and long-term funding to address the issues in a meaningful way. The questions that remain are: Are we prepared to be good stewards of the Arctic, or not? And, what are the steps needed to do so, above and beyond what our nation is doing at present? There are approaches coming online like integrated management, education, adaptive management, ecosystem-based management, knowledge networks, protected areas and co-management. Yet the pace of change is exceeding the rate of implementation, leading us down a crisis to sustainability path as opposed to one focused on adaptive planning and management. Our knowledge bases for decision support will need to be broadened and integrated if we are to move forward on Northern security and sustainability issues.

Knowledge and Decision Support

Two approaches that are experiencing strong convergences within the international community and at national levels are co-management and integrated coastal and ocean management (ICOM). Co-management is an approach upon which the international community is converging, despite a number of inconsistencies in how co-management is defined [Kullenberg, 1999a]. Drawing from a range of sources on the topic, co-management can be defined as a "process that involves a spectrum of institutional arrangements" [Yandle, 2003] that is based on "a participatory and flexible management strategy that provides and maintains a forum or structure for action on participation, rule making, conflict management, power sharing, leadership, dialogue, decisionmaking, negotiation, knowledge generation, and sharing, learning, and development among resource users, stakeholders and government" [Berkes et al., 2001a].

Co-management in the Arctic has, for the most part, been influenced by land claim agreements and may not have progressed this far without them [Berkes et al., 2001b]. This becomes clear when one looks at where the majority of co-management arrangements in Canada take place, that is, in the North. Co-management has been particularly instrumental in creating regional cooperation, as well as the integration of information between science and traditional knowledge [Danby et al., 2003].

However, co-management is not without its faults. In many cases, consultation is still a tokenism, science is not being fully responded to and decisionmakers are struggling with seeing many more costs accounted for than benefits [Ellesworth et al., 1997]. There is also non-inclusion of all stakeholders, primarily youth and women. Kafarowski [2005] found that "a clear path exists for Inuit who wish to become involved in decision- and policymaking in wildlife management in Canada's Arctic. It is equally clear that this path is not yet open to women." Such an imbalance is an oversight that must be addressed.

The foundation of co-management is that it requires the inclusion of local people and their knowledge and experiences, because they are the people affected by policies, programs and environmental issues [Newton et al., 2005]. The idea and practice of including local knowledge in projects and programs is broadly accepted and applied. However, it is the use of local knowledge as a decision-support tool that has not penetrated the business-as-usual norms of government programs, with the exception of decisions that are driven by either an agreement obligation or a local uprising on a specific issue. It seems that local knowledge is still being treated as just another form of data [Nadasdy, 2003] and it is still government policies that "frame indigenous understanding" of issues (for example, contaminants in country food; Newton et al., 2005).

Incorporating local knowledge must consider the fact that local or traditional knowledge is also changing. The physical and biological environment is changing faster and producing different results in such a way as to significantly reduce the predictability of the future. For example, Pungowiyi [2005] asks: "When will the geese arrive?" and "When will the ice recede?" The demographics of the North are also changing. Almost half of the population are youth [approximately 45 percent; Downie and Fenge, 2003] and there are increasing diversions from traditional ways of living, which erodes "cultural memory" [Faust, 2001]. There are also many social issues that burden northern communities such as high levels of addiction, suicide and inadequate services [Tester and McNicoll, 2004]. These issues lead to social disintegration, which influences the ability of a community to adapt to change and participate in environmental management [Dawson, 2004].

Knowledge integration, establishing knowledge networks, and understanding social and cultural issues should be prerequisites to the application of other approaches, like ICOM. The next few decades will see coastal zones around the world becoming a focal point for governance and management because they contain "vital portions of the marine environment which are extremely vulnerable to damage or destruction;" "form a central link in the earth's life-support system;" and are the preferred habitat for an ever-increasing proportion of the world's population [Birnie and Stein, 1975]. ICOM emphasizes processes and relationships, while operating most effectively on a subregional level. Many believe that ICOM is the innovative approach of the future [Friedheim, 1999; Fast et al., 2001; Kay and Alder, 1999] and it should be used to encapsulate other management approaches, like co-management, protected areas and ecosystem-based management.

There are two necessary considerations in an ICOM approach: *(1)* the need for integration; and *(2)* incorporating the principles of sustainable development. The concept of integration is the recognition of the need to "overcome the fragmentation" that is typical of sector-based management and the boundaries created by jurisdictions in order to ultimately redesign institutional arrangements so as to foster a more harmonized, holistic and consistent approach to the sustainable development of coastal and marine areas [Cicin-Sain and Knecht, 1998].

Like many other countries in the midst of setting targets to achieve sustainable development, ICOM is new and its start-up can be a complex and time-consuming process. ICOM in the Russian Arctic is developing as a result of international cooperation and funding. In a partnership among the United Nations Educational, Scientific and Cultural Organization, the Russian Federation Ministry of Education and Science, and the Russian State Hydrometeorological University, the Kandalaksha district on the White Sea coast (Murmansk region) was chosen as a pilot project site for the development of an integrated coastal zone management plan [UNESCO, 2006]. This is the first real attempt in the Murmansk region at implementing the principles of ICOM and providing for the identification and participation of multiple stakeholders. This project drew from well-established ICOM literature and acknowledged that it was a starting point for future initiatives. There were many partners in the project, various workshops held, shortcomings identified and several strategies developed for the continuation of ICOM initiatives in the district.

The literature on the Murmansk region repeatedly suggests that the combination of a strong legislative framework and a plan to use ICOM is the way to move forward [Andreeva, 1998; Eglington et al., 1998; Plink, 1998; Johnson et al., 2000]. As articulated by Andreeva [1998], "If a new integrated policy of resource management is not formed, the situation will worsen." It is also important to make the most of what is currently in place for legislation and activities. For example, a positive outcome of the advancement of the oil and gas industry in Murmansk is the beginnings of undertaking environmental impact assessments. Environmental impact assessments are being used as assessments of risk and baseline data collection and could be the catalyst for eventually undertaking an ICOM plan as more knowledge is gained through the process [Matishov et al., 1998]. The Russian experience highlights how the maturity of a governance system, the level of international cooperation, and the knowledge available impacts the implementation and success of the management approach. It also reminds us to look for opportunities in often overlooked places.

Hope for Russia lies in continued cooperation among scientists within Russia and the international community [Andreeva, 1998]. Plink [1998] and Johnson et al. [2000] provide detailed discussions of how academic institutions and educational programs can disperse the concept of ICOM. In 1993, a training program on coastal zone management was started by the Faculty of Oceanography at the Russian State Hydrometeorological University. This program still exists and is currently developing a Bachelor and Masters Program as part of its Integrated Coastal Management Department [Plink, personal communication]. The idea of incorporating coastal management concepts and principles into academic institutions is being realized and the program founders hope that the efforts will inspire future initiatives for ICOM [Plink, 1998]. Education is a critical component of knowledge and stewardship. People cannot use, change or respond to what they do not know or understand. The first step in education is to provide a source for information, data-sharing and learning. Two programs that hold a lot of promise for fulfilling this need for Arctic regions are ArcticNet and the Arctic Portal. ArcticNet is a Canadian Government initiative and the Arctic Portal is an international initiative led by the Arctic Council.

ArcticNet's central objective is "to contribute to the development and dissemination of the knowledge needed to formulate adaptation strategies and national policies to help Canadians face the impacts and opportunities of climate change and globalization in the Arctic" [ArcticNet, 2004]. The program has four themes, namely: *(1)* climate change; *(2)* food, water, and resources; *(3)* Hudson Bay land-ocean interactions; and *(4)* adapting to change in the Arctic. If this program develops according to plan, then it will become a central clearinghouse on Canadian Arctic coastal and ocean issues. In addition, ArcticNet researchers will contribute to cold-water research and ice research by using the Canadian Icebreaker Canadian Coast Guard Ship Amundsen to access Arctic coastal and ocean areas [ArcticNet, 2004].

The Arctic Council has supported the creation of an Arctic Portal[2] as part of IPY activities. The Portal is intended to provide a variety of services from activity coordination, data sharing, news and events, information on indigenous perspectives and cultural history, publication/document library, links to existing portals and homepages, and Arctic Council specific services, for example, virtual meetings [IPY, 2005]. The intention of the Portal is also to "outlive IPY" and become a long-term resource to the Arctic Council, Arctic states and the international community [IPY, 2005].

Both the ArcticNet and Arctic Portal initiatives are expressions of a desire to create institutional sustainability and address sustainable development in the Arctic. They also underscore the importance of knowledge networks in creating cross-scale linkages, innovation and common understanding of issues; all of which contribute to our knowledge. From institutional arrangements to knowledge networks, broadening and integrating knowledge bases for decision support represents a trend that will encourage and increase the effectiveness of governance systems, while enhancing regional approaches to ocean and coastal management.

Regionalization

The creation of UNCLOS (1982), and the ability of a state to claim an exclusive economic zone, was a convergence in ocean regionalization that continues to define how economics and environment are managed with respect to the oceans. The EEZ, contiguous zone and territorial sea, effectively became their own provinces, extensions of the state, with their own regime for governing them [Kullenberg, 1999b]. However, this legal breakdown of the ocean was just the beginning of regional approaches to ocean management. Today, there are a variety of regional approaches; for example, the Regional Seas Programme, Northwest Atlantic Fisheries Organization (NAFO) areas, and LMEs. LMEs have been a particularly significant step forward in that they focus on sustainable development and make ecosystem integrity a prerequisite to economic efficiency and social equity.

The trend from today's vantage point is that we are moving in the direction of having no ocean "area" free of some system of governance or potentially falling under a national jurisdiction. Yet at the same time we are becoming more aware that there is an "optimum seaward limit" for management [Vallega, 2002]. Regionalization of the oceans differs from creating ocean "areas" because it requires a framework, a high level of

[2] This is now available at http://www.arcticportal.org.

political commitment, and management capacity [Vallega, 2002]. Regions should also be linked so that they converge on ocean realities (for example, climate change), scientific method and policy [Vallega, 2002]. Ideally, creating ocean regions should be the "pursuit of sustainable development on the regional scale" where ecosystems are the "reference reality for any definition of ocean regional spaces" and the size of the units can be managed reasonably [Vallega, 2002].

Units and boundaries for planning and management is a complex topic, covering everything from sovereignty, ecosystem and physical geography, as well as those areas defined for administrative, planning and management purposes. Regionalization includes both zoned and nested units, with local-national, and national-international connotations. In recent decades, there has been considerable attention paid to regionalization as an approach to marine and coastal planning and management, but also much discomfort about selecting appropriate units and boundaries, and the actual value to the result. In addition, problems also arise when adjacent units have differing management approaches, resources or objectives. What needs to be recognized is that regional boundaries are "lines of connection," as well as division [Steinberg, 1999].

There are many benefits of regionalization. For example, it can help resource users, scientists, local governments and institutions identify with something that is larger than the focus of their work, serve adaptive planning and management and knowledge needs, and provide better decision support for security and sustainability issues. It is a means of working reasonably seamlessly on cross-scale issues and also across sectors. Certainly, regionalization is a fundamental basis for organizations such as the Arctic Council, and also for many of the advanced efforts to gain scientific knowledge for the Arctic.

Whatever regionalization options are chosen, they must balance administrative and ecosystem objectives, the benefits and costs, risks of not having such options, and careful consideration that implementation does not make the existing situation worse. Effective regionalization programs also require strong decision-support tools to ensure that the knowledge being acted upon is comprehensive and accurate. A promising and prominent initiative that is working to fulfill this requirement is the Global Ocean Observing System (GOOS), which is "an integrated marine information system involving measurements of the present state of the environment as the basis for forecasting how it is likely to change under certain conditions" [Summerhayes, 2002].

GOOS is a knowledge network that is global in scope, designed to assist regional programs, enhance ecosystem-based management, make local and international environmental connections (for example, ocean currents and local pollution) and encourage international cooperation [Summerhayes, 2002]. The GOOS also has regional units that focus on alignments with domestic programs in specific areas; for example, there is a GOOS-Africa, GOOS-South Pacific, MedGOOS (Mediterranean) and Black Sea GOOS. The Arctic has potential as a GOOS area through the Arctic Council's Arctic Monitoring and Assessment Programme (AMAP), as well as through national level programs like Canada's Marine Environmental Quality (MEQ) program within the Department of Fisheries and Oceans [Summerhayes, 2002].

Knowledge networks like GOOS are an important component of regionalization plans. So far, each Arctic state is taking a unique approach to regionalization, but a regional approach nonetheless. Two states that share similar social, environmental and economic issues, as well as border and maritime boundary issues are Canada and the U.S.

The U.S. released its Ocean Action Plan in 2004 and has been aligning its domestic regionalization plans with the concept of LMEs since 1984 [NOAA, 2005]. The U.S. has identified ten LMEs that encompass all of the ocean space within its national jurisdiction, as well as associated estuaries and watersheds. Three of these LMEs are in Arctic waters: Chukchi, Beaufort and Eastern Bering Sea. Ecosystem-based criteria are used to determine the limits of the LME and each area is assessed in the following five categories: *(1)* productivity; *(2)* fish and fisheries; *(3)* pollution and ecosystem health; *(4)* socioeconomics; and *(5)* governance [Duda and Sherman, 2002]. These categories then serve as a way of measuring how the LME changes over time. The U.S. National Ocean and Atmospheric Administration (NOAA) is the lead agency in the collection, dissemination and evaluation of LME projects and programs. An important element of utilizing LME designations to divide marine spaces into high level management units is that they are linked to the principle of sustainable development and require a strong commitment to international cooperation. They have also been fairly successful models of regionalization.

At a subregional level, the U.S. has also actively pursued ICOM since the early 1970s with the passage of its Coastal Zone Management Act 1972 [Murkowski and Irwin, 2005]. In 2005, the state of Alaska released its updated Coastal Management Program document that outlines coastal management objectives, as well as details on how the program will be carried out. Part of this plan is to encourage communities to create coastal management plans that are then incorporated into the Alaska Coastal Management Program process [Murkowski and Irwin, 2005]. However it is unclear how these ICOM plans feed back into LME units.

In Canada, there is currently no single comprehensive regional approach to the oceans. There are smaller initiatives, like the Eastern Scotian Shelf Integrated Management area, the Beaufort Sea Integrated Management Planning Initiative and the National Marine Conservation Areas. One initiative that is particularly advanced in its ability to coordinate effort, work cooperatively, and manage a large marine area is the Gulf of Maine Council on the Marine Environment. However, these management areas are not linked to a national level regionalization plan or broader international efforts (for example, LMEs).

Different government departments with mandates that include ocean issues are also trying to implement various regional approaches to ocean management in the Arctic. The Department of Fisheries and Oceans, (DFO) Canada, is focused on Large Ocean Management Areas (LOMAs), Ecologically and Biologically Significant Areas and MPAs. The Department of Natural Resources and Parks Canada is looking to extend national park boundaries to include much more of adjacent marine environments, as well as implement national marine conservation areas that focus on large marine units for effective marine conservation.

Protected areas and parks are a popular approach to conservation worldwide, particularly in the Arctic. Ultimately, the goal of a protected area is to connect "local measures with national and international actions to ensure that the Arctic ecosystem as a whole is protected while also allowing Arctic communities to carry on their ways of life in an environmentally sustainable fashion" [CAFF, 2005]. Canada, through national (for example, Oceans Act) and international obligations (for example, Convention on Biological Diversity and Arctic Council), has committed to establishing protected areas (terrestrial and marine). Despite this commitment, the Arctic is still under-represented [WWF, 2005] and many proposals are stuck in the planning and approval phases [Canadian Arctic Profiles, 2005].

To maximize the benefits of protected areas and designating special zones, it is important to coordinate effort. This could be achieved by creating a national coordinating body that would act as a resource to institutions involved in creating protected areas, which would provide advice on what level of protection is needed on a case-by-case basis and develop feedback mechanisms for management [de la Mare, 2005]. This body could be a Protected Areas Council that is made up of several permanent positions, but would also include multiple stakeholders and representatives from academia, industry, government, minority groups and the public. They could also be tasked with certifying a protected area once it met a set of criteria. If the certification process were international, then this body could coordinate with other nations and bring the recommendations and criteria set to the Protected Areas Council for review and implementation. Overall, we need to look at innovative strategies for coast and ocean conservation within a regional framework.

Canada is currently focused on the Beaufort Sea priority area with DFO's Central and Arctic Region as the lead department. Efforts to date have been limited to Beluga management, fisheries co-management and the creation of an MPA [Fast et al., 2001]. These initiatives have been successful in large part because the Beluga's numbers have been good and there has not been a crisis associated with their management [Papst, personal communication].

Beyond ecosystem-based management, Ecologically and Biologically Significant Areas and MPAs, DFO, Canada, is creating LOMAs. LOMAs are a new concept for ocean management in Canada and could provide the larger regional unit necessary to tie the smaller initiatives together and link national efforts to international ones. Such a regional approach to ocean management in Canada will also likely see ICOM being implemented, especially as decisionmakers begin to define the seaward limit of their management capabilities and as people recognize the need for focusing on coastal areas.

Canada and the U.S. may be pursuing different regionalization strategies and coastal management approaches, but they will have to find ways of cooperating in order to optimize the success of their efforts and resolve maritime boundary issues (that is, in the Beaufort Sea). This is also true for other Arctic states and their neighbors. Russia and Norway, for example, have been working cooperatively on such issues as maritime boundaries, cross-border marine and atmospheric pollution, overfishing and fishing regulations [Andreeva, 1998; Eglington et al., 1998]. The most significant area of cooperation is in fisheries management.

Fisheries in the area bordering Norway and Russia are managed via the Russian-Norwegian Agreement [1975] and decisions about scientific surveys and total allowable catches are made by the Joint Russian-Norwegian Fisheries Commission [Shleinik and Troyanovsky, 1998]. The Commission places emphasis on the need for cooperation and carries out nine surveys annually, collecting data on biomass, hydrographic conditions, and spawning. All of the annual data collected by the Commission (several decades' worth) is centralized at the Polar Research Institute of Marine Fisheries and Oceanography [Shleinik and Troyanovsky, 1998]. The cooperation between Norway and Russia for these surveys and other fisheries initiatives has become regarded as a "tradition" between the two countries [Shleinik and Troyanovsky, 1998].

In addition to biological and oceanographic surveys, the two countries cooperate on enforcement of regulations. Recently an agreement was signed between Norway and Russia to allow Russian fisheries inspectors on Norwegian Coast Guard vessels as workers, not just observers [Barents Observer, 2003]. There is also the possibility that Russia will be able to use Norwegian vessels to conduct more extensive illegal fishing patrols [Barents Observer, 2003].

Whether the issue is fishing, mining, climate change, protected areas, POPs or traditional user rights, Arctic states share the outcomes of the issues and therefore must share the responsibility by turning the environmental burdens they face into benefits for all involved (for example, technology transfer and innovative ideas). The method for achieving this kind of return on investment is international cooperation, whereby each state takes ownership of the issues and pledges to achieve sustainable development and governance, cooperatively. In order to do this, participants need a regime that not only promotes international cooperation, but provides the optimal framework for collective action.

International Cooperation

There is a very high cost (social, economic and environmental) to the world community of degrading the Arctic, especially among Arctic states. The origins of some of the most significant past and present drivers are largely global (for example, climate change) or related to other forces (for example, whaling in the 19th century for European use, Cold War militarization and contamination, and POPs produced by non-Arctic nations). These costs will have to be borne largely by the Arctic states, and they will need to cooperate among themselves not only to be cost-effective in terms of finding solutions, but also to determine how other nations may best assist in what are actually becoming global problems. In this way, international cooperation will make tackling Arctic ocean and coastal issues feasible [Holland, 2002].

International cooperation is particularly relevant for the many areas of convergence (for example, UNCLOS applications in the Arctic, MPAs and co-management approaches), particularly, Russia's command-and-control approach and Canada's integrated management approach. As Klock [2005] notes: "International cooperation, however excruciating, represents the next step in social evolution for the nation-state, and perhaps the next front with which to focus our intellectual and educational resources." However, current regional efforts and cooperatives in place (for example, the Northern Forum) are in danger of being diluted by global threats and processes [Young, 2005]. For example, the Arctic Council will struggle to find acceptable solutions to transnational problems without decisionmaking capacity and a legal regime, even if the Council is doing well as a knowledge producer [Young, 2005].

Global threats are particularly salient issues for people living in the Arctic because they are "disproportionately affected by activities beyond the reach of their national governments" [Nowlan, 2001]. Hence the need for Arctic states to work closely together and bring non-Arctic states, like China, on board to find solutions to issues originating within and beyond their national borders. Issues that are domestic, regional and international, and not isolated to one locale or circumstance, tend to get a lot of attention in international cooperation discussions, as well as those focused on sustainable development. Such issues include climate change, oil and gas development, contaminants, maritime transportation and tourism. What sustainable development and international cooperation have so close in common is their purpose to be "a transformative way of doing business, with definitive principles, integrative methods, and goals that will help societies prosper during this century while conserving and restoring environmental and natural resource conditions" [Hanson, 2003]. While the latter description may not encompass all the aspects of sustainable development and international cooperation, it does send the message that ocean and coastal management is going to require a revolution in thought and a shift in how we approach global issues. Such a revolution can only happen in a world that embraces international cooperation.

There are several international conventions that have particular relevance for the Arctic: UNCLOS, Convention on Biological Diversity, Climate Change, POPs, Kyoto, Air Pollution, Hazardous Wastes, Whaling, Marine Dumping, Wetlands and Endangered Species [Nowlan, 2001]. These conventions have highlighted the interdependencies that exist among Arctic states, as well as the need for international cooperation. However, it is not always a straightforward process. Without consequences for non-cooperation or incentives to cooperate, states may continue to act independently [Luterbacher, 1994]. It has also been found that cooperation cannot be delayed because the benefits of cooperation diminish the longer states wait [Hammit and Adams, 1996].

States currently have an opportunity to address weaknesses and gaps as we approach the 2007–2008 International Polar Year (IPY). Like past IPYs and similar events (for example, International Geophysical Year and the International Year of the Ocean), the IPY is a governance mechanism, though transient in nature, which cannot be overlooked for its importance in encouraging national attention to Arctic issues, international cooperation and highlighting the needs and future direction of governance and management for the Arctic [Hik, 2005]. In other words, the IPY should be treated as an opportunity to create a convergence of activities and action on current recommendations at all levels, especially those of the Arctic Council, for example, the Arctic Climate Impact Assessment and the Arctic Human Development Report [Hik, 2005]. An example of coordination currently underway is the Arctic Ship Coordination during the IPY initiative whose purpose is to facilitate the coordination of ships and platforms for the benefit of Arctic research and programs [ASCI, 2006].

Many governments and leading institutions working on Arctic issues have recognized that cooperation is the most realistic method for addressing Northern issues. United Nations Environment Programme/GRID-Arendal has realized this with the implementation of their Polar Programme. In the coming months, the UNEP/GRID-Arendal and many other participants will be looking at how multilateral environmental agreements can be more relevant to the Arctic and enhance policy and management [UNEP/GRID-Arendal, 2005]. Overall, we need to look for new ways that international cooperation can take place more productively and expand on existing cooperative arrangements (for example, International Polar Bear Agreement).

Conclusion

The future holds some certainties: *(1)* human impacts on the environment are ongoing and intensifying, especially with a growing human population; *(2)* demographic, social, political, and institutional changes will continue; *(3)* the costs for maintaining and restoring social, economic, and environmental integrity will become greater; and *(4)* whether decisionmakers deal with the issues proactively or not is almost irrelevant, because they will have to deal with the outcomes regardless [Olsen, 2000]. To overcome our "20th century legacy" of putting ecosystem integrity last, we need to reframe the issues, fine-tune our approach, and ensure that we are flexible enough to respond to current and future issues [Friedheim, 2000]. To this end, conserving the Arctic and adapting to inevitable change requires a level of "knowledge and determination" that has not been pursued to date [Pielou, 1994].

Part of an appropriate response is to develop and maintain a system of good governance. Good governance is a process that emerges from a "sphere of activity" that is rooted in collaboration, cooperation, and also formal agreements, for example, Agenda 21 and land claims [Cole, 2003]. The Coastal Resources Center offers a more comprehensive definition: "Governance, the processes in which public, private, and civil society actors organize themselves and coordinate with each other to make decisions and distribute rights, obligations, and authority for the use of shared coastal resources" [CRC, 2002].

In order to realize a system of good governance, we must admit that "it's too late to avoid changing our world, but we still have time, if good policy is implemented, to avoid disaster" [Flannery, 2005]. Assuming we can manage to put forward good policies, avoiding disaster means that we need to ask ourselves key questions, such as: What environmental state is desired? What are we willing and prepared to do to achieve the desired state? And will it be enough to procure sustainability? From these questions emerges a need to better understand natural and social systems, as well as human values.

Coastal and ocean governance in the Arctic is an area of great opportunity in that there are a small number of actors involved in comparison to other areas and there is also the flexibility that is often associated with a maturing governance system. The hope is that Arctic management and governance will embrace ways of doing things that foster the revolution in thought necessary to make up for lost time and carry us into the future. This chapter has discussed a range of Arctic issues, bringing gaps and opportunities to the surface, in an effort to assess whether Canada's current Arctic governance and management systems are adequate to address future challenges.

Many of the issues and management strategies discussed have been covered many times in literature; but have they fallen on deaf ears? To illustrate, Hik and Kraft-Sloan [2004] identified several areas where Canada's efforts have not been adequate in the Arctic:

- Progress in integrated and interdisciplinary management has been very slow.
- There is a lack of a national Northern science and research strategy.
- Involvement in international circumpolar activities has decreased.
- Innovation and technological advancement opportunities are being missed.
- Northern jobs are not being created and there is an overall lack of support for sustainable development.
- Little funding compared to other countries who have increased federal spending (for example, the U.S. doubled its funding in 2003 for Northern science and research).
- There is a distinct fragmentation among federal Northern science and research initiatives, as well as conflicting mandates, poor planning and little consistency.
- Not enough incentives for recruiting new Northern researchers and scientists.

The question during IPY 2007-2008 and beyond is: Has anything changed?

Some would argue that "our government has shown good intent but failed to perform" [Macnutt, 2004]. If Canada is going to have any hope of making its responses proportional to current and future threats it is going to require "a larger vision, ambition, and plan" [Griffiths, 2004]. We need to be more innovative and find ways to demonstrate our leadership on Arctic issues. Such things as declaring the Canadian Arctic as a nuclear-free zone or taking the opportunity now to set aside a large area of the Arctic, terrestrial and marine, as a national park. Setting aside a large portion of the Canadian Arctic would be a visionary step forward in creating the 21st century identity of the North.

In order to be innovators, leaders must "secure the Arctic properly" and all Arctic states must spend the money [Baglole, 2000]. Canada needs to make more short- and long-term financial commitments to provide the human and infrastructure resources needed to close the gap between current capabilities and future requirements. We need to address our shortcomings at the same pace that the challenges and issues are emerging.

Coming of age in the 21st century will be a time to reflect and a time to respond. It is clear that coastal and ocean areas in the Arctic are unique and that they need equally unique approaches to their management and governance. Each Arctic state has natural, human, and financial capital that it must use wisely and cooperatively so that, as circumpolar nations, they can co-evolve [Berkes and Arctic Institute of North America, 2005]. This co-evolution will be a product of focusing on the issues and ideas presented in this chapter and the means by which we can preserve the three pillars of sustainability: ecosystem integrity, economic efficiency, and social equity.

References

Abbott, C., P. Rogers and J. Sloboda. 2006. *Global responses to global threats: Sustainable security for the 21st century.* Oxford Research Group, Oxford, United Kingdom.

Abrahams, P.W. 2002. "Soils: Their implications to human health." *The Science of the Total Environment*, 291:1–32.

Ahlenius, H., K. Johnsen and C. Nellemann. 2005. "Vital Arctic graphics: People and heritage on our last wild shores." Available at http://www.vitalgraphics.net/arctic.cfm. [Accessed 15 May 2006].

Airoldi, L., M. Abbiati, M.W. Beck, S.J. Hawkins, P.R. Jonsson, D. Martin, P.S. Moschella, A. Sundelof, R.C. Thompson and P. Aberg. 2005. "An ecological perspective on the deployment and design of low-crested and other hard coastal defense structures." *Coastal Engineering*, 52(10–11):1073–1087.

AMAP. 2007. *Assessment of oil and gas activities in the Arctic.* Arctic Monitoring and Assessment Programme. (In preparation).

Andreeva, E. N. 1998. "The Russian Arctic coastal zone management problems: Past lessons and new realities." *Ocean and Coastal Management*, 41 (2–3):237–256.

ArcticNet. 2004. "Rationale." Available at http://www.arcticnet-ulaval.ca/index.php?fa=ArcticNet.aboutUs&home=1. [Accessed 27 March 2006].

ASCI. 2006. "Arctic ship coordination during IPY 2007–1008." Available at http://www.asci-ipy.de/. [Accessed 5 August 2006].
Baglole, J. 2000. "Northern thaw raises defense concerns: A Canadian waterway free of ice may bring commerce and foes." *Wall Street Journal*, Section A14. Available at http://proquest.umi.com.ezproxy.library.dal.ca/pqdlink?did=878491951&Fmt=7&clientId=15814&RQT=309&VName=PQD. [Accessed 29 May 2006].
Barents Observer. 2003. Available at http://www.barentsobserver.com/index.php?cat. [Accessed 22 February 2006].
Bederman, D.J. 1987. "High stakes in the high Arctic: Jurisdiction and compensation for oil pollution from offshore operations in the Beaufort Sea." *Alaska Law Review*, 4(1):37–69.
Beesley, J. A. 1971. "Rights and responsibilities of Arctic coastal states: The Canadian view." *Journal of Maritime Law and Commerce*, 3(October): 1–12.
Berkes, F. and Arctic Institute of North America. 2005. *Breaking ice: Renewable resource and ocean management in the Canadian north*. University of Calgary Press, Calgary, Alberta, Canada. 396 pp.
Berkes, F., R. Mahon, P. McConney, R. Pollnac and R. Pomeroy. 2001a. *Co-management and community-based management in managing small-scale fisheries: Alternative directions and methods*. IDRC, Ottawa. 19 pp.
Berkes, F., J. Mathias, M. Kislalioglu and H. Fast. 2001b. "The Canadian Arctic and the Oceans Act: The development of participatory environmental research and management." *Ocean and Coastal Management*, 44(7–8): 451–469.
Birnie, P.W. and R.E. Stein. 1975. *Critical environmental issues on the Law of the Sea: A report of the International Institute for Environment and Development*. International Institute for Environment and Development, Washington.
Brubaker, R.D. 2001. "Straits in the Russian Arctic." *Ocean Development and International Law*, 32(3):263–287.
Brubaker, R.D. and W. Østreng. 1999. "The northern sea route regime: Exquisite superpower subterfuge?" *Ocean Development and International Law*, 30(4): 299–331.
Brunnee, J. and S.J. Toope. 1997. "Environmental security and freshwater resources: Ecosystem regime building." *American Journal of International Law*, 91(26):26–59.
Bryan, A. 2003. "Slipping into the sea." *The World & I*, 18(12):172.
Byers, M. and S. Lalonde. 2005. "Our Arctic sovereignty is on thin ice." *The T Globe and Mail*, Toronto, 1 August 2005:A11.
CAFF. 2005. "Arctic flora and fauna: Recommendation for conservation." Available at http://www.caff.is/sidur/uploads/CAFFbladid.pdf. [Accessed 25 November 2005].

Canadian Arctic Profiles. 2005. "Government of Canada's digital collections." Available at http://collections.ic.gc.ca/arctic/english.htm . [Accessed 27 November 2005].

CARC. 2006. "Renewing the northern strategy." Available at http://www.carc.org/pubs/v30no1/CARC_Northrn_Perspctves_Winter_2006.pdf. [Accessed 23 May 2006].

Chalecki, E. 2002. "Environmental security: A case study of climate change." Pacific Institute for Studies in Development, Environment, and Security. Available at http://www.pacinst.org/reports/environment_and_security/. [Accessed 19 July 2006].

Cicin-Sain, B. and R.W. Knecht. 1998. *Integrated coastal and ocean management: Concepts and practices.* Island Press, Washington, DC, USA. 517 pp.

Cole, H. 2003. "Contemporary challenges, globalization, global interconnectedness and that there are not plenty more fish in the sea: Fisheries, governance and globalization: Is there a relationship?" *Ocean and Coastal Management*, 46(1–2):77–102.

Cooper, L.W. 2003. *Land-shelf interactions: A scientific initiative in the Arctic nearshore.* RAISE/LSI Project Management Office, University of Tennessee, Knoxville TN, US.

Couture, R., S. Robinson, M. Burgess and S. Solomon. 2002. "Climate change, permafrost, and infrastructure community: A compilation of background material from a pilot study of Tuktoyaktuk, Northwest Territories." *Geological Survey of Canada*, Open File #3867. 83 pp.

CRC (Coastal Resources Center). 2002. *A world of learning: A portfolio of coastal resources management program experience and products.* University of Rhode Island, Coastal Resources Center. Narragansett, Rhode Island, US. 32 pp.

Danby, R.K., D.S. Hik, S.D. Slocombe and A. Williams. 2003. "Science and the St. Elias: An evolving framework for sustainability in North America's highest mountains." *The Geographical Journal*, 169(3):191–204.

Dawson, J. 2004. "Identifying vulnerability to climate change and the challenges of adaptation for Canada's coastal communities." In: *Proceedings from C-CIARN Coastal Zone and C-CIARN Fisheries Workshop at the Ocean Management Research Network (OMRN) National Conference, 2003.* Edited by K. Parlee. C-CIARN Coastal Zone Report 04-2. 20 pp.

Dawson, J.I. and R.G. Darst. 2005. "Russia's proposal for a global nuclear waste repository: Safe, secure, and environmentally just?" *Environment*, 47(4):10.

de la Mare, W.K. 2005. "Marine ecosystem-based management as a hierarchical control system." *Marine Policy*, 29(1):57–68.

Dorian, J.P., H.T. Franssen and D.R. Simbeck. 2006. "Global challenges in energy." *Energy Policy*, 34(15):1984–1991.

Dowdall, M., K. Vicat, I. Frearson, S. Gerland, B. Lind and G. Shaw. 2004. "Assessment of the radiological impacts of historical coal mining operations on the environment of Ny-Alesund, Svalbard." *Journal of Environmental Radioactivity*, 71(2):101–114.

Downie, L. and T. Fenge. 2003. *Northern lights against POPs: Combating toxic threats in the Arctic.* McGill-Queen's University Press, Montreal/Kingston. 347 pp.

Duda, A. M. and K. Sherman. 2002. "A new imperative for improving management of large marine ecosystems." *Ocean and Coastal Management*, 45(11–12):797–833.

Eaton, J.H. 1995. "Kicking the habit: Russia's addiction to nuclear waste dumping at sea." *Denver Journal of International Law and Policy*, 23(2): 287–312.

Eglington, A., R. Israel and R. Vartanov. 1998. "Towards sustainable development for the Murmansk region." *Ocean and Coastal Management*, 41(2-3): 257–271.

Ellesworth, J.P., L.P. Hildebrand and E.A. Glover. 1997. "Canada's Atlantic Coastal Action Program: A community-based approach to collective governance." *Ocean and Coastal Management*, 36(1–3):121–142.

Energy Information Administration. 2006. "Country Analysis Brief: Russia." Available at http://www.eia.doe.gov/emeu/cabs/Russia/Background.html. [Accessed 4 March 2006].

Fast, H., S. Eddy and O. Banias. 2001. "Charting a coordinated approach to management of the Western Hudson Bay Region." In: *Proceedings of the Western Hudson Bay Workshop, 23–25 October 2000, Winnipeg, MB.* Edited by H. Fast, S. Eddy and O. Banias. Oceans Programs Division, Fisheries and Oceans Canada, Winnipeg, MB. 44 pp.

Faust, B.B. 2001. "Maya environmental successes and failures in the Yucatan Peninsula." *Environmental Science and Policy*, 4:153–169

Filler, D.M. and R.F. Carlson. 2000. "Thermal insulation systems for bioremediation in cold regions." *Journal of Cold Regions Engineering*, 14(3):119–129.

Flannery, T.F. 2005. *The weather makers: How man is changing the climate and what it means for life on earth*. Atlantic Monthly Press, New York, USA. 357 pp.

Friedheim, R.L. 1999. "Ocean governance at the millennium: Where we have been — where we should go." *Ocean and Coastal Management*, 42(9): 747–765.

Friedheim, R.L. 2000. "First millennium special issue: Ocean governance." *Ocean and Coastal Management*, 43(2/3):137–275.

Gamberg, M., B. Braune, E. Davey and B. Elkin, et al. 2005. "Spatial and temporal trends of contaminants in terrestrial biota from the Canadian Arctic." *Science of the Total Environment*, 351–352(12/1):148–164.

Gleick, P.H. 2006. "The implications of global climatic changes for international security." In: *Testimony of Dr. Peter H. Gleick to the United States Congress Committee on Government Reform Subcommittee on National Security,* *Emerging Threats, and International Relations Hearing on Energy as a Weapon: Implications for US Security.* Pacific Institute, Oakland, California. US. 8 pp.

Griffiths, F. 2004. "Pathetic fallacy: That Canada's Arctic sovereignty is on thinning ice." *Canadian Foreign Policy*, 11(3):1–16.

Haas, E.B. "Regime decay: Conflict management and international organizations, 1945–1981." *International Organization*, 37 (Spring 1983):193.

Hammitt, J.K. and J.L. Adams. 1996. "The value of international cooperation for abating global climate change." *Resource and Energy Economics*, 8: 219–241.

Hanson, A.J. 2003. "Measuring progress towards sustainable development." *Ocean and Coastal Management*, 46:381–390.

Hassol, S. 2004. *Impacts of a warming Arctic.* International Arctic Science Committee, Arctic Monitoring and Assessment Programme, Program for the Conservation of Arctic Flora and Fauna, Arctic Climate Impact Assessment and Cambridge University Press. 139 pp.

Hebert, P.D.N. and J. Wearing-Wilde. 2002. "Canada's polar life." Available at www.polarlife.ca. [Accessed 27 November 2005].

Hik, D.S. 2005. "IPY 2007–08 and the resurgence of northern (and polar) research in Canada." *Arctic*, 58(1):98.

Hik, D.S. and K. Kraft-Sloan. 2004. "Putting the Canadian polar house in order." *Arctic*, 57(2):iii-v.

Holland, G. 2002. "The Arctic Ocean—The management of change in the northern seas." *Ocean and Coastal Management*, 45(11–12): 841–851.

Homer-Dixon, T. 1991. "On the threshold: Environmental changes as causes of acute conflict." Trudeau Centre for Peace and Conflict Studies, University of Toronto. *International Security*, 16(2):76–116.

INAC. 2004. "Northern strategy." Available at http://www.northernstrategy.ca/. [Accessed 10 November 2005].

IPY. 2005. "Full proposals for IPY 2007–2008 activities." Available at http://www.ipy.org/development/eoi/proposal-details.php?id=388. [Accessed 6 July 2006].

Johnson, D.E., S. Fletcher, S.V. Shibaev, V.A. Shkitsky, A.C. Upton and A.V. Zagorodny. 2000. "Integrated coastal management education in the Russian Federation through academic partnership." *Ocean and Coastal Management*, 43(10–11):953–962.

Johnston, D.M. and D.L. VanderZwaag. 2000. "The ocean and international environmental law: Swimming, sinking, and treading water at the millennium." *Ocean and Coastal Management*, 43(2–3):141–161.

Juda, L. 2003. "Changing national approaches to ocean governance: The United States, Canada, and Australia." *Ocean Development and International Law*, 34(2):161–187.

Kay, R. and J. Alder. 1999. *Coastal planning and management*. SPON Press, London and New York. 375 pp.
Kafarowski, J. 2005. "Everyone should have a voice, everyone's equal: Gender, decisionmaking and environmental policy in the Canadian Arctic." *Canadian Woman Studies*, 24(4):12–17.
Kendrick, A. 2003. "The flux of trust: Caribou co-management in Northern Canada." *Environments*, 31(1):43–59.
Keohane, R.O. 1982. "The demand for international regimes." *International Organization*, 36(2):325–355.
Klock, J. 2005. "Strategies for developing the college course on global climate change." Available at http://egj.lib.uidaho.edu/egj21/klock1.html. [Accessed 11 May 2006].
Kullenberg, G. 1999a. "Approaches to addressing the problems of pollution of the marine environment: An overview." *Ocean and Coastal Management*, 42(12):999–1018.
Kullenberg, G. 1999b. "The exclusive economic zone: Some perspectives." *Ocean and Coastal Management*, 42(9):849–855.
Kullenberg, G. 2002. "Regional co-development and security: A comprehensive approach." *Ocean and Coastal Management*, 45(11–12):761–776.
Larsen, T. S., J.A. Kristensen, G. Asmund and P. Bjerregaard. 2001. "Lead and zinc in sediments and biota from Maarmorilik, West Greenland: An assessment of the environmental impact of mining wastes on an Arctic fjord system." *Environmental Pollution*, 114(2):275–283.
Leont'yev, I.O. 2004. "Coastal profile modeling along the Russian Arctic coast." *Coastal Engineering*, 51(8–9):779–794.
Leopold, J. 2006. "Major oil spill in Alaska." *Earth Island Journal*, 21(2): 44–46.
Levy, M.A. 1995. "Is the environment a national security issue?" *International Security*, 20(2):35–62.
Luterbacher, U.E.R. 1994. "International cooperation: The problem of the commons and the special case of the Antarctic region." *Synthese*, 100(3):413–440.
Macnutt, A. 2004. *Canada's Arctic sovereignty*. Allan Macnutt, Abbotsford, B.C. 266 pp.
Manson, G.K., S.M. Solomon, D.L. Forbes, D.E. Atkinson and M.E. Craymer. 2005. "Spatial variability of factors influencing coastal change in the Western Canadian Arctic." *Geo-Marine Letters*, 25(2–3):138–145.
Matishov, G., V.V. Denisov and Y.E. Kirillova. 1998. "Role of a procedure of environment impact assessment (EIA) in elaborating the integrated project of managing the Barents Sea coastal zones." *Ocean and Coastal Management*, 41(2–3):221–236.
Melnyk, S. 2000. "Arctic Council and fisheries and oceans program initiatives: Existing and potential linkages (draft #2)." Oceans Programs Division, Department of Fisheries and Oceans, Canada, Winnipeg, MB. 150 pp.

Murkowski, F. and T. Irwin. 2005. "The Alaska Coastal Management Program, as amended." Available at http://www.dnr.state.ak.us/acmp/. [Accessed 15 January 2006].

Murton, J.B. 2005. "Ground-ice stratigraphy and formation at North Head, Tuktoyaktuk Coastlands, Western Arctic Canada: A product of glacier-permafrost interactions." *Permafrost and Periglacial Processes,* 16:31–50.

Nadasdy, P. 2003. "Re-evaluating the co-management success story." *Arctic,* 56(4):367–380.

Newton, J., C. Paci and A.E.R. Ogden. 2005. "Climate change and natural hazards in Northern Canada: Integrating indigenous perspectives with government policy." *Mitigation and Adaptation Strategies for Global Change,* 10(3):541–571.

NOAA. 2005. "An ocean blueprint for the 21st century." Final Report of the US Commission on Ocean Policy. Pre-publication copy. Washington, DC. Available at http://www.oceancommission.gov/documents/prepub_report/welcome.html#full. [Accessed 11 July 2006].

Nowlan, L. 2001. *Arctic legal regime for environmental protection.* Law Paper No. 44. IUCN Environmental Law Program, Gland, Switzerland. 85 pp.

Ogorodov, S. A. 2005. "Human impacts on coastal stability in the Pechora Sea." *Geo-Marine Letters,* 25(2–3):190–195.

Olsen, S.B. 2000. "Educating for the governance of coastal ecosystems: The dimensions of the challenge." *Ocean and Coastal Management,* 43(4–5):331–341.

Paci, C., D. James, C. Dickson, S. Nickels, L. Chan and C. Furgal. 2004. "Food security of northern indigenous peoples in a time of uncertainty." In: *Proceedings of the 3rd NRF Open Meeting, 15–18 September 2004, Yellowknife and Rae Edzo, NWT.* 15 pp.

Papst, M. Personal communication. Fisheries and Oceans Canada, Winnipeg District 501 University Crescent, Winnipeg, Manitoba, R3T 2N6.

Pielou, E.C. 1994. *A naturalist's guide to the Arctic.* University of Chicago Press, Chicago. 344 pp.

Plink, N.L. 1998. "Training and education in integrated coastal zone management." *Ocean and Coastal Management,* 41(2–3):273–279.

Plink, N.L. Personal Communication. RSHU, St. Petersburg, Russia.

Proshutinsky, A., V. Pavlov and R.H. Bourke. 2001. "Sea level rise in the Arctic Ocean." *Geophysical Research Letters,* 28(11):2237.

Pungowiyi, C. 2005. "Native observations of change in the marine environment of the Bering Strait region." Available at http://www.arctic.noaa.gov/essay_pungowiyi.html. [Accessed 20 November 2005].

Rachold, V., F.E. Are, D.E. Atkinson, G. Cherkashov and S.M. Solomon. 2005. "Arctic coastal dynamics (ACD): An introduction." *Geo-Marine Letters,* 25(2–3):63–68.

Reistad, O., M.B. Maerli and J. Skorve. 2003. "Russia: Kola cleanup coming?" *Bulletin of the Atomic Scientists,* 59(2):12–16.

Rothwell, D. 1996. *The Polar regions and the development of international law.* Cambridge University Press, New York. 529 pp.
Salmona, P. 2002. "The regional seas in the 21st century: The need for data." *Ocean and Coastal Management,* 45(11–12):935–964.
Samstag, T. and the Nordic Council of Ministers. 1993. "Arctic challenges." In: *Report from the Nordic Council's parliamentary conference, 16–17 August 1993, Reykjavik, Iceland.* Nordic Council, Stockholm. 154 pp.
Schrad, M.L. 2006. "Threat level green: Conceding ecology for security in Eastern Europe and the former Soviet Union." In: *Global Environmental Change.* Corrected Proof. (In Press).
Shaw, J., R.B. Taylor, D.L. Forbes, M.H. Ruz and S. Solomon. 1998a. *Sensitivity of the coasts of Canada to sea-level rise.* Geological Survey of Canada Bulletin 505. Ottawa, Ontario. 14 pp.
Shaw, J., R.B. Taylor, S. Solomon, H.A. Christian and D.L. Forbes. 1998b. "Potential impacts of global sea-level rise on Canadian coasts." *Canadian Geographer,* 42(4):365.
Shleinik, V.N and F.M. Troyanovsky. 1998. "Problems of management of marine biological resources in the Russian sector of the Arctic." *Ocean and Coastal Management,* 41(2–3):153–159.
Smith, B. 1982. "Innocent passage as a rule of decision: Navigation vs. environmental protection." *Columbia Journal of Transnational Law,* 21(1):49–102.
Smith, A.C., J.A. Virgl, D. Panayi and A.R. Armstrong. 2005. "Effects of a diamond mine on tundra-breeding birds." *Arctic,* 58(3):295–304.
Solomon, S. 2005. "Spatial and temporal variability of shoreline change in the Beaufort-Mackenzie region, Northwest Territories, Canada." *Geo-Marine Letters,* 25(2–3):127–137.
Solomon, S. and P. Gareau. 2003. "Beaufort Sea coastal mapping and the development of a coastal hazard index," pp. 1091–1096. In: *Proceedings of the 8th International Conference on Permafrost, 21–25 July 2003, Zurich, Switzerland.* AA Balkema Publishers.
Steinberg, P.E. 1999. "Lines of division, lines of connection: Stewardship in the world ocean." *Geographical Review,* 89(2):254–264.
Summerhayes, C. 2002. "Technical tools for regional seas management: The role of the Global Ocean Observing System (GOOS)." *Ocean and Coastal Management,* 45(11–12):777–796.
Tester, F. J. and P. McNicoll. 2004. "Isumagijaksaq: Mindful of the state: Social constructions of Inuit suicide." *Social Science and Medicine,* 58(12):2625–2636.
Tucker, W., L. Brigham and F. Nelson. 2004. "A new report on permafrost research needs." *Journal of Cold Regions Engineering,* 18(4):123–133.
UNEP. 2006. *Marine and coastal ecosystems and human wellbeing: A synthesis report based on the findings of the Millennium Ecosystem Assessment.* UNEP, Nairobi, Kenya. 76 pp.

UNEP/GRID-Arendal. 2005. "Multilateral Environmental Agreements and their relevance to the Arctic." Available at http://polar.grida.no/. [Accessed 5 June 2006].
UNESCO. 2006. *Exit from the labyrinth: Integrated coastal zone management in the Kandalaksha District, Murmansk Region of the Russian Federation*. Coastal Region and Small Island Papers 21. Edited by M. Shilin. Available at http://unesdoc.unesco.org/images/0014/001469/146919e.pdf. UNESCO, Paris. 75 pp.
Vallega, A. 2002. "The regional approach to the ocean, the ocean regions, and ocean regionalization: A post-modern dilemma." *Ocean and Coastal Management*, 45(11–12):721–760.
Vlassova, T. 2006. "Arctic residents' observations and human impact assessments in understanding environmental changes in Boreal forests: Russian experience and circumpolar perspectives." In: *Mitigation and adaptation strategies for global change*, DOI: 10.1007/s11027-005-9023-4.
Yandle, T. 2003. "The challenge of building successful stakeholder organizations: New Zealand's experience in developing a fisheries co-management regime." *Marine Policy*, 27:179–192.
Young, O.R. 2000. "The structure of Arctic cooperation: Solving problems/seizing opportunities." A paper prepared at the request of Finland in preparation for the Fourth Conference of Parliamentarians of the Arctic Region, 27–29 August 2000, Rovaniemi, Finland, and the Finnish chairmanship of the Arctic Council during the period 2000–2002. Institute of Arctic Studies, Dartmouth College, Hanover, USA. 22 pp.
Young, O.R. 2005. "Governing the Arctic: From cold war theater to mosaic of cooperation." *Global Governance*, 11(1):9–15.
Walker, T.R., S.D. Young, P.D. Crittendena and H. Zhang. 2003. "Anthropogenic metal enrichment of snow and soil in northeastern European Russia." *Environmental Pollution*, 121:11–21.
Welch, H. E. 1995. "Marine conservation in the Canadian Arctic: A regional overview." Paper prepared to facilitate discussion at the National Marine Conservation Strategy Programme workshops, March 1995, Iqaluit and Inuvik, Nunanvut. 21 pp.
WWF. 2005. "Time for tough laws." Available at http://www.panda.org/about_wwf/where_we_work/arctic/publications/index.cfm?uNewsID=24095. [Accessed 23 November 2005].

CHAPTER 24

The Geopolitics of Regional Cooperation and the Straits of Malacca and Singapore

B.A. Hamzah

Introduction

At the International Maritime Organization (IMO)-sponsored meeting of stakeholders in 2006,[1] the littoral states of Indonesia, Malaysia, and Singapore, after consulting among themselves and with the approval of the Tripartite Technical Experts Group (TTEG),[2] have agreed to place on the agenda various projects on navigational safety and marine pollution prevention. These projects are initiated by the littoral states in an effort to reduce their respective cost for keeping the straits safe to navigation

[1] Kuala Lumpur Meeting on the Malacca Strait and Singapore: Enhancing Safety, Security and Environmental Protection,18–20 September 2006.

[2] TTEG is an intergovernmental mechanism established by the three littoral states in 1971 to provide technical advice on navigational safety and marine pollution prevention. It was through the efforts of the TTEG that the routing system was adopted in 1981 and the mandatory ship reporting system implemented in 1998. See also the statement by Yee [2006], Director (Policy), Maritime and Port Authority of Singapore.

and to prevent marine pollution. Some stakeholders have indicated willingness to share costs since their vessels and cargo make use of the waterway and the facilities installed by the littoral states.

For some stakeholders, the economic interests are incidental to their geopolitical concerns.

For the littoral states (certainly for Malaysia), since the deeper navigational channel passes their respective territory, the control of the waterway must always be in their respective hands. The national position is not always appreciated by those who seek to dilute the littoral states' control of the waterway.

Contrary to some perceptions, although most literature on the topic always treats both straits as one, in reality they are governed by different national jurisdictions.[3] Part of the Strait of Malacca, for example, is in the archipelagic waters of Indonesia and part of it forms the territorial sea of Malaysia. The Strait of Malacca is also on the continental shelf of Indonesia and Malaysia. There are others[4] who claim that since the waterway touches their own maritime zones in the Andaman and Phuket, they too wish to exercise some kind of jurisdiction in the Straits.

Likewise, the Strait of Singapore passes through the territorial sea of Singapore and the archipelagic waters of Indonesia.

While the international community respects and recognizes the sovereignty of the littoral states over the Straits, it expects the latter to recognize its rights and obligations to exercise transit passage rights as provided for under the international law of the sea including the relevant provisions of the United Nations Convention on the Law of the Sea. The international community, too, expects the littoral states to keep the waterway safe for navigation.

This chapter pays special attention to the portion of the waterway in the Malaysian and Indonesian territories. More specifically, it focuses on the deeper channel of the Strait of Malacca that runs from One Fathom Bank through the IMO-sanctioned traffic separation schemes (TSS) mainly in the territorial sea of Malaysia and Indonesia. However, this chapter will also address common issues in the Strait of Singapore within the context of IMO-sponsored activities.

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[3] Mariners are well aware of this legal and geographical definition; see Defense Mapping Agency [1989]. In fact, the London-based Joint War Committee (JWC) of Lloyd's Market Association also treats the two straits separately. In 2005–2006 the JWC did not include the Strait of Singapore as a war risk waterway unlike the Strait of Malacca (imposed in June 2005, lifted in August 2006). The IMO recognizes both waterways as two separate bodies of water and lumped them together primarily for the purposes of facilitating a routing system in the Straits incorporating a traffic separation scheme and installation of navigational aids.

[4] See Khurana [2006]. He has argued that insecurity in the Malacca Strait is inextricably linked to India's maritime security and that the northern part of the waterway is "contiguous to India's maritime zones. India has classified itself as a funneling state to distinguish it from littoral states." See also AFP [2006b].

While national jurisdiction determines the basis for cooperation, effective cooperation can only take place by involving other stakeholders. States may differ in their perceptions of, for example, the threat to their security, how to respond to different aspects of navigational safety, or what to do with marine pollution in their part of the waterway. There is no common policy towards these issues as each littoral state is responsible to implement projects or resolve issues within its own maritime zone.

The policies of the Government of Malaysia, for example, in its territorial sea portion of the Strait of Malacca are that of a sovereign nation, not subject to queries or interference from other states. Likewise, the other two littoral states have their own policies, subject only to the relevant customary international law and international treaties which they have agreed to be party to.

The absence of a common position on many issues limits the scope for regional or global cooperation especially on geopolitical issues beyond what is already agreed upon among the littoral states. This reluctance to fully cooperate on security issues, such as joint patrolling in the Malacca Strait, results partly from this. Similarly, the refusal or acceptance of some littoral states to allow foreign forces operating in the Straits of Malacca and Singapore must be seen in the context of their respective foreign policies. In the same breath, efforts by outsiders to "persuade" littoral states to ratify certain international treaties or conventions may simply fail as these states are more likely to cite national interests as their defense. They are less likely to succumb to these external pressures.

Identification and Prioritization of Needs for Projects on Safety of Navigation and Environmental Protection[5]

The six projects approved by the TTEG and endorsed at the Kuala Lumpur meeting, in brief, are as follows:

[5] The list of projects was submitted by Indonesia, Malaysia, and Singapore and presented at the Kuala Lumpur Meeting on the Malacca Strait and Singapore: Enhancing Safety, Security and Environmental Protection, 18–20 September 2006. The littoral states have placed on the agenda two projects each for stakeholders to choose from. China has indicated its willingness to help out with the Indonesian proposal to repair and replace navigational aids destroyed by the tsunami in December 2004. Beijing has also indicated that it will participate in the HNS project proposed by Malaysia.

The Removal of Wrecks Especially within the IMO-authorized TSS for Deep-draught Vessels

The project has identified 12 wrecks, 2 in the Strait of Singapore, 9 in the Malaysian side of the Strait of Malacca and 1 in Indonesian waters.

The rationale for this project is simple. The wrecks are hazardous to navigation especially to vessels with deep draught. Currently, deep-draught vessels and very large crude carriers are required to have under keel clearance of 3.5 m. Of the 90,000 vessels that pass through the Straits, many do not meet the under keel clearance limit; as an example, those vessels with draughts of 21 m will require a minimum depth of 24.5 m to navigate safely. Clearly, there are portions in the Straits which do not have this minimum water depth even in the TSS. The presence of wrecks has compounded the problem of navigation.

The total estimate for removing these wrecks within 5 years is USD 19 million (including hydrographic survey cost and risk analysis). An initial sum of USD 4 million is required to conduct hydrographic survey and risk analysis. The actual removal of the wrecks can only be undertaken after completion of both survey and risk analysis. Priority will be to remove the wrecks in the TSS.

What is expected of the stakeholders? Those stakeholders who wish to participate are expected to: contribute to the required fund (USD 19 million); assist in training those involved in the three different stages, namely: survey, risk analysis, and wreck monitoring; and provide technical assistance.

Each littoral state is to implement the project within its own territory based on an agreed mechanism among them.

Cooperation and Capacity Building on Hazardous and Noxious Substances (HNS) Preparedness and Response to Mitigate Impact of Accidents Involving Tankers Carrying HNS Materials

This proposal requires that each littoral state establish an HNS database and pre-position equipment to combat spills at currently 6 designated locations (5 in Malaysia, 1 in Singapore), designated as HNS Response Centers. The proposal also includes the formulation of a Common Standard Operating Procedure for joint action against HNS spills. The proposal also calls for development and training of locals to undertake the project as well as to improve inter-state cooperating mechanisms dealing with HNS spills.

The project is estimated at USD 3.5 million and it will cover a period of 2 years.

Demonstration Project of Class B Automatic Identification System Transponder on Small Ships[6]

As a pilot study, this project will involve 30 small vessels, 10 from each littoral state (under 300 GRT; not subject to Article 19 of the International Convention for the Safety of Life at Sea). The purpose of installing transponders on these small boats is to facilitate better navigational safety and more efficient traffic management system in the Straits of Malacca and Singapore. The automatic identification system (AIS) is a ship- and shore-based data broadcast system operating in the VHF maritime.

The estimated cost for the pilot project is USD 400,000. The actual cost for installing AIS equipment will depend on the number of vessels, the cost per unit of the transponder, and the support and operating hardware and software.

Setting up a Tide, Current, and Wind Measurement System to Enhance Navigational Safety and Marine Environmental Protection

The rationale is that current, wind, and tides can affect navigational safety of vessels plying through the Straits. At present, there is no system to record and monitor the development of current, wind, and tides on a sustainable and continuous basis in the Straits. Besides, it has been argued that with the use of modeling techniques, the data can be useful for passage planning as well as to determine the flow and trajectory of oil, chemical, and HNS spills.

The estimated cost to install 6 tide stations, 6 wind stations, 6 Acoustic Doppler Current profiles, and an information delivery system is USD 774,000. This cost does not include the commission cost of offshore stations (first year) and the subsequent annual maintenance cost for 4 years which is an additional USD 627,000. The subsequent maintenance cost is not quite clear.

How can the industry or stakeholders help? They can sponsor equipment, provide technical expertise, and provide funding for maintenance and capital expenditure for the entire project.

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[6] See Ali [2006]. The challenge is to implement the idea and to obtain the buy-in from the boat owners. Currently there are more than 20,000 small vessels owned by Malaysians operating in the Strait of Malacca and many more in the Indonesian side. How to get these boat owners and small-time operators to participate in the program when they cannot even afford to install critical communication systems like radio and positioning system remains to be seen.

Replacement and Maintenance of Aids to Navigation in the Straits

Currently there are some 51 navigational aids in the Straits; a few are in need of repair, especially those on the Indonesian side of Malacca Strait. Thirty one of these navigational aids were installed with assistance from Japan (courtesy of the Malacca Strait Council). According to the proposal, Japan has contributed more than USD 130 million for the upkeep of navigational aids.

The proposal calls for replacing 17 damaged navigational aids and those exceeding their respective lifespans. The cost estimated to replace these beacons, light buoys, and their continued maintenance over a 10-year period is USD 18.225 million.

Replacement of Five Lighthouses and Two Light Beacons Destroyed by the Tsunami in December 2006

All seven are found in the Indonesian side of the Strait of Malacca. The cost to replace these facilities is USD 276,000.

Stakeholders can assist Indonesia by contributing the required fund needed to replace the seven facilities. Alternatively, they can contribute the equipment, install, and maintain them.

Marine Electronic Highway Project[7]

The demonstration phase of the Marine Electronic Highway (MEH) in the Straits of Malacca and Singapore was launched in 2004 and to be completed in 2008. The MEH is a marine information and infrastructure system that integrates environmental management and environmental protection systems and marine safety technologies that supports a more efficient navigational system in the Straits. The backbone of MEH is precision navigation that relies on electronic charts, electronic chart display systems, differential global positioning system, and other maritime technologies. The demonstration site which has been approved by the respective littoral states and IMO is mainly the area of the TSS.

The second phase of the project will cover the entire Straits.

[7] As an idea, the MEH has been around for some time. See article by MacPhee [2005]. According to the Director General of Sea Transportation of Indonesia, a Memorandum of Understanding between the littoral states and IMO was signed on 8 September 2005 in Jakarta. A fund amounting to USD 8.3 million has been secured from the Global Environment Facility. The Government of Indonesia has allocated a budget of USD 130,000 as local cost in 2006.

This project is partly funded by the Global Environment Facility and implemented through the World Bank and has the support of the three littoral states and the International Association of Independent Tanker Owners (INTERTANKO). The expected results from this MEH project include the following:

- To improve the navigational safety in the Straits both for through- and cross-Straits traffic;
- To improve the response mechanisms against chemical and oil spills;
- To ensure that all relevant data are available that can be used in the production of electronic navigational chart in the Straits;
- To facilitate regional cooperation in data exchange on marine and environmental matters; and
- To facilitate better and more effective route planning.

The six projects that have been proposed at the Kuala Lumpur meeting are expected to complement and add value to the MEH when it eventually takes off. For example, the installation of AIS transponders on small vessels can help improve navigational safety in the Straits.

National Projects

Long before the MEH and even the IMO-sponsored TSS in the Straits of Malacca and Singapore, each littoral state was responsible to install and manage lighthouses and buoys. In fact the first lighthouse east of India was constructed on Pedra Branca in 1853 located at the eastern entrance of the Singapore Strait. The fund for the project was raised by merchants in Shanghai, Hong Kong, Penang, and Bombay.

Singapore and Malaysia continue to manage lighthouses and other navigational aids built by the British in their respective straits. They also constructed new lighthouses, installed new navigational aids, and installed modern facilities like radar stations to support modern commerce using their own resources. Over the years, the Straits were also resurveyed, realigned, and deepened to facilitate navigational safety. Stranded vessels were salvaged and littoral states have to pay for the mopping up cost every time a passing vessel discharged oil and chemicals into the sea. Besides this, all the three littoral states pay for enforcement activities in their respective straits. So the financial burden on the coastal states is rather stiff. But the national financial burden varies, depending on the importance of the strait to the respective economies and their roles in maritime security. External support is relatively small and likely to remain so. The bulk of the cost is borne by the respective littoral state. Even if some stakeholders were to pay for the six projects proposed at the last IMO-sponsored meeting in Kuala Lumpur, the amount is still dwarfed by what the littoral states pay.

An important element behind requests for burden sharing is the unwritten user-pay-principle.

True, it is in the interest of littoral states to keep the Straits open to navigation as they are very dependent on the Straits for their livelihood, commerce, and security. However, as argued elsewhere, Malaysia has spent more than it needs to support its domestic interest in the Strait of Malacca. The opportunity cost to Malaysia to support the navigational interest of the international community in the Strait of Malacca is obviously high. Hence, it has appealed for other users of the Strait to chip in. Malaysia could impose a levy on transiting vessels were it not for international practice that forbids it.

Although no comprehensive study has been undertaken to determine the cost each littoral state spends to keep the strategic waterway safe and clean, the combined cost could well be in billions of U.S. dollars. This includes the cost of air assets, naval assets, and assets belonging to all the enforcement agencies deployed to support navigational safety, marine environmental protection as well as to ensure law and order in the Straits.

Japan's Contribution[8]

Important as it is, the Japanese Revolving Fund (Yen 400 million)[9] was started only in 1981 partly in response to accidental oil spills by Japanese vessels in the Malacca Strait. Before this, and long before the relevant IMO Regulations and Conventions on marine pollution came into force, each littoral state dipped into their respective national treasury to pay for oil spill cleanup. Contrary to perception, any borrowing from the Fund had to be promptly replaced. The advantage is that the Fund

[8] The Japanese contribution to the littoral states in the Straits of Malacca and Singapore is well described by two Japanese officials at the Kuala Lumpur Meeting on 18–20 September 2006. See Anonymous [2006] and Yamamoto [2006].

[9] See Ono [1997] and Teh [1997]. For a more recent explanation, please see Remarks by Director General of Sea Transportation of Indonesia at the Kuala Lumpur Meeting on the Malacca Strait and Singapore: Enhancing Safety, Security and Environmental Protection, 18–20 September 2006, IMO/KUL 1/2.6.1, 17 September 2006. He revealed that the value of the Revolving Fund on 25 April 2006 was USD 3,845,247.

provides an immediate interest-free loan without any collateral by the littoral state for oil spill cleanup operations.

Japan's total contribution to the littoral states (including the one-time contribution to start the Revolving Fund) for use in the Straits of Malacca and Singapore — undertaken mainly by the Malacca Strait Council plus funding from other shipping-related organizations — is estimated to be around USD 130 million. Currently, Japan is the only external stakeholder that has, over time, funded projects in the Straits of Malacca and Singapore on this scale.

Since the 1960s, Japan has funded the following projects:

- Hydrographic survey and production of common datum charts for use in the Straits of Malacca and Singapore. Under this project the Malacca Strait Council and JICA, with consent from the littoral states, helped to produce tidal charts and tide tables considered crucial to navigation through the waterway.
- Clearance of navigational fairways. Between 1972–1978, four ship wrecks were removed by the Malacca Strait Council and between 1979–1981 some shoals off the Port of Singapore were also removed.
- Construction of aids to navigation. Fund for the Strait of Malacca was used to install 39 navigational aids in 29 locations along the coast of the Straits to facilitate navigational safety from 1969 to 1988. In 1976, the Council donated a buoy tender to the Government of Malaysia.
- Cooperation in maintenance of aids to navigation. This is an ongoing project that Japan has undertaken since 1981.
- In its capacity as coordinator, NAVAREA X1 Japan, passed important information on weather and other data which could affect navigational safety in the Straits. Using the NAVTEX system, important information and data were passed to the littoral states to broadcast to vessels plying the straits.

The breakdown of Japan's contribution to the littoral states in the Straits of Malacca and Singapore is presented in Table 1.[10]

[10] This does not include the running costs of the Malacca Strait Council and the personnel expenses of officials co-opted for every project. See Ono [1997].

Table 1: Japan's Contribution to the Littoral States in the Straits of Malacca and Singapore

PROJECT	FISCAL YEAR	AMOUNT (Yen, in millions)
Hydrographic Survey	1968–1978	1,424
Production of Common Datum Charts	1976–1982	3,59
Tidal and Current Studies	1976–1979	646
Removal of Shipwrecks	1972–1978	1,435
Dredging Works in the Strait of Singapore	1979	1,001
Installation of Aids to Navigation	1968–1993	2,166
Co-operation in Maintenance of Aids to Navigation	1970–1993	1,358
Donation of Buoy Tender to the Government of Malaysia	1975–1976	502
DOSPAR Co-operation	1990–1993	210
Donation of Oil Skimming Vessel to the Government of Singapore	1973	52
Donation of Revolving Fund	1980	400
Other International Co-operation by Malacca Strait Council	1968–1993	420
TOTAL		9,973

Geopolitics of Regional Cooperation

Regional cooperation in the Straits of Malacca and Singapore takes different forms (through different projects) and involves different parties. At one level, cooperation exists between the governments of the three littoral states (tripartite) over issues pertaining to navigational safety and marine pollution prevention in the Straits. The mechanism for this is the TTEG established since 1971. Bilaterally, the littoral states cooperate over a range of issues, for example, cargo security matters. They also cooperate either singularly or as a "region" with external powers like the U.S. and international institutions like the IMO and the Malacca Strait Council for specific activities that have a direct impact on navigational safety, marine pollution prevention, and on security matters.

The level of cooperation between the littoral states in the fields of navigational safety and marine pollution management in straits used for international navigation is among the best in the world. Rarely does one see a very high level of cooperation between states, international organizations, and nongovernmental organizations in matters pertaining to transit passage, navigational safety, marine pollution management, and maritime security. Their ability to work with the IMO and the Malacca Strait Council, for example, speaks well of their political maturity.

The IMO is usually involved and consulted on matters pertaining to navigational safety and marine pollution prevention. For example, projects on traffic separation schemes were instituted. Similarly, projects like the MEH would not have been possible without its support and the support from littoral states, INTERTANKO, and Republic of Korea.

On the whole, despite keen economic competition, commercial relations between the three littoral states are considered good. However, these relations among the littoral states are, at times, affected by unresolved territorial problems. For example, Indonesia and Malaysia have yet to finalize their exclusive economic zone boundary in the Strait of Malacca; Singapore and Malaysia have yet to resolve the ownership of the Island of Batu Putih (Pedra Branca). Maritime boundary delineation in "a gray area" across from the western entrance to the Strait of Singapore is yet to start between the three parties. Thus, the problem of disputed jurisdiction in the waterway complicates law enforcement.

Cooperation between the ports in the three countries is generally good as a large quantity of the cargo does enter each others' ports — especially the Port of Singapore. All three countries are parties to the Tokyo Memorandum of Understanding on Port State Control in the Asia-Pacific region since 1993. The ports authorities usually exchange information on cargo security and substandard ships leaving their ports.

Defense relations between the three littoral states are quite extensive. For example, Singapore and Malaysia are parties to the Five Power Defense Arrangement (with Australia, New Zealand, and Great Britain) since 1971. Indonesia provides Singapore Air Force an area for training purposes; Malaysia and Indonesia have a special border committee or forum for discussion on common defense problems.

However, cooperation over maritime security between the three littoral states in the Strait of Malacca has plenty of room for improvement. Currently, all three have agreed to work separately on enforcing maritime security in the Straits of Malacca and Singapore under the guise of coordinated naval patrols and Eye-in-the-Sky surveillance projects managed by their respective Air Forces.

Coordinated naval patrols simply mean each side patrols its own waters but are not allowed to transgress into each others' area. This is different from combined naval patrols where the navies work together in a designated area against a common threat. Although the level of enforcement has evidently increased in terms of resource deployment, they remain vigilant only on their side of the waterway. Similarly, the Eye-in-the-Sky air surveillance also works on the same basis.

The reluctance to work together on maritime security is historical in nature as it is due to their different threat perceptions towards what constitutes a military threat to their respective security; and their different foreign policy objectives and priorities, for example, with regard to greater involvement of external military powers in the Strait of Malacca. The unresolved territorial problems in the waterway complicate matters and embolden their suspicions of each other's motives.

Third party involvement in security matters (such as military forces and private security companies) in the Strait of Malacca has been a complex subject. Malaysia and Indonesia are evidently not keen to allow U.S. Navy or Australian Navy or navies from any external power to patrol in the Strait of Malacca. Likewise, neither Malaysia nor Indonesia favors the deployment of private security companies in the Strait of Malacca [AFP, 2006a; Jakarta Post/Asia News Network, 2007; Winner, 2005].

Malaysia and Indonesia do not share Singapore's view on the Proliferation Security Initiative (PSI) that President Bush announced on 31 May 2003. To Jakarta and Kuala Lumpur, Washington PSI is a pretext, among other things, to contain China's surging influence in Southeast Asia. The two neighbors perceive, rightly or wrongly, PSI as a cover to interdict vessels and cargo of "unfriendly powers" in the Malacca Straits.

Similarly, there is no common position on the seriousness of maritime threats or threats of maritime terrorism in the Strait of Malacca. Malaysia and Indonesia do not share the fears expressed by Singapore, United States, Australia, and Japan that terrorists will use vessels passing through the Strait to mount attacks on targets in the Strait. The Deputy Prime Minister of Malaysia has dismissed talks of such maritime threats on various occasions.[11] Such divergent views on threat analysis have underlined efforts for greater regional cooperation on maritime security vis-à-vis the Strait of Malacca.

A study by Bateman et al. [2006] shows that more than 80 percent of maritime violence incidents (from 2000 to 2005) in the Strait of Malacca occur in ports and within the territorial seas of Indonesia and Malaysia with the former taking the bulk of them. Of the remaining 20 percent, "the majority is attacks on smaller and more vulnerable vessels carrying trade across the Straits or employed in the coastal trade on either side of the Straits." Many of them, as shown in Figure 1, occur within the port limits. A further analysis of the data shows a number of incidents which occur in the disputed area between Malaysia and Indonesia off Pulau Perak and off Belawan port as well as in Aceh waters. These incidents could be attributed to the activities of those fighting for the

[11] The latest was made at the Kuala Lumpur Meeting on 18–20 September 2006. See Raymond [2006], The Japan Times [2005]; Olimpo [2006], Luft and Korin [2004] and Dragonette [2005].

independence of Aceh, long before the tsunami struck the area on 26 December 2004.

Incidents in internal waters (for example, the port limits and those within the territorial sea) are clearly within the national jurisdiction of their respective states. The suppression of these crimes should be handled in by national enforcement agencies in accordance with national laws. The involvement of third parties, without the consent of the coastal state, in the internal water and territorial sea, constitutes an infringement in law, comity, and practice.

No large vessels above 3,000 GRT have been hijacked, neither has the kidnapping of crew members taken place during the 2000–2005 period; however, fishing vessels and tugs have become victims of hijackers.

Figure 1 provides information on locations of maritime incidents in the Straits of Malacca and Singapore. This map is reproduced from the study by Bateman et al. [2006] from the Institute of Defense and Strategic Studies of National Technological University of Singapore.

None of the incidents that happened in the Malacca Strait from 2000 to 2005 are classified as piracy under customary international law.[12] It is more appropriate to label them as sea robberies. The classification is important. Under international law the jurisdiction to arrest a pirate ship is universal; not in the case of sea robbery, where only domestic jurisdiction applies. Malaysia does not permit foreign vessels to enforce jurisdiction in their territorial sea in the Strait of Malacca for historical[13] and legal reasons. Moreover, it has the means and the capacity to handle crimes in its own territory. This explains why Malaysia, for example, failed to become party to the 1988 Convention for the Suppression of Unlawful Acts against the Safety of Maritime Navigation (SUA 88 and SUA 88 Protocol); it fears foreign forces will use the Convention to arrest locals for offenses in its internal water and territorial sea, to be hunted and treated as pirates.

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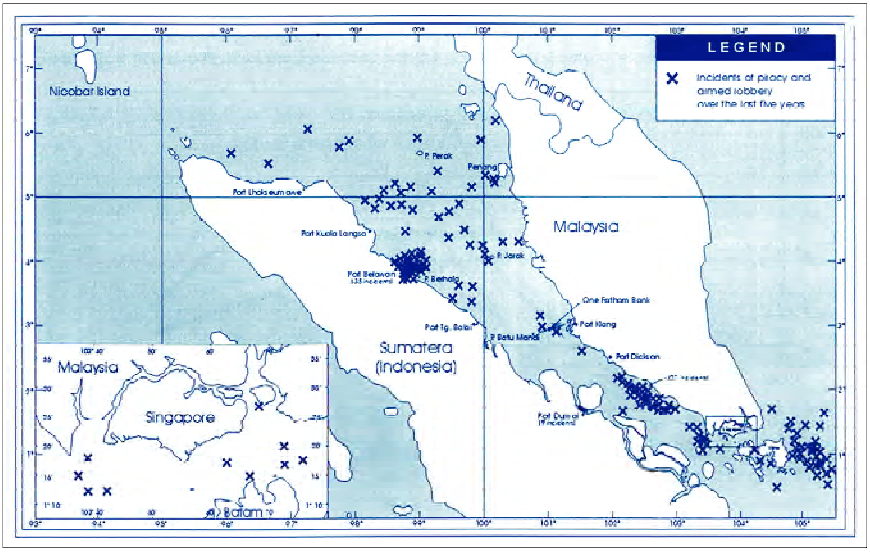
[12] International law defines piracy as any illegal acts of violence or detention, or any act of depredation, committed for private ends by the crew or the passengers of a private ship or aircraft, and directed on the high seas... Reiterated in Article 101 of UNCLOS: The High Seas *"refer to all parts of the sea that are not included in the Exclusive Economic Zone, in the territorial sea or in the internal waters of a state or in the archipelagic waters of an archipelagic state."*

[13] The British used piracy as an excuse to colonize the Malay states in the 19th century. See Rubin [1974a, 1974b].

Figure 1: Location of Attacks in the Malacca and Singapore Straits 2000–2005



Reproduced from Bateman et al. [2006]

Moving Forward

Moving forward requires a strong leadership, commitment, and cooperation from all. However, an acute appreciation of the predicament of some littoral states vis-à-vis certain issues remains critical. Issues like sovereignty, control, and jurisdiction are nontradable. However, to their credit, despite unresolved territorial and jurisdictional problems and different views of geopolitical forces confronting them, they are prepared to cooperate to ensure the Strait of Malacca and Strait of Singapore are safe for navigation. What makes this cooperation possible is because control of the waterway always remains within the jurisdiction of respective littoral states.

Littoral states are likely to resist any attempt in the exercise of control by stakeholders for the cost of a few navigational aids or so. The entire project may just be called off if stakeholders insist on exercising management control of the waterway. This can be learned from the experience of more than 3 decades of assistance from Japan. In hindsight, the use of the Malacca Strait Council as a vehicle to channel donations to the littoral states is a very clever diplomacy; it does not look too intimidating nor is seen as an outright state handout.

Besides geopolitics, other challenges to effective regional cooperation in the Straits include the following:

1. Effective cooperation cannot take place without full commitment from the littoral states

In the Strait of Malacca, for example, the consent of Malaysia to support regional cooperation is critical. There is a tendency to assume that all the three littoral states have similar interests beyond navigational safety and prevention of marine pollution. Issues like jurisdiction, foreign policy orientations and relationship with external powers, different perceptions of threats to national security, domestic politics, and importance of the Straits to their respective economies affect the level of cooperation.

International organizations, stakeholders, and extra-regional powers should take note of local sensitivities and should not presume that an agreement with one littoral state is sufficient to secure the concurrence of the other parties. As sovereign nations they need to be approached separately, especially in areas with overlapping jurisdictions. However, in localities where national jurisdiction is well-defined and uncontested, the prior consent of the affected state is a must and is sufficient. Even in areas where the state has agreed to allow others to exercise jurisdiction over, for example, in IMO-sponsored TSS, the coastal state still retains its exclusive sovereignty in the territorial sea and it should be consulted at all times for any new activities.

2. Implementation of the proposed projects is essential to demonstrate stakeholders' share of responsibility

The most pressing challenge is to implement the projects that have been proposed by the littoral states. The ball is now in the courts of the stakeholders. While some projects are straightforward, others may require time and large resources. Failure to implement the projects will send the wrong signals to many free-riders who mistakenly believe that coastal states have a duty to install and maintain facilities like navigational aids. In a user-pay environment, there is no more place for free-riders.

3. A sustainable funding mechanism is imperative

There have been various suggestions for emulating the Revolving Fund that Japan setup in 1981. While such funding is useful to address

A vessel in distress (Photo: OSRL/EARL)

short-term requirements, suitable sustainable funding mechanisms must be found.[14]

4. Alternative routes should remain as a possible option

As a matter of a long-term strategy, alternative routes aside from the Strait of Malacca should also be considered. Lombok and Sunda Straits in the archipelagic waters of Indonesia and the proposed pipeline across Isthmus of Kra[15] can take away some of the traffic pressure from the Strait of Malacca. It has been reported that China's National Reform Commission has approved plans in April 2006 to build a pipeline from a deep water port off Sittwe across Myanmar to Yunan to carry oil from the Middle East to China. According to Perlez [2006], this overland pipeline would provide China with an "alternative route" to the congested Strait of Malacca.

[14] Hasyim Djalal of Indonesia has raised this issue at the Kuala Lumpur Meeting on 18–20 September 2006. See *The STAR online*, 2 October 2006. But this is anything but new. The Partnerships in Environmental Management for the Seas of East Asia (PEMSEA) has been working on this for sometime now. The littoral states are equally keen to establish sustainable funding mechanisms in lieu of ad hoc measures.

[15] For interesting thoughts on this, please see Kavichongkittavorn [2006].

References

AFP. 2006a. "China fears blockade of sea lanes." *New Straits Times*, 5 October 2006.

AFP. 2006b. "India ready to help protect Malacca Strait." *AFP*, 3 June 2006.

Ali, S. 2006. "Reducing risks posed by small vessels: AIS transponder plan for ships 300 GRT and below." *The Star*, 9 October 2006.

Anonymous. 2006. "Basic policy of Japan's contributions and cooperation in the Malacca Strait and Singapore." Paper presented at the Kuala Lumpur Meeting on the Malacca Strait and Singapore: Enhancing Safety, Security and Environmental Protection, 18–20 September 2006.

Bateman, S., C.Z. Raymond and J. Ho. 2006. *Safety and security in the Malacca and Singapore Straits: An agenda for action*. Institute of Defence and Strategic Studies, NTU, Singapore.

Defense Mapping Agency. 1989. *Sailing directions for the Strait of Malacca and Sumatra*. Defense Mapping Agency Publication No. 174. Washington.

Dragonette, C. 2005 "Lost at sea." Rebuttal and rejoinder to Luft and Karin in *Foreign Affairs*, Volume 84, March /April 2005.

Jakarta Post/Asia News Network. 2007. "US is trying to contain rising China with PSI Plan." Reprinted in *The Star*, July 2007.

Kavichongkittavorn. 2006. "Thailand banking on the Kra Isthmus canal." *The Nation/Asia News Network*, reprinted in *The Star*, 18 August 2006.

Khurana, G. 2006. "Security and the Malacca Strait: Hype or harbinger." Paper presented at the 4th Asia Maritime and Logistics Conference and Exhibition 2006, 11–12 September 2006, Kuala Lumpur, Malaysia.

Luft, G. and A. Korin. 2004. "Terrorism on the high seas." *Foreign Affairs*, Volume 83, November/December 2004

MacPhee, S. 2005. "Rational for a Marine Electronic Highway Program in the Mediterranean." Unpublished Concept Paper.

Olimpo, G. 2006. "Japan: A target for al-Qaeda?" *Terrorism Monitor*, Volume 4, 9 March 2006.

Ono, A. 1997. "Japan's contribution to safety and pollution mitigation in the Malacca Strait," pp 241–246. In: *The Malacca Strait: International cooperation in trade, funding and navigational safety*. Edited by Hamzah Ahmad. MIMA, Kuala Lumpur, Malaysia.

Perlez, J. 2006. "Orphaned and adrift in a sea of oil and gas." *New York Times*, reprinted in *The New Straits Times*, 22 November 2006.

Raymond, C.Z. 2006. "The threat of maritime terrorism in the Malacca Straits." *Terrorism*, Volume 4, 9 February 2006.

Rubin, A. 1974a. *Piracy, paramountcy and protectorates*. Penerbit Universiti Malaya, Kuala Lumpur.
Rubin, A. 1974b. *The international personality of Malay Peninsula: A study in imperialism*. Penerbit Universiti Malaya, Kuala Lumpur.
Teh, K.L. 1997. "The revolving fund: A unique facility." In: *The Malacca Strait: International cooperation in trade, funding and navigational safety*. Edited by Hamzah Ahmad. MIMA, Kuala Lumpur, Malaysia.
The Japan Times. 2005. "The piracy threat to Japan." *The Japan Times*, 17 March 2005.
Winner, A.C. 2005. "The proliferation security initiative: The new face of interdiction." *The Washington Quarterly*, 28 (Spring 2005):2.
Yamamoto, S. 2006. "Japan's perspective as a major user state: Our contributions and a framework for international cooperation." Paper presented at the Kuala Lumpur Meeting on the Malacca Strait and Singapore: Enhancing Safety, Security and Environmental Protection, 18–20 September 2006.
Yee, C.H. 2006. Statement of the Director (Policy), Maritime and Port Authority of Singapore at the Kuala Lumpur Meeting on the Malacca Strait and Singapore: Enhancing Safety, Security and Environmental Protection, 18–20 September 2006.

Part 4

Future Prospects

CHAPTER 25

Securing the Oceans

EAS Congress Secretariat

Introduction

Ocean governance is going through a significant phase of transformation. Understanding of the ocean environment has changed since the 1970s as the world increasingly recognizes the interdependence between ocean development and human security. Issues arising from continuous pressure on the ocean environment have permeated to the political, sociocultural, and economic spheres of society. In recognizing the crucial role of oceans in fulfilling societal aspirations, new concept and thoughts emerged, urging for a comprehensive understanding of ocean governance [Terashima].[1] Along with this new thinking, new approaches, initiatives, mechanisms, and various forums related to ocean governance have evolved, developed, and implemented at the local, national, regional, and international levels in response to the changing needs and concerns of the ocean environment.

[1] The in-text citations appearing in this chapter refer to the authors' presentations during the Theme 2: Securing the Oceans of the International Conference on Coastal and Ocean Governance, EAS Congress 2006 in Haikou, China.

The East Asian Seas (EAS) Congress 2006, held in Haikou City, China, is one forum that drew particular attention to the evolving concept of security and developments in ocean governance. One of the seven themes during the International Conference is Securing the Oceans. With six interrelated workshops and seminars,[2] the theme touched on various issues, constraints, and developments in coastal and ocean governance; reviewed policy actions and existing local, national, regional, and international governance mechanisms related to coasts and oceans; and shared insights on the dynamics of cooperation in securing the oceans for present and future generations. The lessons learned and best practices from around the world were also analyzed to see how they can be relevant in the East Asian Seas region. The key points, conclusions, and recommendations were forwarded by the concerned chairs and rapporteurs of the thematic sessions, namely: Biliana Cicin-Sain, Tadao Kuribayashi, Gunnar Kullenberg, Cielito Habito, Masahiro Akiyama, Hiroshi Terashima, B.A. Hamzah, Gao Zhiguo, Loke Ming Chou, Mohamed Shariff, and Kathrine Rose Gallardo. The synthesis has been published in the December 2006 issue of the *Tropical Coasts*: "One Vision, One Ocean."

This chapter is a refined version of the synthesis. It serves well as the concluding chapter of this book.

Redefining Ocean Governance and the Concept of Security

Developments at the International Level

The term "security" was conventionally used to refer to national and military defense [Kuribayashi], however in recent decades the term has been employed in other fields including the environment in general and coastal and ocean affairs in particular.

The adoption of the United Nations Convention on the Law of the Sea (UNCLOS) in 1982 and subsequent instruments, such as the Rio Declaration on Environment and Development in 1992, Agenda 21, World Summit on Sustainable Development (WSSD), and other related instruments pertaining to marine pollution, biodiversity, and so on, have been influential

[2] The six workshops/seminars included: *(1)* Development of National Ocean Policies in East Asia and around the World; *(2)* The Tokyo Ocean Declaration: Upholding the Advocacy; *(3)* ICM Experiences, Lessons Learned and Scaling Up; *(4)* Regime-building in Coastal and Ocean Governance; *(5)* Advocacy, Leadership, Legislation and Interagency Collaboration in Coastal and Ocean Governance; and *(6)* Coastal and Ocean Governance: Enabling and Strengthening Institutions for Sustainable Coastal and Ocean Governance.

in advancing a broader view of the oceans. These instruments emphasize that the ocean is an integral component of the political, social, cultural, ecological, and economic facets of society, and impacts on various stakeholders. As such, ocean affairs must be considered in the overall development framework to ensure sustainable development. This new comprehensive perspective has factored the oceans within the concept of security, and security within ocean governance.

In line with the principles set forth by UNCLOS, the Rio Declaration, and other international instruments on ocean protection and development, a series of conferences on Geo-Agenda for the Future: Securing the Ocean were initiated in early 2000, hosted by the Ocean Policy Research Foundation (OPRF)[3] of Japan, and culminating in the adoption of the Tokyo Ocean Declaration on Securing the Oceans: Proposals for a New Ocean Security in December 2004.

The Tokyo Ocean Declaration advocates for a new comprehensive security concept toward peaceful and sustainable development of the oceans that "brings within its purview all ocean aspects and their attendant security concerns, including navigation, natural resources, the environment, military activities, and scientific research" [Akimoto].

As a means to realize the concept, the Tokyo Ocean Declaration identified several measures to promote the building of political will and the implementation of the new security concept, including: the creation of an international ocean think tank; the establishment of outreach programs, a coordinating mechanism, and cross-sectoral body for ocean affairs; the involvement of states and international organizations to promote the concept; holding of regular conferences or venues for dialogue and knowledge sharing; international cooperation for capacity building; and the formulation of systems and strategies for confidence building and the protection of ecosystems and the environment.

Ocean Governance at the Regional Level

State sovereignty is said to be evolving towards a law of humanity whereby states recognize their obligation toward all, particularly in cases where international issues should be addressed [Magallona]. The unprecedented degree of collaboration between states, particularly with the growth of regional mechanisms in the past 30 years, signifies the recognition that ocean issues are too overwhelming for states to resolve alone.

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[3] The OPRF was previously known as the Ship and Ocean Foundation. The Tokyo Ocean Declaration is a product of deliberations by 26 eminent ocean law and policy experts. For more information, see: http//www.sof.or.jp.

The move towards regionalization in ocean governance began in the 1970s with the establishment of the Regional Seas Programme of the United Nations Environment Programme. To date, 14 regional seas programs have been established based upon regional conventions or legally binding agreements (Black Sea, Caspian Sea, Eastern Africa, Kuwait region/ ROPME, Mediterranean, Northeast Pacific, Red Sea and Gulf of Aden, Southeast Pacific, South Pacific, West and Central Africa, Wider Caribbean, Baltic Sea, North-East Atlantic, and Antarctic Region),[4] while four regional mechanisms are anchored on nonbinding instruments (East Asian Seas, South Asian Seas, Northwest Pacific, and Arctic Region).

Taking into consideration the distinctive characteristics, uses and concerns of different regional sea areas, regional integration is seen as a good option to address the needs of each region and offers certain opportunities for management actions. While the approaches, developments, and achievements in coastal and ocean management/governance vary across regions, the ultimate goals behind the establishment of regional mechanisms have been the same — to protect and ensure sustainable and environmentally sound development through comprehensive and integrated management involving stakeholders [Box 1].

In reviewing and analyzing the regional regime formations in the past decades, the Nippon Foundation Research Task Force, in particular, has led several initiatives on the study of regional sea areas.[5] From these initiatives and the discussion at the thematic workshops, several issues and challenges can be derived.

Issues/Challenges

Jurisdictional fragmentation

Regional cooperative agreements and initiatives are complex, encompassing various scales and issue areas. As such, considerable overlap with other programs and arrangements can be observed [VanderZwaag, a].

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[4] "Overview of Regional Cooperation in Coastal and Ocean Governance," presented by D. VanderZwaag, identifies three main variations in the 14 regional seas programs established upon legally binding agreements – the first 11 regions mentioned follow a framework convention and subsequent protocol approach, the Baltic and North-East Atlantic are basic conventions with annexes addressing specific pollution and conservation concerns and the Antarctic region follows an "incremental treaty system" (developing a series of agreements negotiated over time).

[5] The Nippon Foundation Research Task Force co-funded the publication of the *Tropical Coasts* issue *From Ripples to Waves* (Vol. 13, No.1), which featured the dynamics of regime-building and various case studies on regional ocean governance.

Box 1: Limitations of Regional Arrangements

It was recognized that while regional cooperation has much to offer in addressing issues on coastal and marine governance, many marine environmental threats cannot be addressed at the regional level alone, particularly with regard to threats posed by external factors (that is, climate change, long-range transport of chemicals, and so on). Cooperation and linkage of regional efforts to international actions must therefore be encouraged. Regions can also seek to influence extra-regional governance regimes by advocating, for example, negotiations of a global convention to address problems such as heavy metals, and urge other regions to take actions to curb pollution causing long-range deposition. Regions can also perform a stronger role internationally by giving a "regional face and voice" in global forums addressing global threats for ocean resources and coastal populations.

Moreover, regional arrangements are faced with critical issues, such as disparities in capacities and funding support among countries, duplication of efforts by donors, international agencies, and organizations within a region, and lack of information and knowledge sharing among countries, regions, donors, and international agencies.

Ratifying/accepting global conventions and regional agreements/amendments

One issue is securing ratification/acceptance of global conventions and regional agreements by states within regions, as in the case of the 1972 London Convention and its 1996 Protocol on Control of Ocean Dumping, which only four East Asian state parties (China, Japan, Philippines, Republic of Korea (RO Korea) have ratified. Another case is the Mediterranean protocols on transboundary hazardous waste movements and seabed activities, which have yet to enter into force [VanderZwaag, a]. The ratification and implementation of the MARPOL Convention (73/78) and its additional annexes on the prevention of pollution from ships in the Straits of Malacca and Singapore provides another example. As one of the busiest transit passages in the world, the Straits of Malacca and Singapore is one area where adherence to MARPOL is crucial. However, of the three littoral states, only Singapore is party to all the additional annexes. Malaysia is party only to Annex V (garbage from ships) and Indonesia is not a party to any of the additional annexes [Beckman].

Getting other actors to share responsibility

The case of the Straits of Malacca and Singapore also emphasizes that apart from the three littoral states, user states, the private sector, and other stakeholders who benefit from the Straits also need to cooperate to enhance navigational safety and environmental protection. Moreover, it was acknowledged that some countries face difficulty in ratifying or implementing conventions and other instruments due to lack of capacity/ resources. In this regard, capacity building and technical assistance from agencies, such as the International Maritime Organization (IMO) and other user states and stakeholders, is encouraged [Beckman; Hamzah].

Ensuring consistency between national actions and international instruments

It was noted that to maintain peaceful use of the oceans, it is important to ensure consistency between state action and international law principles. There are recent cases where state action challenged consensus forged in international instruments. For instance, Australia's recent proposal to extend the Great Barrier Reef Particularly Sensitive Sea Area (PSSA) to the Torres Strait has attracted IMO's attention because of the compulsory pilotage measure. This proposal imposes criminal sanctions on ships that would infringe the pilotage requirement when they come into Australian ports. Singapore viewed this proposal as a curtailment of the right of transit passage through straits used for international navigation and protested the proposal to the IMO. Another case is the European Union's Directive on Criminal Sanctions for Ship-source Pollution, which seeks to impose criminal liability not only on operational but also accidental pollution by ships in situations of "serious negligence." This is said to be inconsistent with MARPOL 73/78, as the Directive is wide enough to impose liability even in situations of genuine accidents. INTERTANKO (International Association of Independent Tanker Owners) challenged the Directive and the case is due to be heard in the European Court of Justice [Tan].

Resolving whether a legally binding agreement/(s) should be pursued in regional sea areas presently not subject to such agreements

Legally binding instruments are considered crucial in regional cooperation as they establish greater political and bureaucratic commitments, establish firmer institutional and financial foundations, and give "legal teeth" to environmental principles and standards. However, as previously cited, four regions have continuously relied on a nonbinding approach in regional ocean management.

The East Asian Seas region remains one of the few areas in the world without a regional convention. The idea for a regional convention has been brought up in several cases, primarily by the United Nations Environment Programme (UNEP) East Asian Seas Regional Coordinating Unit (EAS/RCU). However, the countries remain unconvinced that the legally binding approach is the best option for the region, given the wide diversity of countries particularly in terms of sociopolitical and economic capacity aspects. The region, however, has opted to take nonbinding options that would allow the countries more flexibility [Tan; Bernad, b].

The social, economic, and environmental character of the Arctic region also presents unique challenges and opportunities for regime building and regional cooperation. While progress has been made on national and regional coastal and marine planning and management, particularly as a consequence of the work done by the Arctic Council, these efforts are, in general, fragmented. Linking various initiatives of the Council to regional approaches, such as the identification of LMEs in the Arctic, can help to build a strong Arctic regime. Regional approaches to governing coastal and ocean areas in the Arctic must be encouraged. Emerging management regimes must be adaptive and flexible, in parallel with the pace of change in the region, and knowledge bases for decisionmaking must be broadened and integrated. Finally, the current definition of Northern security must be broadened to include environment, food, sustainability and collective security issues [Hanson et al.].

Addressing territorial and maritime boundary disputes that complicate regional cooperation

While states have started to open up and turn to collaborative activities, it should be emphasized that controversies related to maritime boundaries continue in some parts of the world. It is estimated that over 250 maritime boundaries remain unresolved, including for example, the well-known Spratly Island and Paracel Island tensions in the South China Sea and the Aves Island dispute in the Eastern Caribbean. Another common controversy is the extraction of resources from the sea. One case cited is the issue between China and Japan over gas and oil extraction in the East China Sea. To address this issue, some experts proposed the joint development approach between the concerned states and the private sector to avoid further dispute and even increase production, which would result in benefits to both countries [Gao and Fu].

Addressing the socioeconomic, political, and ethical dimensions fueling marine environmental degradations and unsustainable development practices

Poverty and the inequitable distribution of wealth, population growth, consumerism and overconsumerism, utilitarianism (that is, the environment can be traded off in the name of economic and social development), and globalization (extra pressures on marine resources and coastal areas to support international trade) are some of the major problems linked to ocean governance, which need to be considered, particularly with regard to integrating ocean concerns into economic development plans and strategies.

In 2002, the Arafura and Timor Seas Expert Forum was created to foster collaboration between its littoral states towards the achievement of sustainable use of living resources in the respective sea areas. One focal effort of the Forum is to assist in developing sustainable/alternative livelihoods for coastal, traditional, and indigenous communities. In line with this, to protect the major sources of sustenance and livelihood, the Forum also focuses its activities on the following areas: preventing, deterring, and eliminating illegal, unregulated, and unreported (IUU) fishing; sustaining fish stocks and coastal biodiversity; and improving capacities in information management and sharing between the littoral nations of the Arafura and Timor Seas [Wagey].

Strengthening regional environmental standards to better protect ecosystems and human health

Most regional seas program standards represent political compromises, such as effluent/emission controls through licensing or regulation, rather than pollution elimination/prevention. Setting standards for sewage treatment and industrial wastewater effluents and funding sanitation infrastructure continue to be major shortcomings. Few regions have yet to set timebound targets for pollutant discharges into coastal and marine waters [VanderZwaag, a].

Developments and Innovations

Environmental improvement

The Helsinki Commission (HELCOM) has undertaken various activities to protect the marine environment of the Baltic Sea from all sources of pollution and to restore and safeguard its ecological balance. The efforts have yielded several significant successes, including: lower discharges of organic pollutants and nutrients from point sources; a 20–25 percent overall reduction in the emissions of oxygen-consuming substances (biochemical oxygen demand) from the 132 originally identified hotspots since the early 1990s; deletion of about 50 identified hotspots from the list; stricter controls on industry (permits are now compulsory for industrial emissions); improved joint monitoring; and a major international plan to combat marine pollution with active cooperation involving all contracting parties through HELCOM. To sustain these efforts, HELCOM works with various networks, for example, research institutions, local governments, universities, and industrial sectors [Melvasalo].

Establishing frameworks and mechanisms for sustainable ocean management

The Global Environment Facility (GEF) Programme in the Benguela Current Large Marine Ecosystem (BCLME) began in 2002 with the approval and signing of the BCLME Strategic Action Programme by Angola, Namibia, and South Africa. To sustain the efforts made, BCLME institutional structures will have to be established for long-term cooperation. One step towards this goal is the recent signing of the Interim Agreement, which establishes the Benguela Current Commission (BCC). Under this agreement, the Interim BCC will operate primarily as an advisory body to the governments and will have a secretariat, an ecosystem advisory committee, and various working groups to undertake technical and scientific assessments. Once operational, the BCC will require 5 years for institutional strengthening before it transforms into a permanent BCC [O'Toole].

The European Union (EU) is currently undertaking consultations on the Green Paper towards a future EU Maritime Policy. The EU Maritime Policy is aimed at developing a thriving maritime economy and promoting activities in an environmentally sustainable manner. The Policy also adheres to a broader understanding of the ecosystem approach. In this approach, individual actors will become accountable. The approach also requires that more components of the marine ecosystem are taken into consideration in management and are protected from human activities. Any suite of management measures must be carefully coordinated and checked for compatibility before implementation. Tools to ensure that management is coordinated include a Strategic Environmental Assessment, integrated coastal zone management (ICZM), and systems of spatial planning. The EU has also developed its ICZM policy. The EU believes that strong support from the member countries is crucial to ensuring the success of the policy [Richardson; Siemers].

Innovating regional cooperation through partnerships

The partnership approach or establishment of a collaborative network in the East Asian Seas region is a new paradigm in resource management. The Partnerships in Environmental Management for the Seas of East Asia (PEMSEA) is one of the most recent efforts to develop and sustain regional institutions for improved ocean and coastal governance in East Asia. PEMSEA has sought to address many of the problems associated with regional governance by building collaborative networks or partnerships between nations of the region, between sub-regional groupings of nations focusing on specific issues, such as oil spills, and between agencies within countries [Lowry and Chua]. Using the Sustainable Development Strategy for the Seas of East Asia (SDS-SEA) as a framework, a regional sea mechanism built on the principles of partnership has been established.[6] Governments and stakeholders from international, regional, country, and local levels are involved, thereby creating the climate for more effective, vision-focused regional cooperation [Bernad, a].

Ocean Governance at the National Level

In *Cross National Study of Development of National Ocean Policies around the World*, conducted by the Global Forum on Oceans, Coasts and Islands and the Nippon Foundation Research Task Force,[7] it was shown that a "growing number of countries are moving towards more integrated cross-cutting national/regional ocean policies." However, most of these efforts are still in the preparatory and formulation stages, while very few are in the implementation stage.[8]

In line with the principles and goals provided in various ocean-related instruments, these regional and national ocean policies generally have the following objectives: to achieve multiple purposes particularly to foster sustainable development of ocean areas and protect biodiversity and vulnerable resources and ecosystems; to develop a vision for the governance of their 200-mile exclusive economic zones (EEZs); and to harmonize existing uses and laws, address conflicts, and coordinate the actions of the many government agencies involved in ocean affairs [Cicin-Sain].

National initiatives and developments

The enactment of Canada's Oceans Act in 1996 has advanced integration of coastal and ocean planning in the country, particularly the development and implementation of integrated management plans for all of Canada's marine waters and national system of marine protected areas (MPAs). The Oceans Act has also spurred the Department of Fisheries and Oceans to move beyond a narrow fisheries management focus. With

[6] The regional mechanism for the implementation of the SDS-SEA is composed of the EAS Partnership Council (includes both intergovernmental parties and other stakeholders in the region), the PEMSEA Resource Facility, Partnership Fund, EAS Congress, and the Ministerial Forum.

[7] The study covered 16 nations and 3 regions.

[8] There are three stages of development of national and regional ocean policies, as identified by B. Cicin-Sain in her introductory presentation during the Seminar on National Ocean Policies: *(a)* preparatory stage — informal processes are ongoing to prepare the nation in the formal development of a cross-cutting and integrated national/regional ocean policy; *(b)* formulation stage — a well-defined formal process is underway to develop a cross-cutting and integrated national/regional ocean policy; and *(c)* implementation stage — cross-cutting and integrated national/regional policy has already been enacted and is already being implemented with funding.

the Oceans Act, Canada has been labeled as the "leader" in national oceans policy. However, its experience shows that realizing the objectives set in the Oceans Act entails a great deal of time, funding, continuous awareness building, and commitment. One good strategy that can be gathered from the country's experience is to take the incremental approach in developing management plans, as it is difficult to develop in all areas at once. In applying this approach, focus was first given to areas where the intensity of ocean uses is greatest and stakeholder capacities/interests exist, before proceeding to develop management plans in other areas. While the country has a number of successes in integrated ocean management, Canada's quest for ensuring sustainability continues [VanderZwaag, b].

RO Korea enacted the Coastal Management Act in 1999 as a legal mechanism for implementing integrated coastal management (ICM) policy and strategies. The Ministry of Maritime Affairs and Fisheries (MOMAF), which was created to harmonize marine-related government functions and activities in the country, also became the authority in implementing the Coastal Act. As a consequence of these initiatives, RO Korea has been able to establish a marine corps in the Korean Peninsula and shift control to a mechanism of joint implementation by all stakeholders [Nam].

Beginning 1982, there has been rapid development in national marine legislation in China. Two major legislation efforts were the Coastal Zone Management Act and the Sea Area Use Management Law. The latter in particular is being heralded as a first of its kind in Asia if not in the world. The Sea Area Use Management Law provides a framework for three key regimes: sea area use rights management system; functional zoning scheme; and user pay scheme [Gao and Fu].

Japan has developed an Integrated Ocean Law, a product of years of discussion. Although the law is yet to be set in place, a national ocean council has been established and a minister responsible for the ocean work has been assigned [Akiyama].[9]

The Philippine government recently adopted, through Executive Order No. 533, ICM as a national strategy to ensure the sustainable development of the country's coastal and marine resources. This development was a result of the recognition of the benefits gained from the experiences in the Batangas ICM demonstration site and other coastal and marine-related activities involving interagency and multisectoral cooperation. The Presidential issuance calls for the formulation of a national ICM program, with the Department of Environment and Natural Resources (DENR) as focal agency in coordination with other related agencies and sectors [Jara].

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[9] *Editors' note:* The Basic Ocean Law was officially enacted and came into force in July 2007.

In Indonesia, a draft Presidential Instruction has been prepared. This will be followed by the development of government regulations to support the Presidential Instruction on Indonesian Ocean Policy 2010–2025. The said ocean policy is scheduled to be launched in 2009 at the World Ocean Summit [Muhammed].

In general, the move towards the development of integrated oceans policy is primarily a response to the continuing degradation of marine resources and multiple-use conflicts. Through an oceans policy, countries and regions hope to establish a shared vision for sustainable development, harmonize sectoral policies, protect ecosystems and vulnerable areas, promote social advancement, and ensure maritime security. To achieve these objectives, it is also recognized that there must be coordinated effort. Multistakeholder involvement and support from actors from within and outside the government, and funding and other supporting elements, such as research, science and education support, are crucial to successful integrated oceans management. Once the policy is established and activities are in place, regular monitoring, evaluation, and adjustment should be considered to ensure that all actions undertaken are consistent with the targets and objectives set.

Essential Elements of Effective Ocean Governance

In analyzing issues, trends, approaches, and mechanisms of ocean governance, a number of key interrelated elements are found to be constant. These elements are considered essentials and serve as major driving forces in effective ocean governance.

Vision

A vision embodies the aspiration of a group, organization, community, country, and region. It provides a guiding picture of desired conditions beginning with a shared image of the desired end state and serves not only as a goal but also as a challenge to all who share the vision. The ocean-related instruments from UNCLOS, down to issue-specific conventions and regional and national ocean policies and arrangements, have all identified a vision for the oceans. In principle, creating a shared vision for ocean use is a key first step in designing collective actions and committing resources to achieve those outcomes. In practice, creating a shared vision usually requires extensive communication and consultation, mutual education, negotiation, and relationship building [Lowry and Chua]. Thus far, initiatives in various areas have shown the growing awareness of the need for a shared vision for sustainable ocean governance [Simard].

Awareness and Education

Awareness refers to knowledge on coastal and marine resources, conditions of the ocean environment, its uses, the institutions or means to address adverse impacts on the environment, effective strategies for improving resource conditions, and so on. Building awareness entails the develop-ment of consensus on what is known and unknown and the formulation of strategies for filling knowledge gaps and reducing technical uncertainties. Disseminating knowledge and ensuring that they are understood is an important part of awareness building. To do this, communication processes, which include advocacy, social mobilization, and program communication, are necessary. Awareness targets human capacity and understanding, in order to establish a clear vision and purpose, political will, and commitment
to establish and sustain effective ocean governance [Lowry and Chua].

It can be said that awareness is closely intertwined to knowledge/ education. Education in ocean governance,[10] in general, aims to raise awareness, capacity to implement, encourage leadership, build appreciation of the importance of effective ocean governance, and promote the idea of "sufficient consensus" [Reichelt]. Environmental education should form part of the value system through which ocean ethic can be developed and nurtured [De Silva]. It is important to note, however, that awareness and education cannot be readily enforced by the mere passing of laws but have to be ensured by concerted effort of all stakeholders.

Leadership

Meaningful engagement and the importance of nurturing future leaders are essential in successful ocean governance. It should be underscored that leadership refers not only to rank/position but more on actions. The experiences in Australia, particularly in Victoria's marine protected area campaign, Gippsland Lakes Study and the Great Barrier Reef Marine Park Authority, provide some useful factors on effective leadership. From their experiences, several preconditions for effective leadership in coastal and

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[10] In Survey of the Extent of Education in Ocean Governance commissioned by the Nippon Foundation, it was found that 71 percent of institutions included in the survey (mostly in the United States, Australia, Canada, France, and Sweden) are engaged in education or training in ocean governance.

ocean governance were identified, including: conviction and determination to bring about change; willingness to be a champion; access to resourceful networks; willingness to take risks; efficient team work; innovation and creativity; and action- and outcome-oriented strategies [James].

The role of leaders/champions is critical to success in sustainable coastal and ocean management. There is a need to keep identifying, equipping, and empowering persistent, passionate, and committed leaders not only from government, but from civil society, business, and the community as well.

Legislation

Legislation is crucial in effecting cooperation and action, whether at the international or national level. However, legislation also needs to be updated in response to changing circumstances and emerging issues [Acevedo]. One issue in ocean governance, particularly at the national level, is that many national legal frameworks are outdated and antiquated. This problem is mainly due to political changes and interagency tensions. In China, it was observed that local maritime legislation is often ahead of the national legal framework [Gao and Fu].

Interagency Collaboration

Governments and institutions tend to be organized along rigid sectoral lines. The same is true even at the international level. Experiences have shown that harmonization of actions related to oceans is necessary for ocean governance to be effective. Thus, collaboration between and among ocean-related agencies must be encouraged. Top-level leadership plays an important role in developing mechanisms that would impel interagency collaboration.

Regionalization is one approach that promotes interagency collaboration. The PEMSEA model, which promotes ICM and networking of local governments, has generated support at the local level and promoted interagency and multistakeholder cooperation. The application of ecosystem-based management also needs collaboration across sectors, which can be stimulated through the LME model and MPAs [Kullenberg].

Advocacy and Commitment

In all these elements, long-term commitment is essential among leaders, officials, advocates, and community members. In the Philippines, a group of volunteer lawyers, teachers, law enforcement operatives, fisherfolks, and ordinary citizens have come together to conserve, protect, and restore the Visayan Sea. The Visayan Sea Squadron's inspiring story of ocean advocacy is built on the principles of education, engineering, and enforcement. Its activities include the establishment of the School of the Seas, the Sea Camp, and so on. Their commitment has helped overcome various hurdles, for example, enforcement of environmental law to combat illegal fishing and destructive practices, through legal actions such as petitions and lawsuits [Oposa].

In Japan, scientists acting on advocacy have unmasked deception on some developers trying to hide information and manipulating data, which could result to negative effects on people and the environment [Yamashita].

It should also be emphasized that children and the youth are the best motivation for, as well as one of the key actors in securing long-term commitments. Therefore, they must be given more meaningful and concrete roles in partnerships for the environmental management of our seas.

The East Asian Seas Region and the Implementation of the SDS-SEA

As in other regional sea areas, the East Asian Seas region is faced with complex issues and challenges on coastal and ocean governance. The discussions, lessons, and some recommendations put forward during the workshops/seminars may provide some useful points for the advancement of sound ocean governance in East Asia.

First, countries in the region should be encouraged to ratify and/or implement various ocean-related instruments, especially those that would bring about regional benefits. The principles of sustainable development, comprehensive security and integrated ocean governance, ecosystem-based principles, and so on, should be operationalized at the regional and national levels. In implementing international conventions, other stakeholders, aside from states benefiting from the ocean environment, must also play a crucial role.

At the regional level, while a number of regional sea areas have forged legally binding agreements, this does not necessarily translate to compliance and improvement in the ocean environment. Agreements between and among countries must take into consideration the needs, capacities, and readiness of parties before entering into such instruments. The East Asian Seas region is one of the few areas that continue to rely on nonbinding instruments, however, different collaborative arrangements and efforts have been undertaken within the region and, to some extent, have achieved significant successes. The initiatives of multiple arrangements within the region, however, should be harmonized to avoid redundancy in efforts. Some proposals put forward were: *(1)* to first develop sub-regional conventions that could later develop into a greater whole; and *(2)* the merging of various institutional programs on ocean management into a unitary institutional regime [Tan].

New developments and approaches within the region also serve as useful lessons from which other cooperative arrangements may learn. The PEMSEA case, which advocates partnership building, provides another option for cooperation. Through this concept, stakeholders from local to the international level are given the opportunity to be part of the management/governance process. This approach, coupled with the application of ICM principles and strategies, has proven successful in engaging various stakeholders in coastal governance and should be replicated in other areas.

These regional efforts, to be meaningful, must be complemented by actions at the national level, particularly in decisionmaking processes. Policies on integrated coastal and oceans management are essential in advancing better ocean governance. However, it was only very recently that countries in East Asia started to embark on the development of national coastal/ocean policies. Lessons from other countries, particularly the incremental approach used by Canada, may be considered by the countries in the region.

The devolution of authority to local levels is also seen as progress in ocean governance in various areas. While some countries still prefer the top-down approach, it is said that combination of both bottom-up and top-down approaches may help further strengthen involvement and interaction on ocean affairs within countries.

The application of all essential elements in ocean governance may vary in various countries and regions. In East Asia, a common vision was identified through the Sustainable Development Strategy for the Seas of East Asia (SDS-SEA). As the SDS-SEA complements international instruments and other regional instruments, it can serve as a common framework for regional ocean governance in East Asia. For example, the implementation of the SDS-SEA will also make possible the comprehensive security of the oceans in the region, as advocated in the Tokyo Declaration. One important feature of this strategy is its flexibility to allow different programs or mechanisms to come together and contribute as partners and work towards a common goal. Using the SDS-SEA as regional framework opens up opportunities for linkages/networks and integration of various initiatives. As such, the implementation of the SDS-SEA is seen as integral in securing the region's coastal and ocean resource and environment [Yankov].

A Challenging Future

Indeed, over the years the linkage between the coastal and ocean environment/resources and comprehensive human security and development has become more apparent. This new and more holistic understanding of ocean governance provides intellectual space and opportunities, not only for governments, but also for other stakeholders to partake in ocean affairs management. Ocean governance now implies that ocean-related matters are closely linked to social, political, and economic systems at the national, regional, and global levels.

The objective of Securing the Oceans may be ambitious, but it is an achievable agenda with a concerted effort, political will/commitment, time, and resources. The achievement will also depend on clear objectives and principles, supporting institutions and mechanisms, sufficient human capacity in the natural and social sciences, stable and adequate funding, broad representation of stakeholders, and evaluation mechanisms for measuring success of regional cooperative efforts. Ultimately, it should be emphasized that the success of securing the oceans lies in cooperation and good governance.

References[11]

Acevedo, G.R. "Protection of marine environments in China and the Bolivarian Republic of Venezuela: A diagnostic and comparative study of legal system." Special Seminar on Coastal and Ocean Governance: Enabling and Strengthening the Institutions for Sustainable Coastal and Ocean Governance.

Akimoto, K. "The content, consultation process and follow-up activities of the Tokyo Ocean Declaration on Securing the Oceans." Workshop on the Tokyo Ocean Declaration: Upholding the Advocacy.

[11] *Editors' Note:* The references cited are papers presented during the seminars and workshops under the thematic workshop on Securing the Oceans in the 2006 EAS Congress and therefore the year is not shown here.

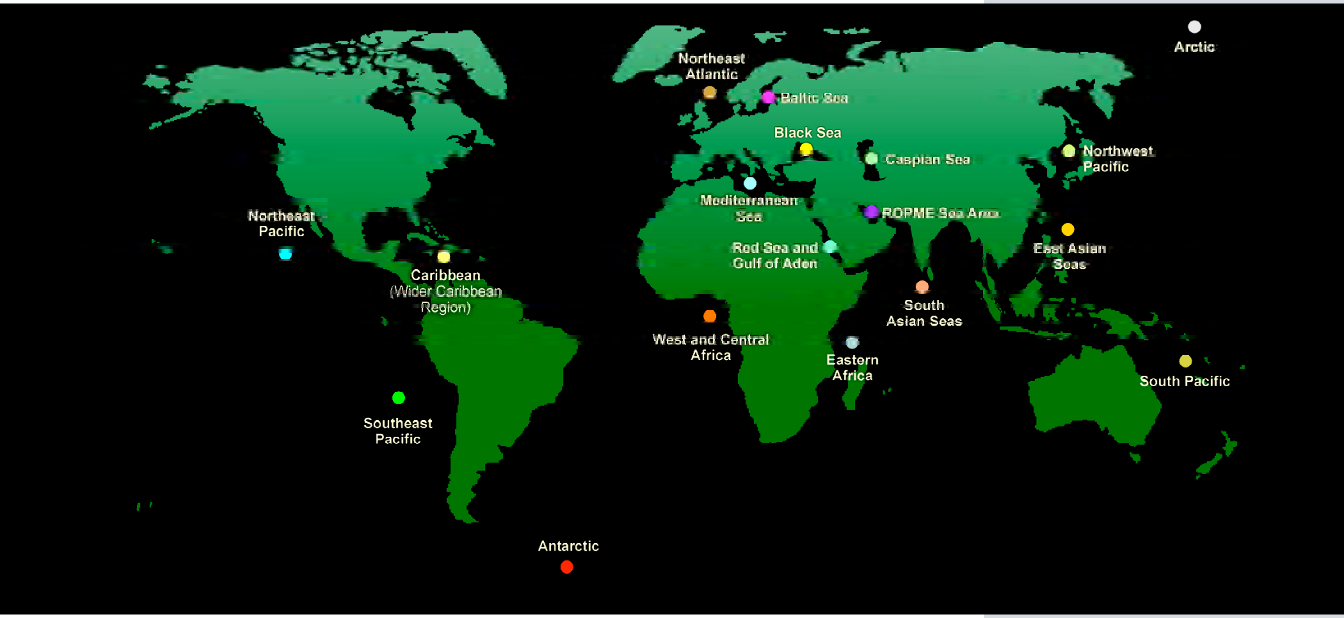
Akiyama, M. "Development of national ocean law in Japan." Seminar on the Development of National Ocean Policies in East Asia and around the World.
Beckman, R. "Enhancing cooperation to protect the marine environment in the Straits of Malacca and Singapore from ship-source pollution." Workshop on the Tokyo Ocean Declaration: Upholding the Advocacy.
Bernad, S.R. (a). "Implementation of the Tokyo Ocean Declaration in the East Asian Seas." Workshop on the Tokyo Ocean Declaration: Upholding the Advocacy.
Bernad, S.R. (b). "Regime-building in the East Asian Seas." Workshop on Regime-building in Coastal and Ocean Governance.
Cicin-Sain, B. "Introduction to panel on national ocean policies." Seminar on the Development of National Ocean Policies in East Asia and around the World.
De Silva, J. "Measures to strengthen and propagate the 'Securing the Oceans' concept." Workshop on the Tokyo Ocean Declaration: Upholding the Advocacy.
Fu, Y. "Joint development in the East China Sea: A practical and positive arrangement to maintain peace." Workshop on the Tokyo Ocean Declaration: Upholding the Advocacy.
Gao, Z. and Y. Fu. "Maritime legislation in China: A focus on the Sea Area Use Management Law." Workshop on Advocacy, Leadership, Legislation and Interagency Collaboration in Coastal and Ocean Governance.
Hamzah, B.A. "Geopolitics and regional cooperation in the Straits of Malacca and Singapore." Workshop on Regime-building in Coastal and Ocean Governance.
Hanson, A., J. Kennedy and J. Mathias. "Arctic regionalism." Workshop on Regime-building in Coastal and Ocean Governance.
James, D. "Leadership is action." Workshop on Advocacy, Leadership, Legislation and Interagency Collaboration in Coastal and Ocean Governance.
Jara, R. "Development of Ocean Policy in the Philippines." Seminar on the Development of National Ocean Policies in East Asia and around the World.
Kullenberg, G. "Global vision: Interagency collaboration." Workshop on Advocacy, Leadership, Legislation and Interagency Collaboration in Coastal and Ocean Governance.
Kuribayashi, T. "Securing the Oceans: A proposal for integrating security of the oceans." Thematic Keynote Speech. Thematic Workshop on Securing the Oceans.
Lowry, K. and T.-E. Chua. "Building vision, awareness and commitment in regional ocean governance." Workshop on Regime-building in Coastal and Ocean Governance.

Magallona, M. "Reorienting state sovereignty: Towards a new regime of Securing the Oceans under the Tokyo Declaration." Workshop on the Tokyo Ocean Declaration: Upholding the Advocacy.
Melvasalo, T. "The Baltic Sea Region." Workshop on Regime-building in Coastal and Ocean Governance.
Muhammed, A. "Development of Indonesian Ocean Policy." Seminar on the Development of National Ocean Policies in East Asia and around the World.
Nam, J. "Development of Integrated Coastal Management Act in RO Korea." Seminar on the Development of National Ocean Policies in East Asia and around the World.
Oposa, A. "The Visayan Sea saga." Workshop on Advocacy, Leadership, Legislation and Interagency Collaboration in Coastal and Ocean Governance.
O'Toole, M. "Implementation of an ecosystem approach to ocean governance – The Benguela Current Large Marine Ecosystem as a case study." Workshop on Regime-building in Coastal and Ocean Governance.
Reichelt, R. "Education in coastal and ocean governance." Workshop on Regime-building in Coastal and Ocean Governance.
Richardson, J. "What maritime policy for the European Union?" Seminar on the Development of National Ocean Policies in East Asia and around the World.
Siemers, H. "Regime-building in coastal and ocean governance: Considerations for an EU maritime policy." Workshop on Regime-building in Coastal and Ocean Governance.
Simard, F. "Securing the Oceans: From good governance to ecosystem approach." Workshop on the Tokyo Ocean Declaration: Upholding the Advocacy.
Tan, A. "Re-assessing prospects for a regional convention on coastal and ocean governance in Asia." Workshop on the Tokyo Ocean Declaration: Upholding the Advocacy.
Terashima, H. "Tokyo Declaration on Securing the Oceans — Proposals for a New Oceans Security." Workshop on the Tokyo Ocean Declaration: Upholding the Advocacy.
VanderZwaag, D. (a). "Overview on regional cooperation in ocean governance." Workshop on Regime-building in Coastal and Ocean Governance.
VanderZwaag, D. (b). "Canada's experience in national coastal/ocean governance and policy." Seminar on the Development of National Ocean Policies in East Asia and around the World.
Wagey, T. "Arafura and Timor Seas Expert Forum (ATSEF) Regional Secretariat." Workshop on Regime-building in Coastal and Ocean Governance.

Yamashita, H. "Making the invisible visible: The educational implications." Special Seminar on Coastal and Ocean Governance: Enabling and Strengthening the Institutions for Sustainable Coastal and Ocean Governance.

Yankov, A. "The importance of implementation for the Sustainable Development Strategy for the East Asian Seas." Workshop on Regime-building in Coastal and Ocean Governance.

Regional Mechanisms for Coastal and Ocean Governance



In recent decades, there has been significant growth in the number of arrangements and instruments for coastal and ocean governance at the regional level. Mechanisms established have become indispensable tools for providing common expectations, standards and frameworks for action in managing the coastal and ocean environment.

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ANTARCTIC

Related Agreements and Governing Instruments:

Antarctic Treaty, 1959
Entry into force: June 1961
Protocols:

- Protocol on Environmental Protection to the Antarctic Treaty, 1991 (Entry into force: 1998)
- Convention on the Conservation of Antarctic Marine Living Resources, 1980 (Entry into force: April 1982)

Participating Countries:

Argentina, Australia, Belgium, Brazil, Chile, France, Germany, India, Italy, Japan, Namibia, New Zealand, Norway, Poland, Russia, South Africa, Spain, Sweden, Republic of Korea, Ukraine, United Kingdom, United States of America, Uruguay, European Community (Contracting Parties to the Convention and Commission Members); Bulgaria, Canada, Cook Islands, Finland, Greece, Mauritius, Netherlands, Peru, Vanuatu (Contracting Parties to the Convention only)

Governing/Coordinating Mechanism:

Commission for the Conservation of Antarctic Marine Living Resources

Goal/Objective:

To ensure the comprehensive protection of the Antarctic environment and dependent and associated ecosystems

ARCTIC

Participating Countries:

Canada, Denmark, Greenland, Faroe Islands, Finland, Iceland, Norway, Russia, Sweden, United States of America

Governing/Coordinating Mechanism:

Protection of the Arctic Marine Environment (PAME) Working Group under the Arctic Council

Goal/Objective:

To address policy and non-emergency pollution prevention and control measures related to the protection of the Arctic marine environment from both land- and sea-based activities, which includes coordinated action programmes and guidelines complementing existing legal arrangements.

BALTIC SEA

Related Agreements and Governing Instruments:

Convention on the Protection of the Marine Environment of the Baltic Sea Area (Helsinki Convention)
Adoption: 1974
Entry into force: May 1980

Replaced by: Convention on the Protection of the Marine Environment of the Baltic Sea Area, 1992 (Entry into force: January 2000)

Baltic Sea Joint Comprehensive Environmental Action Programme

Adoption: 1992

Participating Countries:

Denmark, Estonia, Finland, Germany, Latvia, Lithuania, Poland, Russia, Sweden, European Community

Governing/Coordinating Mechanism:

Helsinki Commission (HELCOM)

Goal/Objective:

To protect the marine environment of the Baltic Sea from all sources of pollution through intergovernmental co-operation

BLACK SEA

Related Agreements and Governing Instruments:

Convention on the Protection of the Black Sea against Pollution (Bucharest Convention)

Adoption: 1992

Entry into force: January 1994

Protocols:

- Protocol on the Protection of the Black Sea Marine Environment against Pollution from Land-based Sources, 1992
  Entry into force: January 1994
- Protocol on Cooperation in Combating Pollution of the Black Sea Marine Environment by Oil and Other Harmful Substances in Emergency Situations, 1992
  Entry into force: January 1994
- Protocol on the Protection of the Black Sea Marine Environment Against Pollution by Dumping, 1992
  Entry into force: January 1994
- Black Sea Biodiversity and Landscape Conservation Protocol, 2003
  (Not yet in force)

Strategic Action Plan for the Rehabilitation and Protection of the Black Sea

Adoption: 1996

Amended: 2002

Participating Countries:

Bulgaria, Georgia, Romania, Russian Federation, Turkey, Ukraine

Governing/Coordinating Mechanism:

Commission for the Protection of the Black Sea against Pollution (Istanbul Commission)

Goal/Objective:

To enable the population of the Black Sea region to enjoy a healthy living environment in both urban and rural areas, and to attain a biologically diverse Black Sea ecosystem with viable natural populations of higher organisms, which will support livelihoods based on sustainable activities in all Black Sea countries

CARIBBEAN (Wider Caribbean Region)

Related Agreements and Governing Instruments:

Convention for the Protection and Development of the Marine Environment in the Wider Caribbean Region (Cartagena Convention)

Adoption: 1983

Entry into force: October 1986

Protocols:

- Protocol concerning Co-operation in Combating Oil Spills (Oil Spills Protocol), 1983
  Entry into force: October 1986
- Protocol concerning Specially Protected Areas and Wildlife (SPAW Protocol), 1990
  Entry into force: June 2000
- Protocol concerning Pollution from Land-based Sources and Activities (LBS Protocol), 1999
  (Not yet in force)

Caribbean Action Plan

Adoption: 1981

Participating Countries:

Antigua & Barbuda, Bahamas, Barbados, Belize, Colombia, Costa Rica, Cuba, Dominica, Dominican Republic, France, Grenada, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Netherlands, Antilles, Nicaragua, Panama, St. Kitts & Nevis, Saint Lucia, St. Vincent & the Grenadines, Suriname, Trinidad & Tobago, United Kingdom, United States of America, Venezuela, European Union (All, except the European Union, adopted the Caribbean Action Plan)

Governing/Coordinating Mechanism:

Regional Coordinating Unit for the Caribbean Environment Programme (UNEP- CAR/RCU)

Goal/Objective:

To assist the nations and territories of the Wider Caribbean Region in protecting their marine and coastal environment and promoting sustainable development

CASPIAN SEA

Related Agreements and Governing Instruments:

Framework Convention for the Protection of the Marine Environment of the Caspian Sea, 2003

Entry into force: August 2006

Caspian Strategic Action Programme, 2003

Participating Countries:

Azerbaijan, Iran , Kazakhstan, Russia, Turkmenistan

Governing/Coordinating Mechanism:

Caspian Environment Programme

Goal/Objective:

To ensure the sustainable development of the Caspian environment, including living resources and water quality, and to protect human health and ecological integrity for the sake of future generations

EAST ASIAN SEAS

Related Agreements and Governing Instruments:

Action Plan for the Protection and Development of the Marine and Coastal Areas of the East Asian Region

Adoption: 1981

Revised and recorded as: Action Plan for the Sustainable Development of the Marine and Coastal Areas of the East Asian Region, 1994

Participating Countries:

Australia, Cambodia, China, Indonesia, Malaysia, Philippines, RO Korea, Singapore, Thailand, Vietnam

Governing/Coordinating Mechanism:

Coordinating Body on the Seas of East Asia (COBSEA)/East Asian Seas Regional Coordinating Unit (EAS/RCU)

Goal/Objective:

To develop and protect the marine environment and the coastal areas for the promotion of the health and well-being of the present and future generations

Other Related Agreements and Governing Instruments:

Putrajaya Declaration of Regional Cooperation for the Sustainable Development of the Seas of East Asia

Adoption: 2003

Sustainable Development Strategy for the Seas of East Asia (SDS-SEA)

Adoption: 2003

Haikou Partnership Agreement

Adoption: 2006

Partnership Operating Arrangements

Adoption: 2006

Participating Countries:
Brunei Darussalam, Cambodia, China, DPR Korea, Indonesia, Japan, Lao PDR, Malaysia, Philippines, RO Korea, Singapore, Thailand, Timor-Leste, Vietnam

Governing/Coordinating Mechanism:
GEF/UNDP/IMO Regional Programme on Partnerships in Environmental Management for the Seas of East Asia (PEMSEA)

Goal/Objective:
To protect the seas' life support systems and enable the sustainable use and management of coastal and marine resources through intergovernmental, interagency and intersectoral partnerships for an improved quality of life

EASTERN AFRICA

Related Agreements and Governing Instruments:
Convention for the Protection, Management and Development of the Marine and Coastal Environment of the Eastern African Region (Nairobi Convention), 1985
Entry into force: May 1996
Protocols:
- Protocol concerning Protected Areas and Wild Fauna and Flora in the Eastern African Region, 1985
  Entry into force: May 1996
- Protocol concerning Co-operation in Combating Marine Pollution in Cases of Emergency in the Eastern African Region, 1985
  Entry into force: May 1996

Action Plan for the Protection, Management and Development of the Marine and Coastal Environment of the Eastern African Region (Eastern Africa Action Plan), 1985

Participating Countries:
Comoros, France (Reunion), Kenya, Madagascar, Mozambique, Mauritius, Seychelles, Somalia, South Africa, Tanzania

Governing/Coordinating Mechanism:
UNEP East African Regional Coordinating Unit (EAF/RCU)

Goal/Objective:
To protect and manage the marine environment and coastal areas of the Eastern African region

MEDITERRANEAN SEA

Related Agreements and Governing Instruments:
Convention for the Protection of the Mediterranean Against Pollution (Barcelona Convention)

Adoption: 1976
Entry into force: February 1978
Replaced by: Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean, 1995
Entry into force: July 2004

Protocols:

- Protocol for the Prevention of Pollution of the Mediterranean Sea by Dumping from Ships and Aircraft (Dumping Protocol), 1976
  Entry into force: February 1978
  Amended and recorded as: Protocol for the Prevention and Elimination of Pollution in the Mediterranean Sea by Dumping from Ships and Aircraft or Incineration at Sea, 1995
  (Not yet in force)
- Protocol concerning Cooperation in Combating Pollution of the Mediterranean Sea by Oil and Other Harmful Substances in Cases of Emergency, 1976
  Entry into force: February 1978
  Replaced by: Protocol concerning Cooperation in Preventing Pollution from Ships and, in Cases of Emergency, Combating Pollution of the Mediterranean Sea (Prevention and Emergency Protocol), 2002
  Entry into force: March 2004
- Protocol for the Protection of the Mediterranean Sea against Pollution from Land-based Sources (LBS Protocol), 1980
  Entry into force: June 1983
  Amended and recorded as: Protocol for the Protection of the Mediterranean Sea against Pollution from Land-based Sources and Activities, 1996
  (Not yet in force)
- Protocol concerning Mediterranean Specially Protected Areas, 1982
  Entry into force: March 1986
  Replaced by: Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean (SPA and Biodiversity Protocol), 1995
  Entry into force: December 1999
- Protocol for the Protection of the Mediterranean Sea against Pollution Resulting from Exploration and Exploitation of the Continental Shelf and the Seabed and Its Subsoil (Offshore Protocol), 1994
  (Not yet in force)
- Protocol on the Prevention of Pollution of the Mediterranean Sea by Transboundary Movements of Hazardous Wastes and Their Disposal (Hazardous Wastes Protocol), 1996
  (Not yet in force)

Mediterranean Action Plan (MAP)
Adoption: 1975
Replaced by: Action Plan for the Protection of the Marine Environment

and the Sustainable Development of the Coastal Areas of the Mediterranean, or MAP Phase II (Adoption: 1995)

Participating Countries:

Albania, Algeria, Bosnia & Herzegovina, Croatia, Cyprus, Egypt, France, Greece, Israel, Italy, Lebanon, Libya, Malta, Monaco, Morocco, Serbia & Montenegro, Slovenia, Spain, Syria, Tunisia, Turkey, European Community

Governing/Coordinating Mechanism:

Coordinating Unit for the Mediterranean Action Plan (MEDU)

Goal/Objective:

To protect the marine and coastal environment of the Mediterranean Sea while boosting regional and national plans to achieve sustainable Development

NORTH-EAST ATLANTIC

Related Agreements and Governing Instruments:

Convention for the Prevention of Marine Pollution by Dumping from Ships and Aircraft (Oslo Convention), 1972*

Entry into force: 1974

Convention for the Prevention of Marine Pollution from Land-based Sources (Paris Convention), 1974*

Entry into force: 1978

* Combined into:

Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR Convention), 1992

Entry into force: March 1998

OSPAR Action Plan (1998–2003), 1992

Participating Countries:

Belgium, Denmark, Finland, France, Germany, Iceland, Ireland, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, European Union

Governing/Coordinating Mechanism:

OSPAR Commission

Goal/Objective:

To prevent and eliminate pollution of the maritime area of the North-East Atlantic and to ensure that its ecosystems are in a sustainable, sound and healthy condition and that human health is protected

NORTH-EAST PACIFIC

Related Agreements and Governing Instruments:

Convention for Cooperation in the Protection and Sustainable Development of the Marine and Coastal Environment of the North-East Pacific (Antigua Convention), 2002

(Not yet in force)

Plan of Action for the Protection and Sustainable Development of the Marine and Coastal Areas of the North-East Pacific, 2002

Participating Countries:

Colombia, Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama

Governing/Coordinating Mechanism:

Northeast Pacific Programme, Central American Commission for Maritime Transport (COCATRAM)

Goal/Objective:

To promote and facilitate the sustainable management of the marine and coastal resources of the countries of the Northeast Pacific for the well-being of the present and future generations in the region

NORTH-WEST PACIFIC

Related Agreements and Governing Instruments:

Action Plan for the Protection, Management and Development of the Marine and Coastal Environment of the North-West Pacific Region (NOWPAP)

Adoption: 1994

Participating Countries:

China, Japan, RO Korea, Russian Federation (Observer: DPR Korea)

Governing/Coordinating Mechanism:

NOWPAP's Regional Coordinating Unit (RCU) co-hosted by Japan and RO Korea

Goal/Objective:

To ensure the wise use, development and management of the coastal and marine environment in order to obtain long-term benefits for the populations of the region while protecting human health, ecological integrity and the region's sustainability for future generations

RED SEA AND GULF OF ADEN

Related Agreements and Governing Instruments:

Regional Convention for the Conservation of the Red Sea and Gulf of Aden (Jeddah Convention)

Adoption: 1982

Entry into force: August 1985

Action Plan for the Conservation of the Marine Environment and Coastal Areas of the Red Sea and Gulf of Aden

Adopted: 1976

Revised: 1995

Protocols:

- Protocol concerning Regional Cooperation in Combating Pollution by Oil

and Other Harmful Substances in Cases of Emergency, 1982
Entry into force: August 1985
- Regional Protocol concerning the Protection of the Marine Environment from Land-based Activities in the Red Sea and Gulf of Aden, 2005
(Not yet in force)
- Regional Protocol for Biodiversity Conservation and Marine Protected Areas,2005
(Not yet in force)

Participating Countries:
Djibouti (Adopted the Jeddah Convention only); Egypt, Jordan, Saudi Arabia, Somalia, Sudan and Yemen (Adopted the Jeddah Convention and Action Plan); Eritrea and Palestine (Adopted the Action Plan only)

Governing/Coordinating Mechanism:
Regional Organization for the Conservation of the Environment of Red Sea and Gulf of Aden (PERSGA)

Goal/Objective:
To develop an integrated management approach in the use of the coastal and marine areas so as to allow the achievement of environmental and development goals of the participating countries in a harmonious manner

ROPME Sea Area

Related Agreements and Governing Instruments:
Kuwait Regional Convention for Cooperation on the Protection of the Marine Environment from Pollution (Kuwait Convention), 1978
Entry into force: July 1979
Protocols:
- Protocol concerning Regional Co-operation in Combating Pollution by Oil and Other Harmful Substances in Cases of Emergency, 1978
Entry into force: July 1979
- Protocol concerning Marine Pollution resulting from Exploration and Exploitation of the Continental Shelf, 1989
Entry into force: February 1990
- Protocol for the Protection of the Marine Environment against Pollution from Land-based Sources, 1990
Entry into force: January 1993
- Protocol on the Control of Marine Transboundary Movements and Disposal of Hazardous Wastes and Other Wastes, 1998
(Not yet in force)

Action Plan for the Protection of the Marine Environment and the Coastal Areas of Bahrain, Iran, Iraq, Kuwait, Oman, Qatar, Saudi Arabia and the United Arab Emirates, 1978

Participating Countries:
Bahrain, Iran, Iraq, Kuwait, Oman, Qatar, Saudi Arabia, United Arab Emirates
Governing/Coordinating Mechanism:
Regional Organization for the Protection of the Marine Environment — Kuwait
Goal/Objective:
To protect the marine environment with a view to promoting human health and well-being

SOUTH ASIAN SEAS

Related Agreements and Governing Instruments:
Colombo Declaration on the South Asia Co-operative Environment Programme (SACEP)
Adoption: 1981
South Asian Seas Action Plan (SASAP)
Adoption: 1995
Participating Countries:
Bangladesh, India, Maldives, Pakistan, Sri Lanka
Governing/Coordinating Mechanism:
South Asia Co-operative Environment Programme (SACEP)
Goal/Objective:
To protect and manage the marine environment and related coastal ecosystems of the region in an environmentally sound and sustainable manner

SOUTH-EAST PACIFIC

Related Agreements and Governing Instruments:
Convention for the Protection of the Marine Environment and Coastal Area of the South-East Pacific (Lima Convention), 1981
Entry into force: July 1986
Protocols:
- Protocol for the Protection of the South-East Pacific against Pollution from Land-based Sources, 1983
  Entry into force: September 1986
- Protocol for the Conservation and Management of Protected Marine and Coastal Areas of the South-East Pacific, 1989
  Entry into force: October 1994
- Protocol for the Protection of the South-East Pacific from Radioactive Contamination,1989
  Entry into force: January 1995

- Protocol on the Programme for the Regional Study on the El Niño Phenomenon in the South-East Pacific (ERFEN), 1992
  (Not yet in force)

Agreement on Regional Cooperation in Combating Pollution of the South-East Pacific by Hydrocarbons and Other Harmful Substance in Cases of Emergency, 1981
  Entry into force: July 1986
  Protocol:
  Supplementary Protocol to the Agreement on Regional Cooperation in Combating Pollution of the South-East Pacific by Hydrocarbons and Other Harmful Substances in Cases of Emergency, 1983
    Entry into force: May 1987

Framework Agreement for the Conservation of Living Marine Resources in the High Seas of the South-East Pacific (Galapagos Agreement), 2000
  (Not yet in force)
  Protocol:
  Modifying Protocol of the Framework Agreement for the Conservation of Living Marine Resources in the High Seas of the South Pacific, 2003

Action Plan for the Protection of the Marine Environment and Coastal Areas of the South-East Pacific, 1981

Participating Countries:

Chile, Colombia, Ecuador, Panama, Peru (All except Panama are members of the Permananent Commission for the South Pacific)

Governing/Coordinating Mechanism:

Permanent Commission for the South Pacific (CPPS)

Goal/Objective:

To protect and preserve the marine environment and coastal area of the Southeast Pacific region

SOUTH PACIFIC

Related Agreements and Governing Instruments:

Convention for the Protection of the Natural Resources and Environment of the South Pacific Region (Noumea or SPREP Convention)
  Adoption: 1986
  Entry into force: August 1990
  Protocols:

- Protocol for the Prevention of Pollution of the South Pacific Region by Dumping,1986
  Entry into force: August 1990
- Protocol concerning Co-operation in Combating Pollution Emergencies in the South Pacific Region, 1986
  Entry into force: August 1990

Action Plan for Managing the Environment of the Pacific Islands Region: 2001-2004
Adoption: 1986

Participating Countries:

American Samoa, Australia, Cook Islands, Federated States of Micronesia, Fiji, France, French Polynesia, Guam, Kiribati, Marshall Islands, Nauru, New Caledonia,New Zealand, Niue, Northern Marianas, Palau, Papua New Guinea, Pitcairn, Solomon Islands, Tokelau, Tonga, Tuvalu, United States of America, Vanuatu, Wallis & Futuna, Western Samoa

Governing/Coordinating Mechanism:

South Pacific Regional Environment Programme (SPREP)

Goal/Objective:

To promote cooperation in the Pacific Islands region and to provide assistance in order to protect and improve the environment and to ensure sustainable development for present and future generations

WEST AND CENTRAL AFRICA

Related Agreements and Governing Instruments:

Convention for Co-operation in the Protection and Development of the Marine and Coastal Environment of the West and Central African Region, 1981 (Abidjan Convention)
Entry into force: August 1984
Protocol:

- Protocol concerning Co-operation in Combating Pollution in Cases of Emergency,1981
  Entry into force: August 1984

Action Plan for the Protection and Development of the Marine Environment and Coastal Areas of the West and Central African Region, 1981

Participating Countries:

Angola, Benin, Cameroon, Cape Verde, Democratic Republic of Congo, Republic of Congo, Cote d'Ivoire, Equatorial Guinea, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mauritania, Namibia, Nigeria, Sao Tome & Principe, Senegal, Sierra Leone, Togo, South Africa

Governing/Coordinating Mechanism:

UNEP Regional Coordination Unit for the West and Central Africa Action Plan (WACAF/RCU)

Goal/Objective:

To protect, manage and develop the coastal and marine environment of West and Central Africa

References

Black Sea Commission	*www.blackseacommission.org*
British Antarctic Survey	*www.antarctica.ac.uk*
CEP	*www.cep.unep.org*
Caspian Environment Programme	*www.caspianenvironment.org*
CCAMLR	*www.ccamlr.org*
COCATRAM	*www.cocatram.org.ni*
COBSEA	*www.cobsea.org*
CPPS	*www.cpps-int.org*
HELCOM	*www.helcom.fi*
Mediterranean Action Plan	*www.unepmap.gr*
Nairobi Convention	*hq.unep.org/easternafrica/index.cfm*
NOWPAP	*www.nowpap.org*
OSPAR Commission	*www.ospar.org*
PAME International Secretariat	*www.pame.is*
PERSGA	*www.persga.org*
PEMSEA	*www.pemsea.org*
ROPME	*www.ropme.net*
SACEP	*www.sacep.org*
SPREP	*www.sprep.org.ws*
UNEP Regional Seas Programme	*www.unep.org/regionalseas*

Abbreviations and Acronyms

ACOPS	Advisory Committee on Protection of the Seas
ACP	Asia, Caribbean and Pacific
ACS	Association of Caribbean States
ADB	Asian Development Bank
AIS	automatic identification system
AMAP	Arctic Monitoring and Assessment Programme
Anti-fouling	International Convention on the Control of Harmful Anti-fouling Systems on Ships
APEC	Asia-Pacific Economic Conference
ARF	ASEAN Regional Forum
ARPEL	Regional Association of Gas and Oil Companies in Latin America and the Caribbean
ASCEND	Agenda of Science for Environment and Development
ASEAN	Association of Southeast Asian Nations
BAT	best available technologies
Ballast Water	International Convention for the Control and Management of Ships' Ballast Water and Sediments
Barcelona Convention	Convention for the Protection of the Mediterranean Sea against Pollution
Basel Convention	Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal
BCC	Benguela Current Commission
BCLME	Benguela Current Large Marine Ecosystem
BCRMF	Batangas Coastal Resource Management Foundation
BEP	best environmental practices
BET	best environmental technologies
Biodiversity	Convention on Biological Diversity
BOO	build-operate-own
BOT	build-operate-transfer
BPOA	Barbados Programme of Action on the Sustainable Development of Small Island Developing States
BSEP	Black Sea Environment Programme

Bunkers	International Convention on Civil Liability for Bunker Oil Pollution Damage
CAFF	Conservation of Arctic Flora and Fauna Program
CAM	coastal area management
CARC	Canadian Arctic Communities
CARICOM	Cooperation Committee and the Caribbean Community
CARICOMP	Caribbean Coastal Marine Productivity Programme
CAST	Caribbean Alliance for Sustainable Tourism
CBCRM	community-based coastal resource management
CBD	Convention on Biological Diversity
CCAMLR	Commission for the Convention for the Conservation of Antarctic Marine Living Resources
CEC	North American Commission for Environmental Cooperation
CEHI	Caribbean Health Institute
CEP	Caribbean Environment Programme
CEPNET	Information Systems for the Management of Marine and Coastal Resources
CFC	chlorofluorocarbon
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CLC	International Convention on Civil Liability for Oil Pollution Damage
CMS	Conservation of Migratory Species of Wild Animals
CO_2	carbon dioxide
COBSEA	Coordinating Body on the Seas of East Asia
COFI	FAO Committee on Fisheries
COLREG	Convention on the International Regulations for Preventing Collisions at Sea
COP	Conference of the Parties
COSALC	Coastal Beach Stability in the Caribbean Programme
CPUE	catch per unit effort
CRM	coastal resource management
CROP	Council of the Regional Organizations of the Pacific
CSCAP	Council for Security Cooperation in the Asia Pacific
CSD	Commission on Sustainable Development
DDT	dichlorodiphenyltrichloroethane
DFI	direct foreign investment
DFO	Department of Fisheries and Oceans, Canada
DRPC	Danube River Protection Convention
DWT	dead weight tonnages

EA	ecosystem approach
EAF	Eastern Africa
EAF	ecosystem approach to fisheries
EAS	East Asian Seas
EAS-RCU	East Asian Seas Regional Coordinating Unit
EBM	ecosystem-based management
EC	European Community
ECLAC	Economic Commission for Latin America and the Caribbean
EEA	European Environmental Agency
EEZ	exclusive economic zone
EIA	environmental impact assessment
ENSO	El Niño – Southern Oscillation
EPPR	Emergency Prevention Preparedness and Response Program
ESCAP	Economic and Social Commission for Asia and the Pacific
EU	European Union
FAO	Food and Agriculture Organization
FFA	Forum Fisheries Agency, Pacific
FIC	Forum Island Countries
FORSEC	Pacific Islands Forum Secretariat
FSM	Federated States of Micronesia
FUND	International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage
GATT	General Agreements on Tariffs and Trade
GCOS	Global Climate Observing System
GDP	gross domestic product
GEF	Global Environment Facility
GEMS	Global Environment Monitoring Systems
GESAMP	Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection
GFCM	Global Fisheries Commission for the Mediterranean
GIS	geographical information systems
GIWA	Global International Waters Assessment
GLOSS	Global Sea Level Observing System
GNP	gross national product
GOOS	Global Ocean Observing System
GPA	Global Programme of Action for the Protection of the Marine Environment from Land-based Activities
GPS	global positioning system
GTCB	Global Thermohaline Conveyor Belt

GTZ	German Organization for Technical Cooperation
GWT	Greenwich Meridian Time
Ha	hectares
HAB	harmful algal bloom
HELCOM	Helsinki Commission
HIV/AIDS	human immunodeficiency virus/acquired immune deficiency syndrome
HNS	hazardous and noxious substances
HNS	International Convention on Liability and Compensation for Damage in Connection with the Carriage of Hazardous and Noxious Substances by Sea
IAEA	International Atomic Energy Agency
IATTC	Inter-American Tropical Tuna Commission
IBCC	Interim Benguela Current Commission
IBRD	International Bank for Reconstruction and Development
ICAM	integrated coastal area management
ICCAT	International Commission for the Conservation of Atlantic Tunas
ICES	International Council for the Exploration of the Sea
ICG	Intergovernmental Coordinating Group
ICM	integrated coastal management
ICNAF	International Commission for the Northwest Atlantic Fisheries
ICOM	integrated coastal and ocean management
ICPDR	International Commission for the Protection of the Danube River
ICZM	integrated coastal zone management
IGO	intergovernmental organizations
IIMS	integrated information management system
ILO	International Labour Organization
IMF	International Monetary Fund
IMO	International Maritime Organization
INCSEA	Incidents-at-Sea
INMARSAT	International Maritime Satellite Organization
INTERTANKO	International Association of Independent Tanker Owners
Intervention	International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties
IO	international organizations
IOC	Intergovernmental Oceanographic Commission

IOC/WESTPAC	Intergovernmental Oceanographic Commission/ Subcommission for the Western Pacific
IOCARIBE	IOC Subcommission for the Caribbean and Adjacent Regions
IOI	International Ocean Institute
IPCC	Intergovernmental Panel on Climate Change
IPOA-IUU	International Plan of Action to Prevent and Eliminate Illegal, Unreported, and Unregulated Fishing
IPY	International Polar Year
IRBM	integrated river basin management
ISA	International Seabed Authority
ISO	International Standards Organization
ISPS Code	International Ship and Port Facility Security Code
ITF	International Transport Workers' Federation
ITLS	International Tribunal for the Law of the Sea
IUCN	The World Conservation Union/International Union for the Conservation of Nature and Natural Resources
IUU	Illegal, Unreported, and Unregulated Fishing
IWC	International Whaling Commission
IWRM	international water resource management
JECSS	Japanese-East China Sea Surveys
JWC	London-based Joint War Committee
km	kilometers
LEAD	Leadership in Environment and Development
LME	large marine ecosystem
LOMA	Large Ocean Management Area (Canada)
London Convention	Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter
LRTAP	long-range transboundary air pollution
m	meters
MA	Millennium Ecosystem Assessment
MAP	Mediterranean Action Plan
MARPOL	International Convention for the Prevention of Pollution from Ships
MCSD	Mediterranean Commission for Sustainable Development
MDG	Millennium Development Goals
MEA	multilateral environment agreements
MED POL	Programme for the Assessment and Control of Pollution in the Mediterranen Region
MEDA	Mediterranean Development Assistance Program
MedGOOS	Mediterranean Global Ocean Observing System

MEDU	Coordinating Unit of the Mediterranean Action Plan
MEH	marine electronic highway
MEQ	marine environmental quality
Migratory Species	Convention on the Conservation of Migratory Species of Wild Animals
MLIT	Ministry of Land Infrastructure and Transport
MNC	multinational company
MOMAF	Ministry of Fisheries and Marine Affairs (RO Korea)
MOU	Memorandum of Understanding
MPA	marine protected areas
MPP-EAS	Regional Programme for the Prevention and Management of Marine Pollution in the East Asian Seas
MSSD	Mediterranean Strategy for Sustainable Development
MSY	maximum sustainable yield
MWTP	marginal willingness to pay
NACA	Network of Aquaculture Centres in Asia-Pacific
NAFO	Northwest Atlantic Fisheries Organization
NAFTA	North American Free Trade Agreement
NAO	North Atlantic Oscillation
NASCO	Northwest Atlantic Salmon Conservation Organization
NEAFC	North-East Atlantic Fisheries Convention
NEAMTWS	Northeastern Atlantic Mediterranean and Connected Seas
NEMS	national environment management strategies
NETS	natural economic territories
NGO	nongovernmental organization
NOAA	National Oceanographic and Atmospheric Administration
NORAD	Norwegian Agency for Development Cooperation
NOWPAP	Northwest Pacific Action Plan
OAS	Organization of American States
ODA	official development assistance
OECD	Organisation for Economic Co-operation and Development
OECS	Organization of Eastern Caribbean States
OPRC	International Convention on Oil Pollution Preparedness, Response and Cooperation
OPRF	Ocean Policy Research Foundation of Japan
OSPARCOM	Oslo and Paris Commission
OTEC	ocean thermal-energy conversion

PACSICOM	Pan-African Conference on Sustainable Integrated Coastal Management
PAME	Protection of the Arctic Marine Environment
PARCOM	Paris Commission
PCB	polychlorinated biphenyls
PCC	Project Coordinating Committee
PCT	polychlorinated terphenyls
PECC	Pacific Economic Cooperation Council
PEMSEA	Partnerships in Environmental Management for the Seas of East Asia
PERSGA	Programme for the Environment of Red Sea and Gulf of Aden
PG-ENRO	Provincial Government's Environment and Natural Resources Office
PIC	Pacific Island countries
PIC	prior informed consent
PICES	North Pacific Marine Science Organization
PIROP	Pacific Islands Regional Ocean Policy
PMO	Project Management Office
PNG	Papua New Guinea
PNLG	PEMSEA's Network of Local Governments for Sustainable Coastal Development
POP	persistent organic pollutant
PPP	public-private partnership
PRF	PEMSEA Resource Facility
PSC	Programme Steering Committee
PSI	proliferation security initiative
PSSA	particularly sensitive sea area
RFB	regional fisheries bodies
RFMO	regional fisheries management organizations
ROLAC	Regional Office for Latin America and the Caribbean
ROPME	Regional Organization for the Protection of the Marine Environment
RORO	roll-on roll-off
Rotterdam Convention	Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade
RPF	Regional Partnership Fund
RTA	Regional Trade Agreements
SADC	Southern African Development Community
Salvage	International Convention on Salvage
SAP	strategic action programme
SARS	severe acute respiratory syndrome

SBT	segregated ballast tanks
SDCA	Framework for Sustainable Development of Coastal Areas
SDS-SEA	Sustainable Development Strategy for the Seas of East Asia
SDWG	Sustainable Development Working Group
SEA	strategic environmental assessment
SEAFDEC	Southeast Asian Fisheries Development Center
SEAFO	Southeast Atlantic Fisheries Organization
SIDA	Swedish International Development Cooperation Agency
SIDS	small islands developing states
SIOFA	South Indian Ocean Fisheries Agreement
SOC	State of the Coasts Reporting
SOLAS	Safety of Life at Sea
SOPAC	South Pacific Applied Geosciences Commission
SPAW	Specially Protected Areas and Wildlife
SPC	South Pacific Commission
SPREP	South Pacific Regional Environmental Programme
SPRFMO	South Pacific Regional Fisheries Management Organization
STCW	Standards of Training Certification and Watchkeeping for Seafarers
Stockholm Convention	Stockholm Convention on Persistent Organic Pollutants
TBT	tributyltin
TDA	transboundary diagnostic analysis
TEU	twenty-foot equivalent units
TEV	total economic value
TSS	traffic separation schemes
TTEG	Tripartite Technical Experts Group
UN ACC	United Nations Administrative Committee on Coordination
UNCED	United Nations Conference on Environment and Development
UNCLOS	United Nations Convention on the Law of the Sea
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	UN Framework Convention on Climate Change

UNICPOLOS	UN Informal Consultative Process on Oceans and the Law of the Sea
UNIDO	United Nations Industrial Development Organization
USAID	United States Agency for International Development
USP	University of the South Pacific
USSR	Union of Soviet Socialist Republics
WACAF	West and Central Africa
WCED	World Commission on Environment and Development
WCPFC	Western and Central Pacific Fisheries Commission
Whaling	International Convention for the Regulation of Whaling
WHO	World Health Organization
WIDECAST	Wider Caribbean Sea Turtle Conservation Network
WMO	World Meteorological Organization
World Heritage	Convention Concerning the Protection of the World Cultural and Natural Heritage
WSSD	World Summit on Sustainable Development
WTA	willingness to accept
WTO	World Trade Organization
WTP	willingness to pay
WWF	World Wildlife Fund/World Wide Fund for Nature

Glossary

Adaptive management — A systematic process for continually improving management policies and practices by learning from the outcomes of employed policies and practices [MA, 2005].

Agenda 21 — An extensive action plan presented during the 1992 United Nations Conference on Environment and Development (UNCED) that provides guidance to nations on matters related to environment and development. Chapter 17 of Agenda 21 addresses oceans and coasts.

Albedo — The fraction of the solar radiation that is reflected back into space.

Ballast — Heavy material in a ship's hold to lower the center of gravity and provide greater stability when the ship carries little or no cargo, usually on its way back to its port of origin.

Benguela Niño — Refers to large-scale episodic warm events that occur along the coast of southern Angola and Namibia every ten years, and which have a character not unlike the El Niño in the Pacific Ocean.

Biodiversity — A contraction of biological diversity. The variability among living organisms from all sources, including terrestrial, marine, and other aquatic ecosystems and the ecological complexes of which they are part. This includes diversity within species, between species, and between ecosystems.

Biological pump — The biological mechanisms by which organic matter is relatively rapidly transported from near-surface waters to the deep ocean, such as through grazing and defecation of fast-sinking fecal pellets by copepods and larger organisms, and the vertical migration of near-surface feeders to mesopelagic depths [Koslow, T. 2007. *The silent deep: The discovery, ecology and conservation of the deep sea.* The University of Chicago Press, Chicago. 270 pp.].

Biosphere — The part of the Earth's crust, waters, and atmosphere where life can subsist.

Capacity building — A process of strengthening or developing human resources, institutions, organizations, as well as networks.

Chemosynthesis — The formation of organic compounds in which energy is derived from inorganic substances such as sulfur and hydrogen, as opposed to photosynthesis, in which the driving force is the sunlight.

Climate change — A variation changing global or regional climates which is attributed directly or indirectly to human activity that alters the composition of the atmosphere and which is in addition to natural climate variability over comparable time periods.

Coastal governance — The process by which the full range of laws, policies, plans, institutions, and legal precedents address the issues affecting coastal areas, the governance of which integrates people, science, politics, and values.

Cold War — The economic, military, and political struggle between the United States and Soviet Union (from 1945 to 1990), as well as their allies. The period is characterized by the buildup of atomic arsenals and the threat of nuclear war.

Common Heritage of Mankind — A concept referring to natural resources considered by the community of nations to be held in common for the benefit of all humankind. For example, the 1982 UNCLOS placed the mineral resources of the deep seabed in this category.

Consensus building — The building of agreement among stakeholders through informed discussion and negotiation.

Contiguous zone — A zone adjacent to a nation's territorial zone, not extending beyond 24 nautical miles of the baseline from which the breadth of the territorial sea is measured (usually between 12 and 24 nautical miles offshore). In this zone, a coastal nation may exercise the control necessary to prevent infringement of its custom, fiscal, immigration or sanitary laws.

Continental shelf — The seabed and subsoil of the submerged areas that extend beyond a coastal nation's territorial sea throughout the natural prolongation of its land territory and to the outer edge of the continental margin, or to a distance of 200 nautical miles from the baseline from which the breadth of the territorial sea is measured.

Coordinating mechanism — An institutional arrangement for intergovernmental, interagency and intersectoral consultations and collaborations towards achieving common goals and immediate objectives.

Cost-benefit analysis — A technique that determines the feasibility of a project or plan by quantifying its costs and benefits

Disaster risk reduction (disaster reduction) — The conceptual framework of elements considered with the possibilities to minimize vulnerabilities and disaster risks throughout a society to avoid (prevention) or to limit (mitigation and preparedness) the adverse impacts of hazards, within the broad context of sustainable development.

Economic instruments —Mechanisms in the form of market-based incentives that work through price signals, thereby affecting costs and benefits of alternative actions, hence influencing decisions and behaviors of individuals, firms and governments, so that environmentally superior options are chosen. They are designed to serve as alternative, to, or to complement, legal or regulatory mechanisms.

Economic valuation — Mechanism to measure the benefits derived from, and the costs accruing to, ecosystems and their management.

Ecosystem-based management — Management driven by explicit goals executed by policies, protocols, and practices, and made adaptable by monitoring and research based on best understanding of the ecological interactions and processes necessary to sustain ecosystem structure and function [Christensen, N.L., A.M. Bartuska, J.H. Brown, S. Carpenter, C.D. Antonio, R. Francis, J.F. Franklin, J.H. MacMahon, R.F. Noss, D.J. Parsons, C.H. Petersen, N.G. Turner and R.G. Woodmanse. 1996. "The report of the Ecological Society of America Committee on the Scientific Basis for Ecosystem Management." *Ecological Applications, Ecological Society of America,* 6(3):665–691].

Ecotourism — Tourism focusing on environmental and cultural resources and usually based on a conservation theme.

El Niño — It is an oscillation of the ocean-atmosphere system in the tropical Pacific which affects the weather and climate around the globe.

Environmental impact assessment — A process whereby a detailed prediction is made of the effects of a proposed development project on the environment and natural resources. Such assessments generally include a consideration of options for reducing or mitigating adverse environmental effects and of alternative courses of action

Environmental risk assessment — The process to estimate the likelihood of harm being done to human health and/or ecosystems through factors emanating from human activities that reach their target via the natural environment.

Epistemic community — A knowledge-based professional group that may come from different scientific disciplines but sharing the same world view and concerns about a particular issue. This group believes in the same cause-and-effect relationships, identifies problems and processes information in the same manner, shares a common network to which findings are shared, and formulates shared concerns through policy-relevant conclusions [Haas, P.M. 1990. *Saving the Mediterranean: The politics of international environmental cooperation.* Columbia University Press, New York, NY, USA. 303 pp.].

Exclusive economic zone (EEZ) — A coastal zone 200 nautical miles wide where a coastal nation claims jurisdiction over mineral resources, fishing, and such things as pollution control.

Flag state — A flag state is the nation in which a ship is registered and which holds legal jurisdiction over operation of the ship, whether at home or abroad. Maritime legislation of the flag state determines how a ship is crewed and taxed and whether a foreign-owned ship may be placed on the register.

Greenhouse effect — The theorized heating of the Earth as water vapor and carbon dioxide in the atmosphere absorb infrared radiations from the surface that otherwise would go back into space, blocking them much as glass traps heat in a greenhouse.

Gross domestic product (GDP) — The total value of goods and services provided in a country in one year.

Hazards — A potentially damaging physical event, phenomenon, or human activity, which causes loss of life or injury, property damage, social and economic disruption or environmental degradation.

Hazardous and noxious substances (HNS) — Any substances other than oil which, if introduced into the marine environment, are likely to create hazards to human health, to harm living resources and marine life, to damage amenities, or to interfere with other legitimate uses of the sea.

High seas — All parts of the sea that are not included in the exclusive economic zone, the territorial sea, or the internal waters of individual nations. On the high seas, nations have such freedoms as freedom of navigation, overflight, laying of submarine cables and pipelines, construction of artificial islands and other installations, fishing, and scientific research.

Indicator — Quantitative or qualitative statement that can be used to describe existing situations and measure change or trend over time.

Institutional arrangements — The functional or working dynamics of institutions designed to harmoniously perform their respective roles and responsibilities.

Integrated coastal management (ICM) — A natural resource and environmental management framework which employs an integrative, holistic management approach and an interactive planning process in addressing the complex management issues of the coastal area.

Land-based sources of marine pollution — Marine pollution originating from the land through rivers, estuaries, pipelines, runoff, outfall structures, and so on.

Large marine ecosystem (LME) — Regions of ocean space encompassing coastal areas from river basins and estuaries and out to seaward boundary of continental shelves and the seaward margins of coastal current systems. They include upwellings, semi-enclosed seas, shallow shelf ecosystems on western ocean boundaries, coral reefs, ocean-shelf-deltaic-riverine interactive systems.

Law of the Sea, Convention — Begun in Geneva in 1958 as a series of United Nations conferences to standardize national claims to territorial waters; it went into force in 1994 with a set of rules meant to reconcile the conflicting maritime interests of many countries and to govern virtually all aspects of humanity's relationship with the sea. Among other things, it covers pollution control, seabed mining, dispute arbitration, the right of free passage on the high seas, and the exclusive economic zone that stretch for 200 nautical miles beyond the shores of coastal states.

Local government — The political institution exercising legislative and executive authority over persons and property within a certain geographical area that is part of a larger political entity, that is, the country or state.

Manganese nodules — Blackish rocks that occur over much of the global seabed and sometimes occur so abundantly they look like cobblestones. They have a high content of manganese and nickel and other metals and minerals and are viewed as likely target for deep mining.

Marine protected areas — Areas of coastal land or water that are specially designated to protect coastal and marine resources, preserve biological diversity, increase public awareness, and provide sites for recreation, research, and monitoring.

Marine regionalism — A process driven by countries' perception that their mutual needs and interests (based on physical geography), uses, or policy distinguish them from outsiders and are best satisfied by a regional approach and arrangement [Valencia, M.J. and Y. Amae. 2003. "Regime building in the East China Sea." *Ocean Development & International Law*, 34:189–208].

Millennium Development Goals (MDG) — The United Nations MDGs are eight goals to be achieved by 2015 that respond to the world's main development challenges. The MDGs are drawn from the actions and targets contained in the Millennium Declaration that was adopted by 189 nations and signed by 147 Heads of State and Government during the UN Millennium Summit in September 2000.

National government — The political institution exercising legislative, executive, and judicial authority over a country, whether unitary or federal.

Nongovernmental organization — A nonprofit group or association organized outside of institutionalized political structures to realize particular social objectives or serve particular constituencies.

Nonpoint-source marine pollution — Marine pollution originating from diffuse sources associated with agriculture and urban runoff, runoff from construction activities, atmospheric deposition, and the like.

Ocean governance — The means by which ocean affairs are governed by governments, local communities, industries, nongovernmental organizations, and other stakeholders through national and international laws and policies, as well as customs, traditions, culture, and the institutions and processes that these create.

Persistent organic pollutants (POPs) — They are chemical substances that persist in the environment, bioaccumulate through the food web, and pose a risk of causing adverse effects to human population and the environment.

Point-source marine pollution — Pollution discharged from a specific, fixed location such as a pipe or an outfall structure.

Polychlorinated biphenyls (PCBs) —They are toxic industrial chemical compounds produced by chlorination of biphenyls. They are environmental pollutants found usually in sediments that accumulate in animal tissue; they are known to have pathogenic and teratogenic effects.

Polluter pays principle — The principle that the cost of controlling environmental pollution should be internalized (that is, borne by polluter, developer, or consumer) rather than imposed on society as a whole.

Pollution hotspots — Areas where the pollution load is high and poses serious impacts on marine and coastal ecosystems and threat to public health.

Pollution of the marine environment — The introduction by man, directly or indirectly, of substances and energy into the marine environment (including estuaries) which results in such deleterious effects as harm to living resources, hazards to human health, hindrance to marine activities including fishing, impairment of quality for use of seawater and reduction of amenities.

Port state control —The inspection of foreign ships in national ports to verify that the condition of the ship and its equipment comply with the requirements of international regulations and that the ship is manned and operated in compliance with these rules.

Precautionary principle — The principle that preventive or remedial action should be taken, on the best available scientific evidence, to avoid making policy decisions that have irreversible adverse effects on the environment. In the precautionary approach, when full scientific information is not available, the burden of proof (for demonstrating lack of irreversible adverse consequences) lies with the developer of a proposed coastal project, not with the government.

Private sector — Collectively, people or entities conducting business for profit.

Public-private partnership (PPP) — A sustainable financing mechanism designed to reduce risks in environmental investments wherein each partner is required to assume responsibility for measures or commitments that form the foundation of project viability. PPPs address two basic issues, namely: *(1)* creation of investments that are technically sound, financially viable, environmentally acceptable, and affordable to users; and *(2)* development of partnership arrangements between public and private sectors that are equitable and sustainable.

Reception facilities — Facilities for the reception of wastes from ships at port for appropriate disposal.

Regime building — The process of integrating to a common platform several metrics which include: sets of implicit or explicit principles (beliefs of fact, causation, and rectitude), norms (standards of behavior defined in terms of rights and obligations), rules (specific prescriptions or proscriptions for action), and decisionmaking procedures (prevailing practices for making and implementing collective choice around which actor expectations converge) to regulate national actions within a management area. [Valencia, M.J. and Y. Amae. 2003. "Regime building in the East China Sea." *Ocean Development & International Law,* 34:189–208].

Regional mechanism — A structured arrangement among countries within the region that may or may not be based on a legal instrument, entered into for a purpose of undertaking common, integrated, collaborative, and coordinated approaches to address the issues and problems of a region.

Regional Seas Programme — UNEP's Regional Seas Programme was finally launched in 1974 following its inception during the 1972 United Nations Conference on the Human Environment held in Stockholm. The Regional Seas Programme aims to address the accelerating degradation of the world's oceans and coastal areas. It functions through an action plan. In most cases the action plan is underpinned with a strong legal instrument in the form of a regional convention and associated protocols on specific problems.

Strategic action program (SAP) — A set of actions taken collectively and nationally by countries sharing a body of water after several priority transboundary concerns are identified in a transboundary diagnostic analysis (TDA).

Sea level rise — An increase in elevation of the sea level. It may be associated with local land subsidence as a result of tectonic factors or the withdrawal of hydrocarbons or water, or it may be associated with global warming phenomena, which can cause heat expansion of ocean waters and melting of glaciers and polar ice caps.

Semi-enclosed sea — A gulf, basin, or sea surrounded by two or more States and connected to another sea or the ocean by a narrow outlet or consisting entirely or primarily of the territorial seas and exclusive economic zones of two or more coastal States.

Stakeholders — Persons or entities who, directly or indirectly, positively or negatively affect or are affected by the policies relating to, or activities or phenomena in, the coastal and marine area.

Subsidiarity, principle of — The notion of devolving decisionmaking authority to the lowest appropriate level.

Subregional sea — A relatively large area of marine environment that geographically forms a single management area but is politically under two or more jurisdictions.

Sustainable development — Development that ensures the continuance of natural resource productivity and a high level of environmental quality, thereby providing for economic growth to meet the needs of the present without compromising the needs of future generations.

Sustainable financing — Mechanism of raising or allocating financial resources to provide sustained funding of a programme, project, activity, or sets of environmental management interventions.

Transboundary diagnostic analysis (TDA) — A collaborative factual analysis that contains actual or likely future dispute, conflict, or problem and the diagnosis of its root causes that produce stress on a transboundary system. It is a result of a joint process by which interministerial committees are established in each country sharing a water body to provide that country's input of factual information on the shared basin or marine ecosystem; identify threats and root causes; and determine which issues are priorities for action.

Territorial sea — The area of the sea where sovereignty of a coastal nation extends beyond its land territory and internal waters and, in the case of archipelagic nation, its archipelagic waters, to an adjacent belt of sea described as the territorial sea. Every nation has the right to establish the breadth of its territorial sea to a limit not exceeding 12 nautical miles, measured from baselines. The sovereignty of a coastal nation extends to the airspace over the territorial sea and the territorial sea's water column, seabed, and subsoil.

Track–Two diplomacy – Refers to the activities/frameworks in which academic and nongovernmental actors are brought into discussion with governmental officials who are acting in an unofficial capacity.

Tragedy of the commons — Coined by Garrett Hardin in 1968, it means the degradation of commonly owned resources due to the lack of incentive for individual users to conserve them.

Transboundary — Moving beyond the territorial jurisdiction of a country, state, or other political entity.

Tsunami — A shallow water progressive wave, potentially catastrophic, caused by an underwater earthquake or volcano, that can rise to great heights and catastrophically inundate shorelands.

User fee — A fee charged by a government agency for use of a particular coastal resource.

Vulnerabiltiy — The conditions determined by physical, social, economic, and environmental factors or processes, which increase the susceptibility of a community to the impact of hazards.

Westerlies — Steady winds found in northern and southern hemispheres between 30 degrees and 60 degrees latitude, moving west to east, the direction of the Earth's rotation. At the planet's surface, the speed of the westerlies is about 6 miles per hour. But higher up, at jet-stream heights, the winds can move at speeds of hundreds of miles per hour.

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About the Authors

Anders Alm

Biologist and fisheries expert; has worked on coastal management and marine environmental protection with several international organizations (IOC, IMO, UNEP and the World Bank); with extensive experiences from many regional seas (the Caribbean, the Mediterranean and the Baltic Sea); currently working with the Swedish Ministry for the Environment and is the Swedish Head of Delegation to HELCOM.

Salvatore Arico

Ph.D.; Programme Specialist for Biodiversity (UNESCO's Division of Ecological and Earth Sciences); was a Senior Visiting Research Fellow at the Institute of Advanced Study, United Nations University; Visiting Scholar and Post-Doc Fellow in Marine Policy at the Center for the Study of Marine Policy, University of Delaware (1997); was in-charge of the 'Jakarta Mandate' on Marine and Coastal Biodiversity Unit at the Convention on Biological Diversity Secretariat (1998–2000); employed by the Intergovernmental Oceanographic Commission (IOC) in Paris (1993 and 1996); served as an expert to several UN processes related to oceans and marine biodiversity; involved in the Millennium Ecosystem Assessment; served in the steering committees of several scientific programs (GTOS, DIVERSITAS); currently co-chair (Working Group on High Seas of the Global Forum on Oceans, Coasts and Small Islands); has more than 40 publications on the marine environment and biodiversity.

Samuel Barkin

Associate Professor (Political Science, University of Florida); works on international environmental politics, international organization, and international relations theory; within the field of international environmental politics, published on fisheries issues, the politics of multilateral environmental agreements, and the relationship between environmental economics and international environmental politics; author or editor of three books: *International organization: Theories and institutions*; *Anarchy and the environment: The international relations of common pool resources*; and *Social construction and the logic of money: Financial predominance and international economic leadership*.

Stefano Belfiore

Ph.D. (Marine Policy); Programme Specialist, Intergovernmental Oceanographic Commission of UNESCO; currently involved in the development of integrated coastal area management (ICAM) projects, guidelines and tools, and policy analyses of national and regional ocean policies; assists also with the technical secretariat of the Intergovernmental Coordination Group for the Tsunami Early Warning and Mitigation System in the North Eastern Atlantic, the Mediterranean and Connected Seas (ICG/NEAMTWS); an international affairs specialist at NOAA's International Programme Office (2002–2005); consultant to the World Bank and FAO as evaluator of ICAM projects in Southeast Asia, Africa, and Latin America as well as with UNEP's Regional Activity Centre for Priority Actions Programme.

Stella Regina Bernad

Legal Officer (International Conventions) of PEMSEA (1999–2007); spearheaded the development and adoption of a regional instrument — the *Sustainable Development Strategy for the Seas of East Asia* (SDS-SEA); contributed to the studies on reforms on coastal and marine policies; coordinated the Regional Network on Coastal and Ocean Governance; attended the University of the Philippines-Diliman, College of Law and the University of Washington, School of Law.

Danilo A. Bonga

Works at PEMSEA; was previously affiliated with the WorldFish Center, the King Fahd University of Petroleum and Minerals (Saudi Arabia), and the University of the Philippines Marine Science Institute; research centered on integrated coastal management, ocean and coastal governance, ecological habitat assessment, environmental impact assessment, and aquaculture (giant clams).

Chua Thia-Eng

Ph.D.; retired; spent the last 40 years serving academic institutions (University of Singapore, Science University of Malaysia, University of the Philippines) and international and UN organizations by managing regional projects under the GEF, UNDP, IMO, FAO, USAID, ICLARM and NACA; founding president of the Asian Fisheries Society (AFS) and Malaysia Society of Marine Sciences; former member of GESAMP; former Scientific Advisor of the International Foundation of Science, Sweden; published more than 200 papers, articles and several books; recipient of several awards from societies and governments; currently a member of the Research Council of the Ocean Policy Research Foundation (OPRF) of Japan, Associate Editor of the Journal of Ocean and Coastal Management and Chair to the East Asian Seas Partnership Council of PEMSEA, which he headed as Regional Programme Director for the past 14 years.

Elizabeth R. DeSombre

Frost Professor (Environmental Studies) and Professor (Political Science), Wellesley College; research speciality is on global environmental politics, particularly relating to issues of the global commons; recent publications: *Flagging standards: Globalization and environmental, safety, and labor standards at sea* (MIT Press, 2006) and *Global environmental institutions* (Routledge, 2006); her first book, *Domestic sources of international environmental policy: Industry, environmentalists, and U.S. power* (MIT Press, 2000) won the 2001 Chadwick F. Alger Prize (best book published in 2000 in the area of international organization) and the 2001 Lynton Caldwell Award (best book published on environmental policy); a second edition of her textbook, *The global environment and world politics* (Continuum, 2002) was published in 2007.

Peter M. Haas

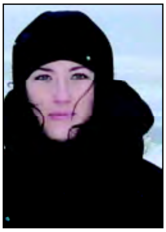
Ph.D.; professor of political science at the University of Massachusetts Amherst; has had visiting positions at Yale University, Brown, and Oxford; published widely on international environmental politics, global governance, the interplay of science and international institutions at the international level, international relations theory, and constructivism; consults with the Commission on Global Governance, the United Nations Environment Programme, United States Department of State, the French government, United States Environmental Protection Agency, United States National Academy of Sciences, the American Association for the Advancement of Science, and the World Resources Institute; has received grants from the National Science Foundation, German Marshall Fund, Rockefeller Brothers Fund, Institute for the Study of World Politics, and the Gallatin Foundation.

B.A. Hamzah

Currently, Director of the Centre for Global Studies, UPSI, Tg Malim, Perak, Malaysia; served as a member of the Institute of Strategic and International Studies (ISIS); former Director-General of the Maritime Institute of Malaysia (MIMA); served as Special Fellow with the United Nations Institute of Training and Research (UNITAR)-Hiroshima Office; has written extensively on maritime security, ocean policies, and law of the sea.

Arthur J. Hanson

Ph.D.; Distinguished Fellow and past President of the International Institute for Sustainable Development (IISD); served as Canadian Oceans Ambassador and as Research Director of the Dalhousie Oceans Studies Programme, and in various marine and coastal initiatives within North America and globally; has more than three decades of experience on Asian environment and development issues.

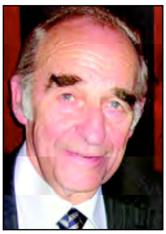


Janelle Kennedy

Affectionately known as Arctic Girl by her friends and family; graduated from the Master of Marine Management program at Dalhousie University where she focused her studies solely on Arctic issues; her research took her to Winnipeg to spend time at the Freshwater Institute and landed her a spot on the HMCS Montreal for their deployment to Lancaster Sound in August 2006; has been working on marine resource local knowledge studies; currently residing in Iqaluit, Nunavut where she is coordinating the Nunavut Coastal Resource Inventory pilot project in Iglulik.

Gunnar Kullenberg

Ph.D.; retired; marine scientist (ocean mixing, ocean-atmosphere interaction, optics, pollution, interaction physical-biological processes, ocean circulation and coastal processes, and coastal and ocean governance); formerly Executive Secretary/Director General, International Oceanographic Commission of UNESCO (1989–1998) and Executive Director, IOI (1998–2002); chaired several committees: GESAMP, SCOR working group, Danish and Swedish national committees and Advisory Committee on Marine Pollution of the International Council for the Exploration of the Sea (and the consultative committee of the same organization); was a professor of physical oceanography at the University of Copenhagen and the University of Goteborg; authored several books and articles on coastal and ocean management.



Ulf Lie

Ph.D.; retired; marine biologist (zooplankton, fish nutrition and quantitative benthic ecology); served as Research Associate, Institute of Marine Research, Bergen (1958–1962); Oceanographer and Associate Professor, Department of Oceanography, University of Washington, Seattle, USA (1962–1970); Reader and Professor, Department of Marine Biology, University of Bergen (1970–1990); Dean, Faculty of Mathematics and the Natural Sciences, University of Bergen (1984–1986); Director, Centre for Studies of Environment and Resources, University of Bergen (1990–1997); Programme Specialist, UNESCO, Paris, France (1974–1976); Vice-Chairman and Chairman, IOC Working Committee for Training, Education and Mutual Assistance (TEMA) (1980–1991); Chairman, IOC (1987–1981); Member and Leader of IOC Advisory Missions to Sri Lanka, Libya, Seychelles, Caribbean States, and South American States (Ecuador, Ecuador, Peru and Chile); and Member, Independent World Commission on the Oceans, (1995–1998).

John Low

Currently a businessman, an independent consultant, and a company managing director; former civil servant with the Fiji and Australian governments; former lecturer with the University of the South Pacific; was previously the economist and policy adviser for the Australian Bureau of Agriculture and Resource Economics and the Australian Department Foreign Affairs and Trade and Natural Resources adviser with the Pacific Islands Forum Secretariat; coordinated the development of the first regional ocean policy and framework for action in the world (the Pacific Islands Regional Ocean Policy and Framework for Action); adviser on marine resources and sustainable development issues for Pacific Island countries in regional and international gatherings such as the United Nations Commission on Sustainable Development processes and meetings.

Kem Lowry

Professor and former Chair (Department of Urban and Regional Planning) and Director (Program on Conflict Resolution), University of Hawaii; visiting scholar at Sophia University, Tokyo; visiting faculty at the Department of City and Regional Planning, University of North Carolina; fellow at the Marine Policy Program, Woods Hole Oceanographic Institution; published articles on planning and environmental management, ocean and coastal management, conflict resolution and evaluation; served as a consultant on ocean and coastal management projects in Hawaii, Sri Lanka, Indonesia, Thailand and the Philippines.

Jack Mathias

Ph.D.; retired; consultant in integrated coastal management; worked for the past 30 years with the Canadian Department of Fisheries and Oceans; worked with the National Aquaculture Centres in Asia-Pacific (NACA) program in China; for the past 15 years he has been involved with all aspects of integrated coastal management, both in the Arctic Ocean and on the Pacific Coast of Canada where he was Program Leader and Senior Policy Advisor, respectively.

Terttu Melvasalo

Retired UN official; involved in environmental projects and activities of intergovernmental organizations, ministries, water research institutes, and laboratories; responsible for coordination of activities related to marine pollution and water protection and management; special interest in the protection of the marine environment of the Baltic Sea; and served as a UNEP director in coordinating UNEP's activities and efforts in reducing pollution in the regional seas.

Michael J. O'Toole

Ph.D.; currently the Chief Technical Advisor of the UNDP/GEF Benguela Current Large Marine Ecosystem Programme (BCLME); responsible for developing and managing transboundary fisheries and environmental initiative between Angola, Namibia, and South Africa since 1997; spent over 20 years in government ministries in marine research and fisheries management in Southern Africa, Ireland and India; serves concurrently as a member of the Global LME consultative Committee and a member of the fisheries and aquaculture sustainability and governance working group, as well as the capacity development and marine ecosystem productivity/services working group of the Global Forum on Oceans, Coasts and Small Islands.

Rodolfo A. Pantillano

Holds a Masters Degree in Economics from the University of the Philippines with focus on development and monetary economics; worked for 15 years in the investment banking sector in the Philippines; consulted with PEMSEA on the assessment of financial instruments in coastal and ocean governance in the East Asian region and on a public-private sector partnership project related to water and sanitation.

Janet F. Pawlak

Retired; has a background in both science (biochemistry) and law; formerly with the United States Environmental Protection Agency; currently serving as a consultant covering a wide range of marine environmental issues, with particular focus on the North Atlantic area, including the Baltic Sea, and the Arctic; served as consultant to intergovernmental organizations including the Arctic Monitoring and Assessment Programme (AMAP) and the Baltic Marine Environment Protection (Helsinki) Commission (HELCOM); developed and coordinated the marine environmental programme at the secretariat of the International Council for the Exploration of the Sea in Copenhagen (1976–2004), covering both the scientific and the advisory functions and cooperating closely with regional intergovernmental organizations (for example, OSPAR Commission, HELCOM, AMAP, and the European Environment Agency) and several UN agencies, including UNEP and IOC.

Graham Robin South

Ph.D.; adjunct Professor in the School of Earth and Environmental Sciences, James Cook University, Australia and Senior Advisor to the Reef and Rainforest Research Centre, in Townsville, Queensland, Australia; formerly Professor and Head of the Department of Biology, Memorial University of Newfoundland, Director of the Huntsman Marine Science Centre in New Brunswick, Canada, and Professor of Marine Studies at the University of the South Pacific, in Suva, Fiji; research speciality is on marine plant biodiversity; published widely on marine science and ocean policy, with special reference to small island developing countries.

Mark J. Valencia

Ph.D; retired; maritime policy analyst, political commentator, and consultant focused on Asia; Senior Fellow with the East-West Center for 26 years where he originated, developed, and managed international, interdisciplinary projects on maritime policy and international relations in Asia; Visiting Senior Fellow at the Maritime Institute of Malaysia and a Visiting Senior Scholar at Japan's Ocean Policy Research Foundation; published over 150 articles and books and is a frequent contributor to the public media: *Far Eastern Economic Review, International Herald Tribune, Asia Wall Street Journal, Japan Times* and *Washington Times;* selected works: *The proliferation security initiative: Making waves in Asia,* (2005), *Military and intelligence gathering activities in the exclusive economic zone: Consensus and disagreement,* (co-editor, *Marine Policy Special Issues,* January 2004 and March 2005); *Maritime regime building: Lessons learned and their relevance for Northeast Asia* (Martinus Nijhoff, 2002); *Sharing the resources of the South China Sea* (with Jon Van Dyke and Noel Ludwig, Martinus Nijhoff, 1997); *A maritime regime for Northeast Asia* (Oxford University Press, 1996); *China and the South China Sea disputes; Atlas for marine policy in East Asian seas* (with Joseph Morgan, University of California Press, Berkeley, 1992); and *Pacific Ocean boundary problems: Status and solutions* (with Douglas Johnston, Martinus Nijhoff, 1991).

David VanderZwaag

Ph.D.; Director and Professor of the Marine & Environmental Law Institute at Dalhousie University and Canada Research Chair in Ocean Law and Governance; member of the World Conservation Union's Commission on Environmental Law (CEL) and co-chair of CEL's Specialist Group on Oceans, Coasts and Coral Reefs; extensive research and lecturing experience in South and Southeast Asia, the South Pacific, Australia, and the Caribbean; authored numerous papers in the ocean law and policy field; most recent book publications: *Towards principled oceans governance: Australian and Canadian approaches and challenges* (co-editor, Routledge Press, 2006) and *Aquaculture law and policy: Towards principled access and operations* (co-editor, Routledge Press, 2006).