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Tropical Coasts

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One Vision One People

The Solution is with the People

In a coastal community in the Philippines, a non-fisher offered a suggestion in dealing with illegal fishing operations. The idea came as a result of the community's moral dilemma. Since communities themselves do the patrolling and surveillance operations and, in many cases, witness the arrest of their neighbors, it weighs heavily on their conscience to report offenders knowing that an entire family would not eat for that day, possibly even longer, until the confiscated fishing gears can be replaced.

Depending of course on the gravity of the crime, the suggestion was to take it within an "action-reflection" process that rings of Paolo Freire's *Pedagogy of the Oppressed*. Legal consultants may flinch at the idea of offenders being dealt with through a three-stage process – patience, conscience and penitence. But perhaps there is something to be learned.

The first offence may have been borne of ignorance, so patience would have to be exercised in educating the offender. If the offence is repeated, the proposal was to attack the conscience – on moral grounds, what that person has done has compromised the resources of the future or current generation, and hope that he hears what you have to say. Tough luck, a third offence surely warrants penitence.

The suggestion prompts us to rethink the foundation within which sustainable development rests – the belief on human rationality to "self-correct," that is, to reflect on the consequence of one's actions and provide remedy, and the institutional capacity to reasonably temper individual excesses. Effective coastal and marine management, and consequently, sustainable development interventions do not rest on an initiative to completely alter behavior. We can only manage human behavior and the best way to do that is if we are able to come up with the closest possible estimation of what motivates people. In a region so diverse, is a collective estimation of human behavior even remotely possible? Is there a future for "one people, one vision"?

Coastal and marine resource exploitation and, consequently, the uphill battle for sustainable development, is not purely a result of legal failure but is more of a systemic breakdown – economic and market failure, degeneration of the social and moral fabric that values the future, leadership problems that cease to unify and articulate people's aspirations and vision, and a failure to sustain existing efforts. Poverty continues to be embedded in these issues.

Poverty strips people of their dignity and prevents a meaningful participation in sustainable development activities. In addressing the dire coastal and management problems in the region, poverty alleviation should be seen not only a matter of economic sufficiency but an entire culture of promoting dignity – a confidence by the people that they have the inherent capability to break away from the shackles of poverty.

A systemic problem would therefore require a systemic solution. From a wide range of institutional and legal reforms to economic incentives, coastal and marine management has to take on parallel initiatives that target changes within individuals, institutions and societies. That is stating the obvious, of course.

Continuing from the previous issue of *Tropical Coasts*, we explore in this issue the myriad of experiences in managing coastal and marine resources under an ever changing environment. We look at the complex process of community engagement – from capacity development to providing the necessary technical and scientific support and the role of various institutions in the "make or break" process of coastal and marine development and management.

In this issue, we look back at the three themes* – Communities in Sustainable Development; Ecosystem-based Management: From River Basins to Coastal Seas; and Applying Management-related Science and Technology – and explore how numerous approaches and tools are utilized to engage different stakeholders in the process of coastal management. Like most management interventions, the underlying question is "how do we remove, or at least deal with, the barriers to motivating people to participate in the sustainable development of coastal and marine resources, considering that incentives may not directly translate to immediate and observable gains?"

From the discussions, debates and findings among experts and managers during the EAS Congress 2006, a general agreement was that coastal and marine issues transcend administrative boundaries, necessitating the need for an ecosystem-based approach founded on concerted action among various stakeholders – from government leaders to civil society groups, the business sector and local communities. Coastal and marine resource management is no longer a concern of a single sector, but is a collective moral, social and economic responsibility.

The breadth of available information should therefore be translated into languages specific to target stakeholders. It is only when the information is understood and appreciated that meaningful participation and action can take place. The process of achieving authentic participation, however, occurs only within a conducive political, social and economic environment.

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* In the previous issue on One Vision, One Ocean, four of the seven themes of the EAS Congress 2006 International Conference on Coastal and Ocean Governance: One Ocean, One People, One Vision were reviewed, namely: Securing the Oceans; Safer Shipping and Cleaner Oceans; Certifying Sustainability; and Local Government Financing for Water, Sewage and Sanitation.

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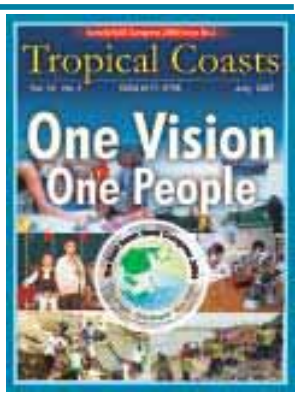
On the Cover

One Vision, One People

This special issue on the outputs and outcomes of the East Asian Seas Congress 2006 focuses on the Thematic Workshops on Communities in Sustainable Development; Ecosystem-based Management: From River Basins to Coastal Seas; and Applying Management-related Science and Technology. Side Events during the EAS Congress are also presented in the issue.



in this issue

special features

The East Asian Seas Congress 2006

12-16 December
Haikou City, Hainan Province, PR China

Communities in Sustainable Development

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Communities in Sustainable Development

Sustainable Development and the Principles of Community Participation

The World Commission on Environment and Development in its 1987 report, *Our Common Future*, first defined the concept of sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

The definition incorporates:

- the concept of *needs*, in particular the essential needs of the world's poor, to which overriding priority should be given; and
- the idea of *limitations* imposed by the state of technology and social organization on the environment's ability to meet present and future needs (ARIC, 2000).

Sustainable development encompasses the linkages and interactions of economic, sociopolitical and environmental concerns and has been enshrined in various international and regional instruments. The Millennium Declaration adopted on 8 September 2000 during the 8th plenary of the Millennium Summit targets eight development goals with measurable indicators. It covers a range of issues from combating poverty, hunger, disease, illiteracy, environmental degradation to discrimination against women. Millennium Development Goals 1, 7 and 8 respectively stipulate actions to eradicate extreme poverty and hunger, ensure environmental sustainability and build a global partnership for development. Natural resource management in combating poverty is crucial as a significant portion of the population in East Asian countries

are still highly reliant on agriculture and aquaculture for their survival.

One aspect of natural resource management that is supported by international agreements is the promotion of sustainable fishery management. The guiding principles in achieving such a goal are embodied in existing agreements and codes of conduct for improved management of national and regional fisheries including the United Nations Convention on the Law of the Sea (UNCLOS), Agenda 21, the Food and Agriculture Organization (FAO) Code of Conduct for Responsible Fisheries and the recent commitments at the World Summit on Sustainable Development (WSSD) in Johannesburg to restore depleted fish stocks to maximum sustainable yields by 2015.

At the regional level, the Sustainable Development Strategy for the Seas of East Asia (SDS-SEA) provides a platform for the utilization and management of coastal and marine resources by providing a framework for interagency and multisectoral collaboration to ensure that sustainable development objectives, including those for sustainable fisheries, are met. One important aspect of the SDS-SEA is its promotion of community-level implementation through the adoption of coastal strategies in PEMSEA sites. Coastal strategies provide a set of suitable approaches that address marine and coastal management concerns within the dynamics of specific localities in PEMSEA participating countries.

Engaging communities in Sihanoukville, Cambodia.

What's the Logic to Community Participation?

The term community suggests both social and political meanings. In contrast to economic and political centers, which are often located in urbanized regions, communities being referred to in this article are those situated in the peripheral areas. "Community" here is taken to mean a social group or a network of people sharing common ideas and experiences with focus given to the disadvantaged and marginalized sectors. They consist of the various groups of stakeholders—community leaders, youth, women, religious sectors, people's organizations (POs) and other interest groups. These groups are geographically located within specific administrative boundaries of the local government units (LGUs) including provinces, municipalities and villages located along the coastal areas. It is important to clarify, however, that communities are not homogenous entities but are also divergent social groups.

Unlike "core" or urbanized areas, these communities are usually underdeveloped in terms of basic infrastructure and services, and access to better facilities and economic opportunities. These limitations often result in further political marginalization as families and individuals become more preoccupied with their own survival instead of their participation in development processes. It is assumed that participation—a result of political maturity—follows a certain level of economic sufficiency to enable the involvement of community members in local development projects.

Participatory approach to development stems from the recognition on the primacy of local knowledge, skills and resources in addressing community concerns. By

facilitating dialogues at their level, communities are given the opportunity to articulate their interests and influence development processes that have direct impact on their lives. Put simply, encouraging community participation in sustainable development is fulfilling the individual and community's right to self-determination. It is both an end and a process. By enabling communities to participate and chart the course of their own development, a stronger sense of ownership is being built and development initiatives are gradually being mainstreamed into broader sociopolitical structures. As a process, it should be seen within a continuum that evolves through time by reinforcing the individual and institutional capacities to achieve meaningful engagement. As 'participation' can be an overused term in development, the use of this concept in this article pertains to the process of providing communities an opportunity to influence public decisions (Cariño, 2006). It ascribes to the notion of meaningful and authentic as opposed to a mere symbolic involvement. Recent literature on citizen's participation stresses the difference between authentic and symbolic participation by citing the nature and extent of engagement (Table 1) (King, et al., 1998, as cited in Cariño, 2006).

Authentic participation in coastal and marine management has always been challenged by the reality that benefits and results are not immediately visible and felt, and are therefore given less attention than immediate 'survival' activities. For meaningful engagement to happen, therefore, conditions for participation—political, economic and social structures—should be in place to encourage people to be involved.

Experiences in various countries show that government leaders and institutions do not place a high premium in practicing participatory processes, thinking that a more agonizing and lengthy procedure of consultation and decision-making procedures will ensue from getting more sectors involved. Such beliefs perpetuated a long history of the top-down approach and the imposition of a set of pre-determined agenda by so-called development institutions. This resulted in a poor sense of local ownership, culturally insensitive approaches and technologies, and relatively unsuccessful implementation of local development programs.

Learning from these lessons, and as part of the on-going discussion of participatory approaches, the East Asian Seas Congress 2006 International Conference on Coastal and Ocean Governance convened the Thematic Session on Communities in Sustainable Development to examine the major challenges, opportunities and policy recommendations of engaging communities in sustainable development. The succeeding sections of this article discuss three related issues, namely:

1. mechanisms for ***preparing*** the communities for meaningful engagement;
2. arrangements for ***promoting*** local participation; and
3. approaches for ***strengthening*** community participation in specific aspects of resource management.

These issue-areas were discussed within the context of coastal and marine management through six separate but mutually reinforcing workshops/seminars:

- Workshop on Achieving the MDGs through Enhancing Local Capacities for Integrated Coastal Management: Evidences and Lessons Learned

Table 1. Authentic and Symbolic Participation.

	Symbolic	Authentic
Choice of issue	By agency	Open
Framework	Preordained	Continuous
Dialogue	Add-on	Integral part
Administrator	Central, expert	'Interpretive mediators'
Citizens	Client, reactive	Partner
Power of citizens	To block, judge, redirect	To make and do
Result	Conflictual	Longer process

- Seminar on Civil Society Participation in Sustainable Development
- Workshop on Environmentally Friendly Aquaculture: Challenges and Potentials
- Workshop on Asian Fisheries in the Context of ICM
- Workshop on Rights-based Fishery Management
- Seminar on Sustainable Eco-tourism

By enabling communities to participate and chart the course of their own development, a stronger sense of ownership is being built and development initiatives are gradually being mainstreamed into broader sociopolitical structures.

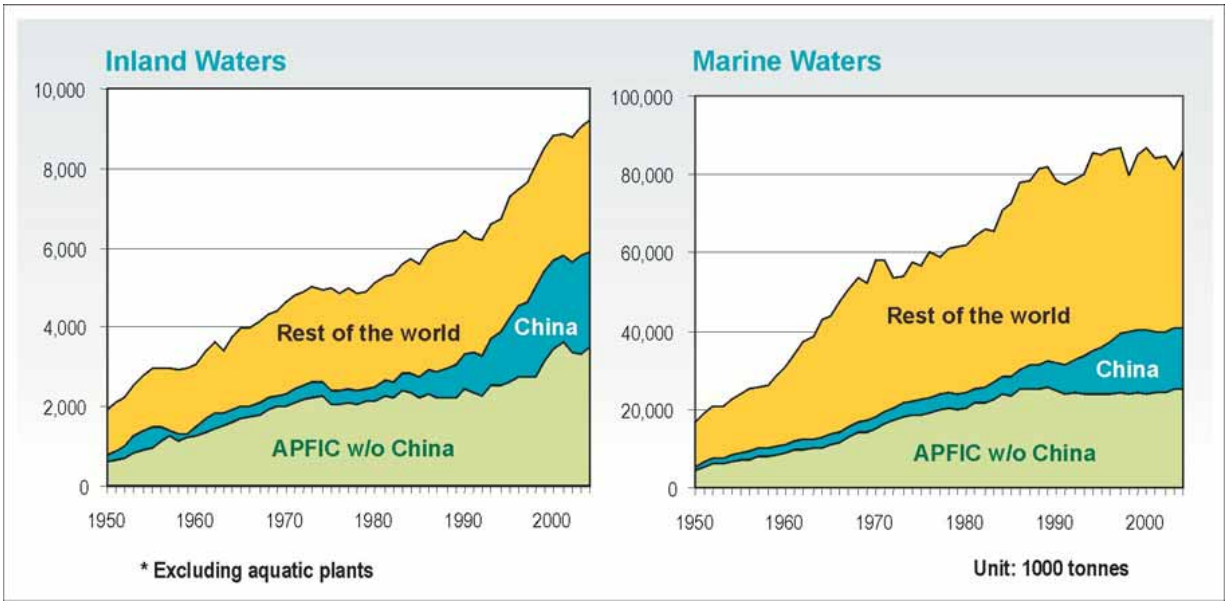
The Communities of East Asia

Home to about two billion people, the countries of East Asia form a unique landscape that combines a varied and colorful sociocultural and historical diversity. This rich natural heritage determines the way of life of about 1.3 billion people who live within 100 km of the coastline (Chua, 2006). The region offers one of the wealthiest sources of fishery resources in the world, and the people of the region are highly dependent on the benefits of coastal and marine resources. These benefits include *regulatory* or *supply services* such as the direct provision of goods (fish), *ecological services* (nutrient cycling and storm protection), and *cultural benefits* (aesthetics and parks) (Bartley, et al.). Six large marine ecosystems encompassed by these seas produce more than 40 million tons of fish annually, which is close to half of the global production from capture fisheries (Figure 1).

The fisheries sector in Asia is characterized by a huge production from small-scale operations which contributes significantly to national economies. It employs about 87 percent of the world's total fishers and fish farmers. Of this, 33 million are fishers while 9.5 million are fish farmers (Staples).

The worldwide expansion of aquaculture production reached 59 million tonnes in 2004, with an estimated farm gate value of $70

Figure 1. Capture Fisheries Production (Staples).



Note: Asia-Pacific Fishery Commission or APFIC

billion. In the Asia-Pacific region alone, mariculture has grown from around 12 million tonnes in 1995 to around 27 million tonnes in 2004 with China contributing the biggest volume amounting to 22 million tonnes (Figure 2) (Phillips, et al.).

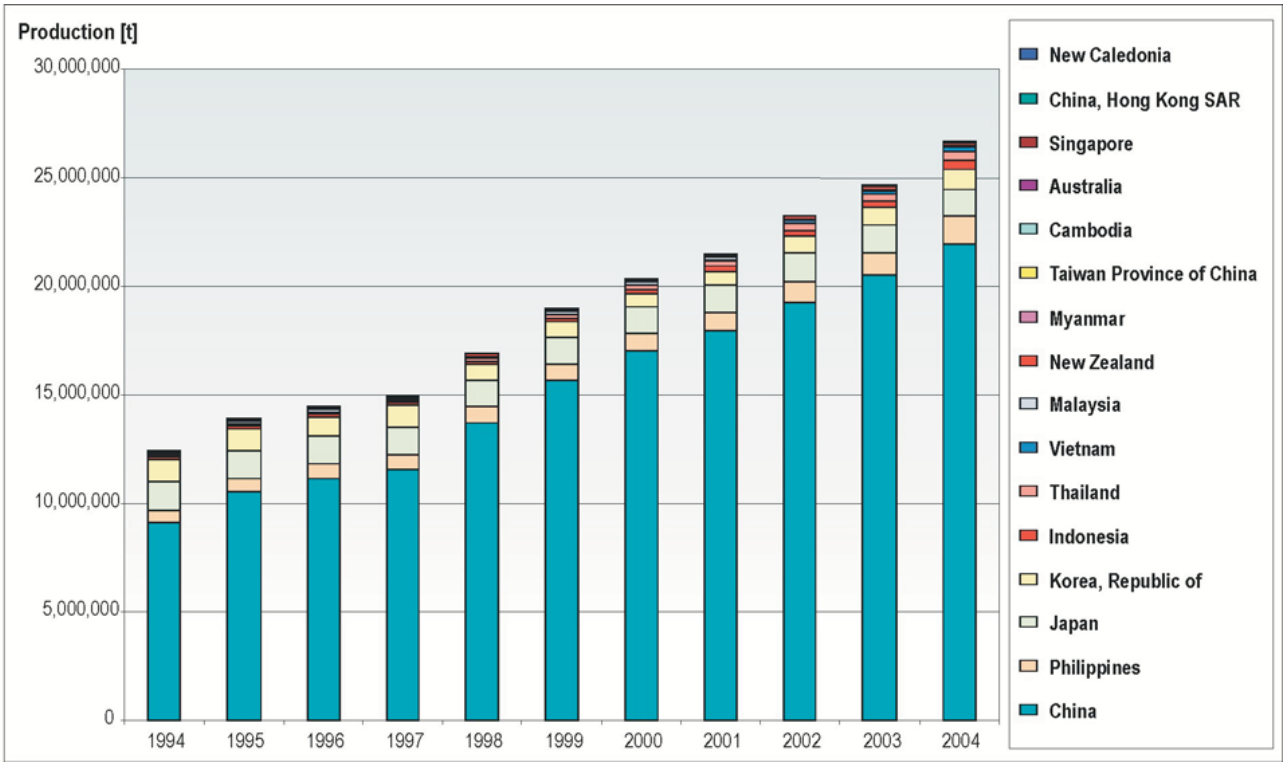
Rapid urbanization, extensive development and population growth have exerted tremendous pressure on the coastal and marine environment causing severe damages to these resources. Illegal, unregulated and unreported (IUU) fishing activities also remain a major issue, thwarting attempts at fishery management.

The cycle of poverty and environmental degradation reflects the complex problems of the fishery situation. In 2004, it was estimated that over 280 million people in East Asia live below the poverty line, most of whom are located in rural areas (AusAID, 2006; PEMSEA, 2003). This indicates social vulnerability as rural communities remain disadvantaged in terms of access to information and knowledge, basic social services and 'technical support' to address these problems. A diagram of problems and constraints in a fishing community in Marinduque (Philippines) mirrors the complex problems of many fishing communities in East Asia (Figure 3) (Fellizar, a).

Preparing Communities for Participation

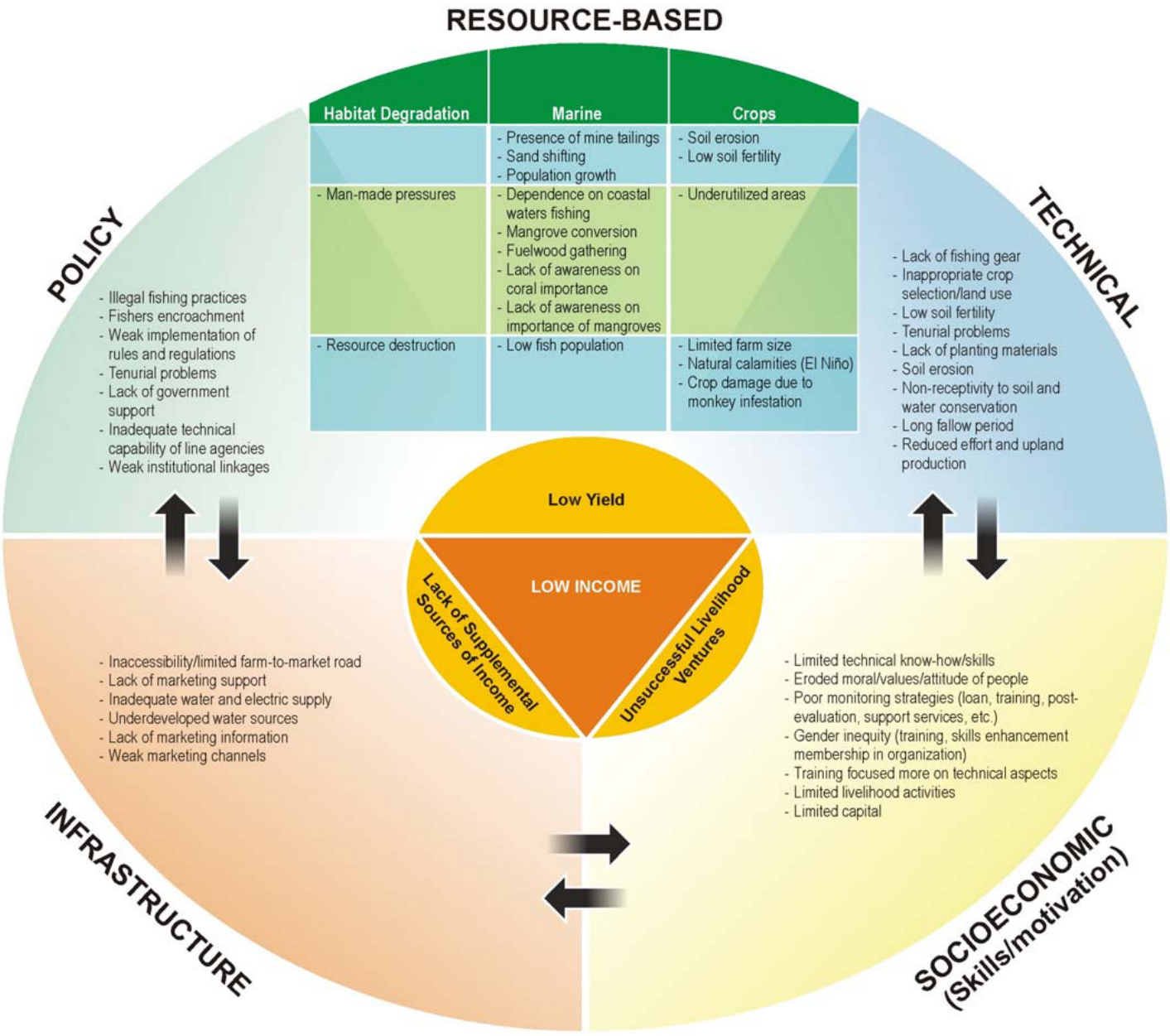
Community engagement is a product of a broader societal change that enhances skills and capacities for communities to effectively participate in planning and management processes. The process of preparing communities for engagement entails continuous and parallel strategies to address complex sociocultural, political and economic barriers through capacity development. To facilitate this process, civil society organizations (CSOs) are seen as strong intermediaries between the government and the community. Given their social and political mobilization skills, CSOs can sensitize political institutions to involve stakeholders, such as POs, NGOs and other community-based groups. CSOs enjoy the confidence of local institutions and can serve as the catalyst for change to promote harmonious cooperation between the government and other stakeholders.

Figure 2. Mariculture Production in Asia-Pacific (1994–2004).



Source: Phillips, et al.

Figure 3. Network Diagram of the Problems and Constraints in Santa Cruz, Marinduque, Philippines (Fellizar, a).



Capacity Development in ICRM[1]

Participation in coastal and marine management will only be effective if the actors and institutions are prepared and willing to take on their respective responsibilities. Capacity development is a central strategy for social development as it strengthens knowledge and reorients the way individuals, sectors and communities perceive and behave towards the marine environment (Tantichodok).

The UNDP defines capacity development as "the process by which individuals, groups, organizations, institutions and countries develop their abilities, individually and collectively, to perform functions, solve problems and achieve development objectives" (JPO Programme, 2006). Using this definition, Capacity 2015 emphasizes the linkage between integrated coastal resource management as an approach to achieving the Millennium Development Goals (MDGs). ICRM promotes a holistic process of poverty reduction in coastal communities by strengthening local institutions—from knowledge enhancement strategies to local institutional reforms.

[1] The term ICRM was used interchangeably with ICM during the Workshop on Achieving the MDGs through Capacity Development in ICRM: Evidences and Lessons Learned.

Designing capacity development programs that are more sensitive to local situations requires the examination of the terms and dimensions of poverty and its linkage to environmental conditions, the powers, capacities and innovations of stakeholders, and the various policy and decision-making processes. For knowledge to become effectively functional, results of such studies should be translated into format that can be easily understood by local communities.

Technical skills should be matched with strong leadership capacity and a strong orientation and commitment to the mission or participatory management (Fellizar, a). Mainstreaming resource management plans into regular government initiatives requires strong political commitment to provide institutional support such as financial and human resources (Williams). Since outcomes of resource management projects are not readily visible, politicians may not always prioritize these over "vote-earner" infrastructure projects. The challenge is on the reorientation of the belief of local executives to see beyond immediate political gains and recognize the long-term benefits of resource management. Changes among local executives are necessary not only in securing political support for the projects but also because of their influence to effect a broader institutional reform within local government offices.

The implementation of the Coastal Resource Management Program in the Municipality of Bani, (Pangasinan, Philippines) affirms that collective learning, political commitment, experience and vision determine the success of ICRM implementation at the local level (Navarro). Bani, in collaboration with its neighboring coastal municipalities (Anda, San Fernando, Bolinao and Alaminos), became part of a network of sanctuaries called BASBAS (local term for blessing). The network serves as a venue where transboundary concerns, such as pollution, poaching and apprehension of illegal fishers are collectively discussed and addressed by the six member municipalities.

As communities evolve, ICRM implementers should be committed to continuing education to reflect these conditions. Capacity development should focus on retooling of approaches to examine closely ground-level experiences and fine-tune strategies based on field learning. For instance, as the relationship between local communities and the government evolves and more institutions are gradually opening up to democratic processes, community organizing and capacity development practices should emphasize cooperation instead of confrontation among stakeholders in the resolution of issues. This necessitates exploring possibilities for building networks or expanding social capital within which capacity-building techniques can be nurtured and promoted. Capacity development strategies, therefore, should be directed towards strengthening relationships between these institutions and how they can be made functional to address resource management concerns.

The process of "acting and learning together" allows linkages and coordination of basic factors including population, technology, institutions and resources to serve as

a preventive measure for escalation of conflicts (Fellizar), as it allows multiple stakeholders to interact and collectively learn. The livelihood development strategy in post-tsunami Aceh (Indonesia) is based on this framework when the reconstruction program went beyond provision of initial capital such as fishing vessels but also included the revival of local institutions (Kusumastanto). Due to the devastation and deaths caused by the tsunami in 2004, livelihood projects were directed to strengthen human capital for community members, to rebuild local institutions and to hone local leadership skills in the process. This strategy facilitated the integration of financial as well as social, human and natural capital.

Several challenges exist with regard to capacity development for ICRM. First, local communities have access only to small-scale and short-term projects and are therefore confronted with problems of institutionalization. Since capacity development is a continuous process, it remains a question whether local communities can sustain this process without external support (Bernardo). Barriers to localization also include limited capacity of local authorities resulting in poor policy support on the implementation of coastal and marine management projects. Inadequate and inconsistent data collection and baselining compound confusion in analyzing local development needs and in designing effective projects. Fragmentation of efforts and political differences between national government and local authorities also complicate the problems of the localization process as each agency pursues its own interest.

For ICRM capacity development to effectively prepare the communities for engagement, two fundamental concerns at the local level have to be addressed: skills enhancement for local communities to be meaningfully engaged in the dynamic process of resource management; and a broader institutional reform that would support changes occurring at individual and sectoral levels. Capacity development should delve on providing *access* to development activities; enhancing *abilities* of local institutions; extending *assistance* to local institutions to meet capacity requirements and institutionalizing these through formal *agreements*.

While there have been several success stories in coastal resource management, monitoring tools have yet to be developed for assessing the results of capacity development in ICRM and in determining its contribution to the achievement of the MDGs. Add to this the reality that no single institution is charged with the periodic collection and assessment of data on oceans, particularly those regarding cross-cutting issues and goals (Cicin-Sain). The challenge lies in effectively establishing the links between evaluation and performance to accurately reflect the impact of implementation (Witoelar and Fellizar).

Steering, Not Rowing: The Role of Civil Society in Collaborative Management

As in any development process, initiatives on resource management and utilization interventions are expected to originate from the auspices of the government and its agencies, as they are legally mandated to carry out these initiatives. Corollary to new public management approaches, governments should *steer rather than row* in administering the affairs of coastal management (Fellizar). This indicates that government should not attempt to address all problems associated with coastal and marine management but provide the enabling environment for stakeholders to maximize their potentials in effectively managing fishery resources. This would include widening the sphere of governance to be more inclusive and participatory; enabling immediate and appropriate responses to management challenges within specific localities by decentralizing functions and authorities to LGUs; improving basic social services; and creating more economic opportunities to enable local fishing communities to diversify income-generating activities.

Collaborative governance has proven to be an effective *steering* mechanism in the Asia-Pacific region mainly because of its strong orientation towards community involvement and decentralization of policies in the design and implementation of projects. The growing trend towards collaborative

management stems from the need for conflict reduction, partly because the causes and consequences of coastal and marine resource depletion, degradation and coastal hazards do not fall neatly within the jurisdiction of any single agency or level of government. This heightens the recognition of the level of interdependence among communities, regions and nations. Resource use creates a momentum for greater collaboration among technically-minded professionals and some government leaders because of the risks and uncertainties associated with current trends in resource conditions (Lowry).

An important factor that facilitates steering and promotes collaborative governance is the involvement of CSOs[2] (Cunanan). CSOs are essential ingredients as they serve to catalyze development processes by operating down to the grassroots level to organize communities, conduct capacity development activities and serve as a "voice" to the various sectors which are unable to represent their interests at national, regional and international forums. Being "one" with communities, they can enjoin the participation of marginalized sectors, such as women, youth and the indigenous peoples by using locally sensitive approaches that are more appropriate to these target groups. The agenda-setting function of CSOs can improve the "contractual" environment by elevating local issues to become national concerns and by increasing the capacity of local communities to negotiate on specific development objectives, including coastal and marine management issues. Civil society has the advantage of propagating its ideals through both informal and formal avenues, unlike those of the state, which are mainstreamed into the formal governance process. CSO networks are vast and varied—from community-based organizations to transnational networks—enabling them to shape both global and local perspectives. Through CSOs' access to social networks and multiple channels of communication, communities are able to promote environmental management at varying scales which otherwise might not have been possible had they relied solely on the agency of the state. Further, while resource management is seen as an obligation by the government, many CSOs view this as moral responsibility to the future generation. Commitment to implementation is emphasized through civic virtues of mutual respect, trust, sharing and cooperation rather than the sole imposition of legally binding agreements and rights.

The disenfranchisement of civil society, however, is partly due to economic inequity as well as institutional forces and policies that shape social behavior (Nguyen). Among the sectors neglected in the promotion of sustainable development include women, youth and indigenous peoples, particularly those living in the coastal areas, a neglect which leads to seemingly perpetual marginalization of these sectors. Participation from women and youth are particularly important in sustainable coastal and ocean management in that they comprise a large portion of the population that can be mobilized towards various environmental management activities, including livelihood development, particularly loan management, capacity development and information, education and communication (IEC) campaigns.

As in other parts of the world, women and youth constitute a large portion of the population in Vietnam. The Socialist Party is estimated to have about 17 million members from the women and youth sectors alone. Tapping this strength, the UNDP GEF Small Grants Programme in Vietnam has instituted a process that would prioritize projects proposed by these sectors, especially those coming from impoverished local communities. Women and youth are given the opportunity to participate in capacity-building activities on project management and development-related work, leading to an enhanced credibility of these organizations. The experience gained by women and youth eventually becomes beneficial for career development and advancement (Nguyen).

[2] Civil society organization is a broad term used to include trade unions, NGOs, community-based organizations (CBOs), families, tribal groups, religious entities, charities, clubs, foundations, political parties, cooperatives, citizens' watch-dog organizations, cultural groups, sports associations, environmental groups, special interest groups, professional associations, support groups, academic and research institutions, consumer groups and service organizations. This qualification is made by Fellizar (Chair's Introduction on Workshop on Civil Society in Sustainable Development).

Experience in the International Ocean Institute (IOI)–India relates the vulnerability of women and youth as a result of a long historical and social marginalization. Through IOI initiatives, women are accorded the opportunity to participate in local projects on microcredit, sanitation, herbal gardens, water conservation, tree planting and training in alternative occupations; join self–help groups and attend the evening schools for children, among others (Rajagopalan). These enable them to pursue economic sufficiency while providing contributions to their communities.

Meanwhile, the experience of UNDP GEF SGP in Thailand points to the importance of indigenous knowledge and practices (IKPs) in promoting sustainable development as they are founded on natural resource management principles. More often, community ownership is stronger when development projects are initiated and implemented using the people's processes and strategies. IKPs, however, should adapt to the changing times and should be sensitive to both continuity and change for these to be more useful (Sreesangkom).

Collaborative governance has not always been easy, and civil society has, in many cases, aggravated the situation. In some cases, however, NGOs are characterized by their confrontational stance towards the government and have the tendency to promote their own agenda instead of the community's. Competition for funding among these organizations also results in duplication of projects and uncoordinated activities. Further, varying research agendas and procedures by different NGOs, academic groups and other CSOs working at the local level have turned communities into research laboratories without necessarily contributing to the advancement of the community's development objectives. Nonetheless, continued harnessing of CSO expertise in engaging local communities remains central to attaining meaningful engagement with these communities (Reyes).

Community Engagement in Coastal and Marine Management

Given the fast rate of resource deterioration, the urgency of policy responses and the relatively slow progress in strengthening institutional capacities and civil society involvement, in what ways can marine and coastal management better integrate participatory approaches?

There are several options and strategies to complement efforts in collaborative governance and encourage community participation. Experiences in integrated coastal management (ICM) and fishery co–management demonstrate that while stakeholder engagement is an important factor in the success of resource management initiatives, institutional fragmentation, ambiguous management and use rights seriously hamper the realization of an effective coastal and marine management regime.

Asian Fisheries and the Challenges of ICM

Several attempts have been made to merge more traditional fishery management with broader ecosystem management principles. The

emergence of the ecosystems approach to fisheries provides a framework and toolbox of management interventions that recognizes the complex interactions between fishery resource utilization, its components and the users of coastal waters and watershed areas in the region (Staples and Paterson).

Prior to recent attempts at creating a more holistic approach, fragmented initiatives in resource management have led to the inefficient and ineffective use of information and resources, both human and financial. The concept of ICM came as a response to the sectoral approach with the hope of consolidating management efforts that would result in greater impacts. However, there is limited evidence that much progress has been made towards integrating fisheries into the broader framework of ICM, particularly at the government level. Several examples of good integration at the local community level have been achieved but fragmented and sectoral approaches remain a challenge at the national level. Environment and fisheries departments often work independently and sometimes at cross purposes in many countries—one advocating for better ecosystem management to protect and enhance biodiversity and the other advocating for better fisheries management and support for impoverished fishery communities. Tourism departments are often more concerned about the development of infrastructure to encourage more visitors.

The slow progress in integrated management is partly caused by the structural constraints of having separate departments on fisheries, environment and tourism in many countries, and narrow sectoral training and education among staff in these departments, resulting in limited human capacity especially in engaging fishers and fishing communities in the process of coastal resource management. This is further aggravated by the reality that environmental departments, which usually hold ICM in their domain, have failed to interact with the other agencies, although fisheries issues are often better dealt with by fisheries management intervention, rather than the department overseeing ecosystem-based management.

In trying to find solutions to overcome these constraints, there is a need to consider integrated coastal planning where competing uses and allocation of resources may be resolved. The outcomes of such planning can then be implemented and managed along sectoral lines using an institutional arrangement for interagency and inter-sectoral mechanisms.

While fishery management in the region is continually challenged by environmental, sociopolitical and economic factors, several opportunities exist which promote integrated management on various levels. The establishment of fisheries *refugia* (Paterson) is one such measure. Refugia is defined by the United Nations Environment Programme (UNEP) Regional Working Group as "a spatially and geographically defined, marine or coastal area in which specific management measures are applied to sustain important species [fisheries resources] *during critical stages of their lifecycle*, for their sustainable use."

The purpose of refugia is to develop a mechanism that would focus on fish lifecycle and critical habitat linkages; and remain easy for fishing communities, local government officials and provincial level fisheries managers to relate to and provide a suitable platform for the fisheries sector to best represent their issues in forums relating to multiple-use marine management. It is hoped that through this mechanism, impacts of fishing efforts will be minimized when fish populations are particularly vulnerable (i.e., such as when they are spawning or utilizing inshore areas for feeding and/or protection from predators). Although they may share the same objectives as the Marine Protected Areas (MPAs), refugia emphasize the protection of fishes at critical points in their lifecycles.

The concept and application of fisheries refugia attempts to consolidate the elements of sound fishery management. This is achieved through information gathering to enable multistakeholders to make informed decisions on the best possible options for protecting resources,

and in facilitating local and national venues for negotiated bargaining between and among various stakeholders to ensure that all interests are considered in the process, particularly in identifying areas for "no-take" zones.

Utilizing data on larval fish distribution and abundance, 146 sites known as critical spawning and nursery areas for important fish species in the region were characterized to identify viable areas for refugia. A series of national and local level consultations were conducted to solicit information from various stakeholders in mapping out potential refugia sites. Existing information from the Southeast Asian Fisheries Development Center (SEAFDEC) were also utilized in the process. Information campaigns and training activities are also being carried out to strengthen local understanding and increase appreciation of coastal communities on the benefits of establishing refugia and to clarify this concept vis-à-vis MPAs.

The development of the Prachuap Khiri Khan-Surat Thani Fisheries Refugia Site in the Gulf of Thailand has undergone a long process of stakeholder negotiations. Early initiatives to protect fishery resources included research on larval fish, closure of spawning grounds for multiple species and banning of specific fishing gears. These measures, however, prompted protests from fishers leading to reduction of the area for fishing and the length of closures. In recent years, more challenges have cropped up as new efficient fishing gears are developed and as fishers ask for reductions in the area of the refugia site (Saikliang).

It is important to also highlight the importance of management as a determining factor in the success—or failure—of refugia in sustainable coastal development. Using the Philippines as an example, a simulation was used to model various arrangement scenarios for potential refugia sites. Three possible management scenarios were identified. The first, a *collapse* of the management regime will lead to overall decline in harvestable biomass. The second, *partial management*, will lead to the biggest overall increase in the harvestable biomass but a drastic decline in important commodities such as the blue crab. The third scenario, *sound management*, will lead to a moderate increase in desirable species, especially carnivores (Armada).

Co-management: Reconciling the Dilemmas of Rights-based Fishery Management

An effective rights-based fishery management regime provides a potential solution to the problems of the open access nature of coastal areas. Rights can be classified into two categories: the *right to manage* and the *right to utilize* fishery resources. In recent years, *management rights* have been primarily exercised by governmental institutions, neglecting various stakeholders and users in the process. These resulted in top-down management regimes which failed to address fundamental problems of the fishery sector at the local level, as policies and implementation arrangements were mainly prescribed by executives who are less familiar with local conditions (Vichitlekarn).

Use rights, on the other hand, are rights to conduct fisheries in designated areas but does not pertain to ownership of fishery resources (Vichitlekarn; Mitsutaku). Depending

on the specific site, the government or fishers organizations may designate individual quotas (IQs), individual transferable quotas (ITQs), territorial use rights and other such mechanisms to ensure that use rights are exercised in a manner consistent with the principles of sustainable development. Traditional use rights arrangements have also been applied in many coastal communities in the region.

However, while these rights are supposed to protect fishery resources from being overexploited and promote the interest of the marginalized fishers, some rights come with vague accountabilities (Mitsutaku). Further, these have not been balanced with the proper devolution of responsibilities to manage, resulting in weak or even ineffective exercise of such privileges at the local level.

To reconcile the rights to manage and utilize the fishery resource, co-management is seen as an option that can facilitate the assertion of rights and invocation of responsibilities. Funge-Smith defined co-management as a "partnership approach where government and the fishery resource users share responsibility and authority for the management of a fishery or fisheries in an area based on collaboration between themselves and with other stakeholders."

Co-management deviates from the usual sectoral approach in fisheries management and the prevailing view that the government and its agencies exercise sole responsibility for managing fishery resources. Under an effective co-management scheme, stakeholders and the government determine a set of workable arrangements that can be adopted at the local and national levels, where fishers can responsibly exercise their constitutional rights on the utilization of fishery resources and at the same time take on the responsibility of managing these resources.

While most countries in the Asia-Pacific region practice co-management arrangements, failures generally emanate from: a weak policy framework in that implementation is not linked with effective regulatory mechanisms; insufficient incentives for implementation; limited awareness on policies at the local level; and scant knowledge on the needs of local communities at the national level. Failure of such arrangements also stem from the reality that collaborative governance is not authentic in a sense that collaborating institutions lack a shared vision of issues, appropriate organization, facilitative leadership, sufficient resources, and also rarely pay attention to participatory processes (Lowry; Funge-Smith).

Strengthening Community Participation

While often not considered, 'participation' in coastal and marine management is a cost borne by families and individuals. Providing an economic base to marginalized communities may possibly increase their participation in local development projects. Can economic growth alone transform the avenues and opportunities of community participation?

In recent years, some consider economic development to be inconsistent with environmental management, claiming that the expansion of economic activities sacrifices some of the principles of sustainable resource management and depletes resources. The Asian Development Bank *Asian Environment Outlook* (2005) has provided interesting data that indicates the positive relationship between the rise in per capita income and the enforcement of national regulations. It was observed that the fastest decline in pollution intensity appears to occur as countries move toward achieving middle-income status, not after it. As per capita income rises from $500 to $20,000, pollution intensity falls by 90 percent (Asian Environment Outlook, 2005).

A closer examination of some of the economic activities in coastal communities, including aquaculture and tourism, suggests that increased income is also associated with better environmental management. For communities which are highly reliant on tourism activities, potential growth is possible through private sector collaboration, especially in cases where LGUs and community organizations do not have sufficient

funds for developing local infrastructure and where market services are limited. On the other hand, continuous research by the academe on technology improvement in aquaculture can lead to more efficient use of resources. Local government support is also vital as these activities require representation of community interests—during negotiations with the private sector and in ensuring the equitable distribution of gains.

Environment-friendly Aquaculture

Since Asian aquaculture remains small-scale, and will likely remain so, investments in community-level activities should be pursued. Several opportunities exist to promote sustainable practices including the consortium program on Shrimp Farming and the Environment established by FAO, the Network of Aquaculture Centres in Asia-Pacific (NACA), The World Bank, the World Wide Fund for Nature (WWF) and UNEP, which aims to analyze and share experiences on better management of shrimp aquaculture in coastal areas. The consortium has also developed the International Principles for Responsible Shrimp Farming, which promotes principles and best practices on farm siting, farm design, water use, broodstock and post-larvae, feed management, health management, food safety and social responsibility. These principles provide the basis for development actions among target groups including the government, private sector and NGOs and totaling over 100 researchers in 20 countries (Phillips, et al.).

A closer examination of some of the economic activities in coastal communities, including aquaculture and tourism, suggests that increased income is also associated with better environmental management.

Shrimp farming at the local level in India demonstrates the importance of community organizations, such as farmer groups, in promoting better management practices. Within five years, the project demonstrated that investments in small-scale sectors can lead to improved farming methods through better management approaches.

An important dimension in managing aquaculture activities is the commitment among government and local communities to implement policies that would effectively strike the balance between management of coastal resources and enhancement of aquaculture production. Experience from coastal aquaculture in Yangcheng, PR China, shows the potential for securing the participation of the local government to integrate such mechanisms in its formal operations. Since 2002, local governments, particularly at the county level are working as initiators and trainers to create "green level aquaculture" among local farmers (Del Mar Otero-Villanueva).

Advances in both laboratory and field researches carried out by CSOs, such as academic groups and

international NGOs, have resulted in improved farming practices in the region. For instance, cage culture is fast gaining recognition as an alternative method in aquaculture. Unlike aquaculture in an open environment, cage culture enables factors to be controlled, protecting the fish from external threats such as storms and marine mammals (Williams). Site selection, cage design and construction, and maintenance of cages, are therefore important considerations. ICM tools should also be applied to cage culture to promote a higher rate of success in such projects. The ICM framework, processes and toolboxes can be adopted including the use of indicators, certification, financing strategies and lessons of partnership dynamics. Other potentials and challenges of environment-friendly aquaculture are shown in Box 1.

Sustainable Eco-tourism: Boon or Bane?

Eco-tourism is a travel concept that supports the sustainable use of the environment and natural resources. While eco-tourism is still primarily a business endeavor, it has proven to be an effective tool for the conservation and sustainable utilization of the environment and natural resources by promoting income generation through responsible tourism practices. The use of management tools, such as the determination of carrying capacity, the prevention of economic leakage, as well as the setting up of "firewalls of eco-tourism" consisting of different protection and conservation tools, demonstrate the possibility of promoting eco-tourism based on sustainable development principles (Libosada).

Experiences in promoting sustainable eco-tourism in the region demonstrate that it is a double-edged sword. While it has provided economic opportunities to local communities, it has been associated with negative social and environmental consequences. In many tourist sites, the absence of a comprehensive management plan for tourism activities often results in the deterioration of the very environment that sustains eco-tourism (Otsuka). The general trend in coastal tourism areas reveals severe problems of pollution, exhaustion of freshwater supply, and ecosystem damage, particularly to coral reefs. This is most visible in developing countries where no adequate measures have been taken to prepare the communities prior to full-swing tourism activities. For example, the influx of tourists in Boracay Island, Philippines, resulted in an economic tragedy when news of coliform contamination halted tourism operations. This resulted in higher unemployment rates in the local communities as there were inadequate infrastructure to cope (Favila).

Partnership with a private company may significantly improve tourism infrastructure and services in cases where local governments and communities do not have sufficient resources to properly manage tourist sites. For instance, the Tao Island Group in Thailand is popular for snorkeling and SCUBA diving. One strategy to promote sustainable eco-tourism is to lease a portion of the Tao Island Group to a private company, which initiates several activities, including collecting entrance fees from visitors and restricting access to certain areas. Various regulations were enforced, including the prohibition of: bringing in plastic containers and cans; feeding of marine life; removal of shells, corals and similar resources; anchoring on coral reefs; and use of flippers or fins, weighted fishing nets, or spear guns. Studies reveal that these rules have significantly enhanced both habitat quality and overall reef biodiversity as evidenced by faster coral regeneration (Sutthacheep, et al.).

Ecotourism is also a mechanism to generate funds to finance environmental protection in Danjugan Island in the Philippines. The island was purchased in 1994 through international fund raising to save its terrestrial and marine resources from further destruction. Since then, the Philippine Reef and Rainforest Conservation Foundation, Inc. started to preserve the natural environment of the island. The foundation is currently embarking on a nature tourism concept in Danjugan Island to generate funds to establish a network of MPAs and provide sustainable livelihood to communities (Ledesma).

Several ecotourism models demonstrate how government and

Box 1. Potentials and Challenges of Environment-friendly Aquaculture.

Experiments in integrated culture systems also shed light on possible measures to mitigate the environmental impacts of aquaculture. Some of these are currently being implemented in the Philippines, PR China and in other parts of the region, and involve the utilization of planktons and suspended solids by filter-feeding species, the use of detritus by bottom-feeder species, and the use of seaweeds to extract nutrients from water. Experiments on polyculture require: detailed engineering design; quantitative information on physical conditions; nutrient budgets; and biological comparability among cultured species and systems (Su, et al.; Yusoff).

Researches on feed formulation by Universiti Putra Malaysia also indicate the significance of highly nutritious organisms such as microalgae and microcrustaceans. These contain high polyunsaturated fatty acids which enhance immunity and stress tolerance in cultured animals, thus increasing the survival rate and tolerance to stress. Biotechnological approaches further identify possible measures for promoting "high health" aquaculture production. The use of bioremediators or biological agents, such bacteria, fungi and microalgae, to remove or neutralize contaminants in polluted soil or water also increases growth and produce healthier fish or shrimp. Some of these bioremediators are also effective in preventing pathogenic bacteria thus eliminating the use of antibiotics. Biomanipulation, on the other hand, involves the use of various aquatic organisms such as filter-feeders, omnivorous fishes, and macroalgae to improve water quality in recycling systems (Yusoff).

Despite the promises of academic and field researches, large-scale aquaculture practices have often been regarded negatively by many critics, the dominant perspective being that the growth in this sector is largely fueled by unsustainable farming practices. Issues such as the indiscriminate cutting of mangroves to make way for aquaculture expansion and the deterioration of water quality due to pollution from fish cages and fish ponds are only some of the negative environmental consequences arising from aquaculture activities.

The upward aquaculture production trend has made Asia the biggest consumer of aquaculture feeds, utilizing 84 percent of the global production of fishmeal, while producing only 17 percent (De Silva). While it is projected that there will be a decrease in the use of fishmeal, it is yet to be ascertained whether the decrease can lead to a sustainable level. Equally important is the concern that some marine fin-fish culture is highly dependent on direct feeding of locally-obtained trash fish. The use of trash fish is perceived to be less costly and more effective but the conversion efficiency is lower, thereby creating higher waste discharges to the environment. While such consequences are acknowledged, these impacts have been overly magnified and have created a dominant viewpoint that sustainable aquaculture is inconsistent with environmental management. In this regard, it is important to remember that a large proportion of aquaculture production comes from small-scale rural farmers that use ponds as part of their daily livelihood activities.

Environmental economic valuation may help in assessing these impacts by determining the cost of aquaculture activities on the environment through various ecosystem valuation methods. It is, however, taxing to gather data, particularly in cases where ecosystem values are subjective and can only be determined by a specific sector, community or individual.

If the benefits of aquaculture are to be sustained, environmental concerns, such as water quality, sedimentation, aquatic seed quality, genetics and transboundary movement, and feed and feed resources, among others, would have to be continually addressed through responsible aquaculture practices.

These researches present some of the opportunities to improve economic potential for environment-friendly aquaculture, particularly in small-scale farming activities.

local community support affects the efforts of the tourism sector in its bid to contribute to developing sustainable tourism. The city of Alaminos, Pangasinan in the Philippines, for instance, focused its efforts on a three-point executive agenda on Tourism Revival and Environmental Conservation and Coastal Resources Management (Braganza). Experience in Alaminos demonstrates that political will from local executives is a main ingredient in promoting sustainable practices by mainstreaming these into local government initiatives.

Strong political will is also an integral part of an institutional approach to implement the Adopt-a-Beach Program in the Republic of Korea. A private construction company and a local community association are designated as "adopters" of pilot beaches (Kim). The adopters participate in beach cleanup activities and other regular management practices with their own budget and facilities within the designated period, especially during

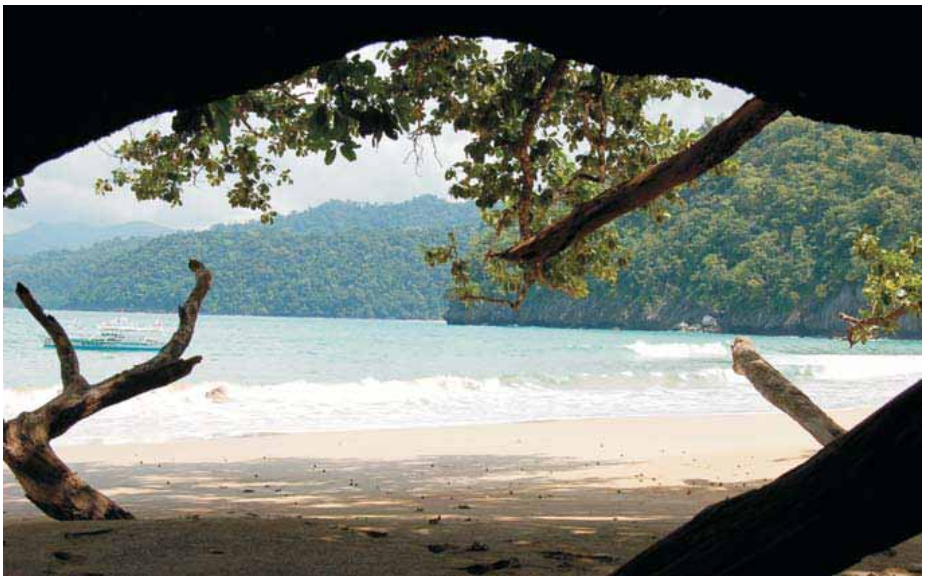
summer when these beaches are most frequented by tourists.

Meanwhile, a tripartite partnership between the government, private sector, and the local people's organizations in Bohol, Philippines has enhanced implementation of communication strategies. Research activities are based on a multidisciplinary approach, promoting effective awareness campaigns due to greater involvement of various sectors who are not only implementers but are themselves recipients of the awareness campaigns. This resulted in a heightened sense of responsibility and commitment among tourists towards the ecological and cultural consequences of their travel (Apale and Tercero).

Local buy-in of eco-tourism projects enable stakeholders to identify with the common objective of income generation and resource management. Both the government and the local people of Bonin Islands and Miyakojima Island in Japan have become active in keeping the environment attractive for sustainable tourism. At the other end of the spectrum, the experience in the Tao Island Group demonstrates that since the local community was not involved in tourism planning, the environmental gains by the private resort are being negated by continued poaching by local community members.

The sociocultural impacts of eco-tourism should not be underestimated. It has been observed that as areas evolve into international tourist destinations, social values are continually changing—communities are increasingly shaped by the outside influences of consumerism that may emphasize the pursuit of income-earning activities rather than preserving the integrity of the coastal and marine ecosystem. This trend is more pronounced among younger generations in coastal communities (Apale and Tercero).

Ecotourism bridges economic development with sustainable environmental practices. The planning of such activities should consider not only the revenues that the industry can generate but also the environmental and socioeconomic development of the area and how these would affect resource management and the tourism industry in the long run.



Where Do We Go from Here?

It has been argued that the one important measure of success in any development project or government program would be if these projects have promoted the interests of the marginalized and vulnerable sectors who lack the voice, the necessary skills and resources to participate in mainstream development processes.

Coastal communities in East Asia continue to remain at the margins of development; critical sociocultural, political and economic reforms which pave the way towards authentic participation have yet to be fully realized. However, several opportunities exist to turn the avenues of participation from a constricting arena to an engaging field of dialogue and active consultations. CSOs can prepare local communities by organizing them and serving as "bridges" among various interest groups to facilitate greater collaboration among previously competing forces. Funding organizations such as the UNDP GEF Small Grants Programme can consequently shape development priorities by providing marginalized

communities access to grant funds and enabling them to implement projects that directly address problems at the community level.

Capacity development mechanisms also help prepare communities to engage in a broader process of sustainable development. Experience in Aceh, Indonesia, demonstrates the primacy of an integrated approach that addresses a range of issues, from the immediate livelihood needs to that of human capacity.

As various sectors and institutions mature and become more accommodating to local communities, several political processes would have to be installed to promote greater participation. The processes of decentralization and devolution in the region are some of the opportunities given to LGUs to exercise an integrated approach to coastal and marine management within their respective jurisdictions. The decentralization process, however, has caused further fragmentation of efforts with many government departments often working independently. While the issues of coastal and marine management are complex and cross-sectoral in nature, the initiatives to address these concerns have thus far been sectoral and disjointed.

Decentralization efforts are still hounded by strong central government control as well as limited knowledge among LGUs on how to properly exercise the delegated functions and responsibilities. Similarly, economic and social reforms have not been fast enough to cope with the process of the delegation of powers. Devolution of functions should also be coupled by the decentralization of fiscal powers to enable local communities to adequately respond to these concerns.

As immediate users of ecosystem services, communities should be empowered to take the frontline in managing their resources, ranging from resource planning to stakeholder mobilization in economic, social and political activities that have consequences on resource management.

Communities need to evolve from being passive recipients of programs to being implementers, planners and evaluators. This entails harnessing more internal resources— both human and financial—to reduce dependency on external sources to be able to move towards more self-supporting strategies that will also capitalize on the skills of "insiders" who have better understanding of local dynamics. In policy development, the top-down and one-way consultation approach should move into a process of two-way communication and representation. Through stronger participation, communities gain greater influence and power to pursue sustainable development. The increasing trends of community capacity building to implement development projects, and advocacy for co-management approaches at the local level, illustrate a shift in focus from macro-level strategies and national-level policy pronouncements, to on-the-ground implementation.

That being said, at the national level, interagency and multisectoral collaborative arrangements can be strengthened in order to facilitate holistic planning and strategic actions targeting the multiple dimensions of coastal issues. Economic growth through better aquaculture and tourist management practices need to include the social dimension, promoting poverty alleviation, and enhancing the level of participation among impoverished fishers and farmers.

Supporting all these activities are CSOs, which need to work effectively at the community level, cultivate civic virtues, facilitate the access to basic services, and 'bridge' government institutions and local communities.

Orientation towards greater community participation, however, is not just a local or national concern. Rather, it must be contextualized within the changing regional and global landscape. For example, issues of globalization and international trade agreements are particularly important in fishery production. The SDS–SEA provides a framework for intergovernmental, interagency and multisectoral collaboration in resource management. Countries of the region are committed to the implementation of the SDS–SEA and the impact of the partnership approach to sustaining the marine and coastal resources of the region will be evident in the near future. ■

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Presentations

Apale, T. and M.A. Tercero. "Eco-tourism as a Conservation Tool in the Management of the Bohol Marine Triangle." Seminar on Sustainable Eco-tourism.

Armada, N. "The Use of Fisheries Refugia in Managing Critical Fisheries Habitat and Resolving Fisheries Conflict." Workshop on Asian Fisheries in the Context of ICM.

Bartley, D., C. Brugere, P. Gerber, D. Soto, and S. Funge-Smith. "Environmental Costs of Aquaculture." Presented by Prof. Sena De Silva. Workshop on Environment-Friendly Aquaculture: Challenges and Potentials.

Bernardo, R. Panel Discussant. Workshop on Achieving the MDGs through Capacity Development in ICRM: Evidences and Lessons Learned.

Braganza, H. "Alaminos…A Work in Progress: Tourism Revival Program in the Hundred Islands." Seminar on Sustainable Eco-tourism.

Cicin-Sain, B. Thematic Keynote Speaker. "Sustainable Development of Oceans and Coasts: What Progress Are We Making? A Global Perspective."

Cunanan, A. Panel discussant. Workshop on Civil Society Participation in Sustainable Development.

De Silva, S. "Feeds and Feeding in Aquaculture: A Key to its Sustainability." Workshop on Environment-Friendly Aquaculture: Challenges and Potentials.

Del Mar Otero-Villanueva, M. and L. Yao. "Yancheng Coastal Aquaculture Development and Fisheries: Management within a National Wetland Reserve (Jiangsu, China)." Workshop on Environment-Friendly Aquaculture: Challenges and Potentials.

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Fellizar, F., Jr. (a). "Achieving the MDGs through Enhancing Local Capacities for ICRM: Lessons Learned." Workshop on Achieving the MDGs through Capacity Development in ICRM: Evidences and Lessons Learned.

Fellizar, F., Jr. (b). Chair's Introduction during the Workshop on Civil Society Participation in Sustainable Development. Workshop on Civil Society Participation in Sustainable Development.

Funge-Smith, S. "Co-management and Rights-based Fishery: Mainstreaming Fisheries and Aquaculture in Asia and the Pacific." Workshop on Rights-based Fishery Management.

Kim, J.-D. "A New Beach Management Model Based on Public-Private Partnership in RO Korea." Seminar on Sustainable Eco-tourism.

Kusumastanto, T. "Local Community Capacity Development in the Aftermath of Tsunami: The Case of Aceh Sustainable Coastal Recovery." Workshop on Achieving the MDGs through Capacity Development in ICRM: Evidences and Lessons Learned.

Ledesma, G. "Danjugan Island: Beyond Island Purchase. Philippine Reef and Rainforest Conservation Foundation." Seminar on Sustainable Eco-tourism.

Libosada, C. "Business or Leisure? Economic Development and Resource Protection—Concepts and Practices in Sustainable Eco-tourism." Seminar on Sustainable Eco-tourism.

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Mitsutaku, M. "Coastal Fisheries Management and Rights-based Fishery Systems in Japan." Workshop on Rights-based Fishery Management.

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Navirak, N. Panel discussant. Workshop on Civil Society Participation in Sustainable Development.

Nguyen, K.A. "SGP Experience with Projects on Women and Youth Participation." Workshop on Civil Society Participation in Sustainable Development.

Otsuka, M.B. "Eco-tourism in Small Islands: Benefiting the Local People in a Sustainable Manner." Seminar on Sustainable Eco-tourism.

Paterson, C. "Integrating Fisheries and Habitat Management in Asia: Challenges and Regional Initiatives." Workshop on Asian Fisheries in the Context of ICM.

Phillips, M., M. Rimmer, R. Subasinghe, A. Lovatelli, Alessandro K. Yamamoto. "Future of Mariculture." Paper presented by Mr. Hassanai Kongkeo. Workshop on Environment-Friendly Aquaculture: Challenges and Potentials.

Rajagopalan, R. "Women and Youth Activities in Sustainable Coastal Management: Five Years of the IOI Women/Youth and Sea Programme: Successes and Failures." Workshop on Civil Society Participation in Sustainable Development.

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Saikliang, P. "Managing Fisheries and Critical Habitat Linkages in Thailand: The Prachuap Khiri Khan-Chumphon Fisheries Refugia." Workshop on Asian Fisheries in the Context of ICM.

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Ecosystem-based Management: From River Basins to Coastal Seas

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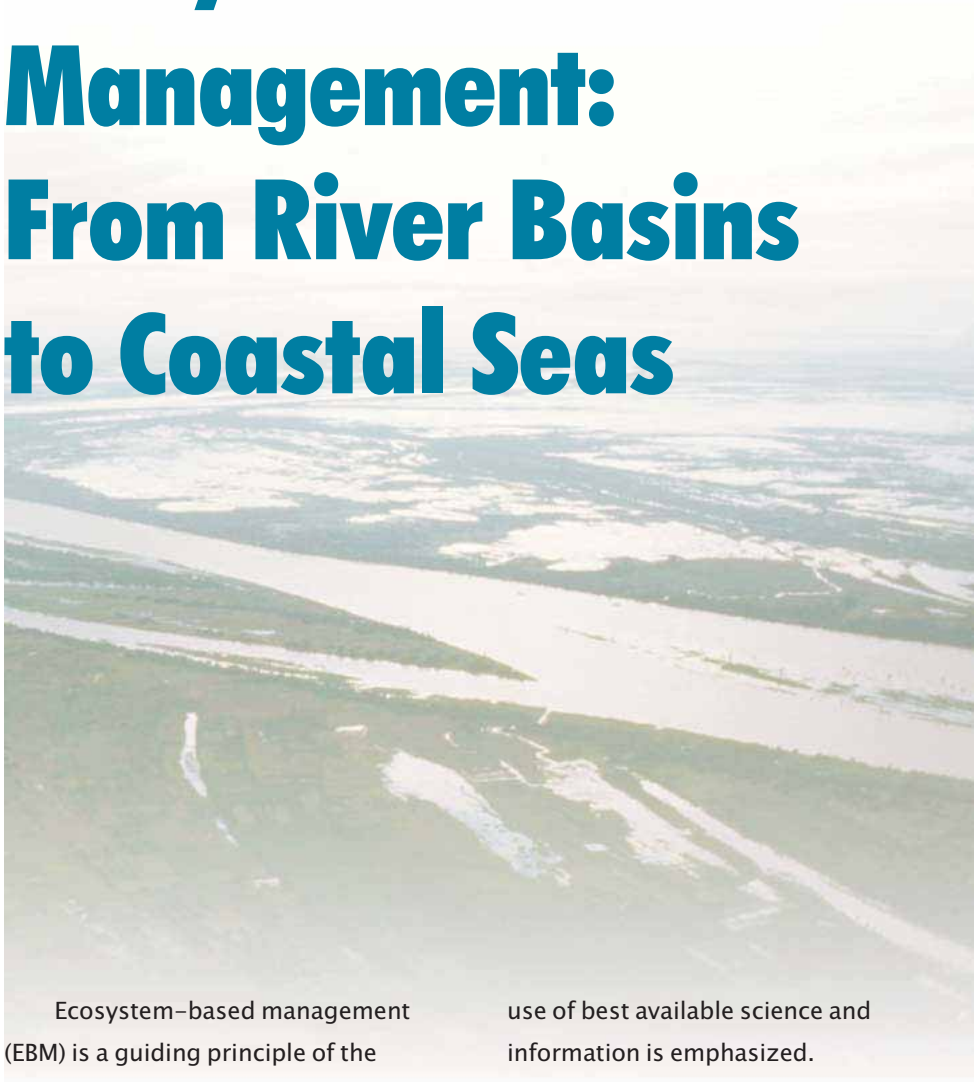
Ecosystem-based Management: From River Basins to Coastal Seas



Ecosystem-based management (EBM) is a guiding principle of the Sustainable Development Strategy for the Seas of East Asia (SDS-SEA). The implementation of the SDS-SEA is therefore guided by four key management principles, i.e., integration of ecosystem components and uses, striving for sustainability outcomes, precaution in avoiding deleterious actions and adaptation to achieve effective solutions (Boesch, 2006). The concept of EBM is continuously evolving as efforts to effectively put into practice the principles, objectives and recommended actions, particularly in several developed countries, are increasing. In all of these efforts, the use of best available science and information is emphasized.

As part of the effort to promote the exchange of information and sharing of experiences from current initiatives, a Thematic Workshop on Ecosystem-based Management: From River Basins to Coastal Seas was organized during the East Asian Seas Congress 2006, with a series of workshops and seminars covering ecosystem-based management in interrelated river basins, estuaries and adjacent coastal seas, management effectiveness of marine protected areas, partnership building in a large marine ecosystem, habitat restoration and management, and monitoring and forecasting change. A synthesis of the

relevant points of the discussions from the different workshops and seminars is given below.

Conceptual and Practical Overview of EBM

The United States has long been an advocate of the implementation of the EBM approach, especially following the recommendations of two expert commissions, the Pew Oceans Commission and the US Commission on Ocean Policy. The National Oceanic and Atmospheric Administration (NOAA), the lead agency appointed to implement the ecosystem approach to management (EAM) has developed a framework for an integrated and science-based approach to planning and management of NOAA's coastal, ocean and Great Lakes jurisdictions. The integrated, science-based framework is supported by seven characteristics, which are comprehensive, cross-sectoral and designed to adjust to the needs of a particular ecosystem (Box 1).

NOAA is focusing its efforts on gaining the knowledge, experience and information necessary to promote regional implementation of EAM in collaboration with federal, state, academic and NGO partners. It was recognized that this stakeholder-driven approach is definitely the "way of doing business." It is holistic and provides an effective basis for engaging stakeholders, decision-making and in implementing appropriate management interventions.

Box 1. Characteristics of NOAA's Ecosystem Approach to Management (Dunnigan).

1. Geographically specified
2. Adaptive
3. Takes account of ecosystem knowledge and uncertainty
4. Considers multiple external influences
5. Strives to balance diverse societal objectives
6. Incremental
7. Collaborative

EBM of Interrelated River Basins, Estuaries and Adjacent Coastal Seas

Putting EBM Goals into Practice

The practical experiences on EBM from nine ecosystems located in seven countries, including the Lower Mekong River Basin, provide important information in advancing the implementation of the EBM approach (Box 2). These ecosystems are ecologically and socioeconomically important and all have strategic plans and management programs in place. The importance of EBM as an emerging approach with high potential for implementation in the East Asian region was reached by consensus through the identification of major uses, issues and problems confronting the different ecosystems, the management measures undertaken, the policies developed, management structure and institutional arrangements, stakeholder engagement and remaining challenges. Developed countries, various international organizations, NGOs and governmental organizations have important roles in sharing knowledge and practices and in providing assistance to developing countries to implement EBM.

Below are several key issues faced by the nine ecosystems presented in Box 2.

Types and Sources of Pollutants

Environmental pollution from domestic sources causing coastal eutrophication is a recurrent problem. Additional pollutants of concern include heavy metals (Jakarta Bay), solid waste (Laguna de Bay and Manila Bay) and ocean dumping (RO Korea).

Conflicts Between Users

Conflicts between user groups largely belong to one of four main categories: allocation of fishery resources (aquaculture vs. traditional

Box 2. Representative Sites Implementing EBM.

1. Bohai Sea (PR China)
2. Chesapeake Bay (USA)
3. Jakarta Bay (Indonesia)
4. Laguna de Bay (Philippines)
5. Masan Bay (RO Korea)
6. Manila Bay (Philippines)
7. Tokyo Bay (Japan)
8. Taedong River (DPR Korea)
9. Lower Mekong River (Cambodia, Lao PDR, Thailand and Vietnam)

fisheries; aquaculture vs. coastal reclamation; aquaculture vs. navigation; species protection and maintenance of biodiversity vs. coastal reclamation); allocation of pollution reduction (agriculture vs. waste treatment; shoreline development vs. buffers); water usage (drinking water allocation, irrigation, maintenance of flow); and transboundary considerations (between provinces, between nations).

Monitoring Changes and Access to Information

While most, but possibly not all, of the ecosystems have robust monitoring programs, there is still a need for regular monitoring and updating of data. Active research and analysis and application should be increased. Access to scientific data, particularly along areas with transboundary management concerns may require the application of innovative approaches to information sharing and use of data. There is a need to provide fair access and transform scientific information into forms easily understood by end-users, especially if the stakeholders involved consist of the wider public. Building trust through sharing not only elicits better understanding of the issues but also stronger stakeholder participation.

Management Interventions

Various examples that demonstrate positive EBM approaches include the following:

- Restoration and rehabilitation programs

  In concert with the goals of maintaining healthy and productive ecosystems, restoration and rehabilitation efforts are underway, particularly in areas where habitats have been lost or severely degraded and/or ecosystem functions have been diminished.

  In Chesapeake Bay (USA), two key habitats are being restored using top-down (direct restoration) and bottom-up (indirect restoration) approaches. **Top-down or direct restoration** involves setting in place desirable plants or animals in areas where water quality and substrate are thought to be adequate for that species to grow and where populations are reduced from past levels. **Bottom-up or indirect restoration** involves improving water quality to stimulate natural recovery of desirable plants or animals, usually in areas where local populations are reduced from past levels. In Chesapeake Bay, top-down restoration seems to work best for oysters, while bottom-up restoration seems to work best for seagrasses, although both approaches have had limited success in the Bay. In Tokyo Bay (Japan), rehabilitation of the tidal flats to allow the recovery of the benthic ecosystem around the bay is being undertaken. The conceptual and methodological frameworks used in these efforts were developed based on sound science and technology including the conduct of meso-scale ecological experiments, such as larvae trajectory analysis to determine recruitment patterns and connectivity, and surface current monitoring using a radar system. The best practices derived from these efforts can serve as a guide for other initiatives with similar concerns.

- Integrated river basin and coastal management

  In DPR Korea, the integration of the management of the Taedong River with that of the Nampho coastal area was seen as an effective solution to address major environmental issues confronting both upstream and downstream areas. Suggested actions included the strengthening of institutional capacity for partnership and coordination, strengthening of scientific and technical capacity and developing a master plan for integrated management of Taedong River and Nampho coastal area. Similarly, in Jakarta Bay (Indonesia), which receives input from three major river systems, actions towards the development of a basin-wide ecosystem-based management strategy are being taken seriously including the establishment of a coordinating agency, capacity and awareness building and pursuing twinning arrangements.

There is a need to provide fair access and transform scientific information into forms easily understood by end-users, especially if the stakeholders involved consist of the wider public. Building trust through sharing not only elicits better understanding of the issues but also stronger stakeholder participation.

- Transboundary regional cooperation

  The Mekong Program, which is implementing integrated water resources management through the Mekong River Commission, serves as a strong example illustrating the importance of promoting regional cooperation for water resource management on a basin-wide scale. The "1995 Agreement on the cooperation for the Sustainable Development of the Mekong River Basin" was signed by Cambodia, Lao PDR, Thailand and Vietnam to cooperate in the development, utilization, conservation and management of the basin's water and related resources in a sustainable way. Integrated water resource management and development principles are applied to ultimately fulfill the commitments addressed in the 1995 Agreement by also taking into account member countries' development needs and concerns on maintaining environmental sustainability of resources. The program, which is expected to address the needs and interests of the countries sharing the river system, is employing a suite of tools to support transboundary environmental cooperation including monitoring, modeling and the application of the transboundary environmental impact assessment guidelines.

- Integrated land and sea-use zoning

  Integrated land and sea-use zoning plans are primarily developed to address multiple use conflicts. In Laguna de Bay (Philippines), a revised zoning and management plan was developed to address conflicts in fishery allocations. The plan provides the zoning of the lake for fish cage, fishpen, fish sanctuary, navigational lanes, and open fishing. In Jakarta Bay, the socioeconomic problems were attributed to the lack of integrated land and sea use planning, hence justifying its need. With a land and sea-use zoning plan in place, conflicts between aquaculture and navigation, fisheries and coastal reclamation are anticipated to be reduced.

- Stakeholder participation

  The Chesapeake Bay experience illustrates the benefits of a partnership approach and educating stakeholders in implementing statewide strategies and policies to restore habitats and reduce nutrient pollution. Maryland's 10 Tributary Teams representing diverse interests, state and federal agency staff, the business sector and local governments were brought together to play active roles in the restoration and nutrient reduction programs of their local rivers and the Chesapeake Bay.

  In Manila Bay (Philippines), the implementation of the Operational Plan for the Manila Bay Coastal Strategy over a 25-year period will likewise involve a diverse set of stakeholders in reducing water pollution, addressing overexploitation of resources, habitat loss and degradation, and strengthening partnerships and governance. The Manila Bay Coordinating Committee is coordinating the development and implementation of a response program for reducing pollution in the Bay, which is hinged on political awareness and commitment. It is well recognized that the

implementation timeframes are highly dependent on a number of factors, including appropriate policies, legislation and laws; the availability of financial resources; and the support of the public and other users of the Bay.

- Policy support and coordination

  In RO Korea, the problems brought about by fast development-oriented government policy and a fragmented environmental management system prompted the Presidential Commission on Sustainable Development to improve the coordination and integration of national and interdepartmental policies on the coastal environment. This has resulted in the development of new and proactive coast-related policies. At the local level, the establishment of a community advisory council to oversee the management of Masan Bay provided a good model in enhancing community participation in the decision-making process resulting in effective implementation of national and local policies.

- Ecosystem services

  Studies to value the processes and products provided by fully functioning ecosystems are very important. An assessment framework to determine the ecological assets of Bohai Sea (PR China) in the context of EBM has been developed. The goal is to provide information leading to environmentally sustainable policies, plans and management activities as well as to optimize development plans. An important output of the activity is an ecological asset map to supervise marine-related construction activities along the Bohai Sea area.

Remaining Challenges

Several remaining challenges in the development and implementation of EBM need to be addressed, including transboundary considerations, sustainable financing, raising awareness and educating the public, and developing policy support. It also appeared that few EBM plans actively considered global concerns such as climate change, sea level rise, future population growth and development and poverty.

Twinning Opportunities

Twinning arrangements between and among EBM sites can be a useful approach to share and learn about all aspects of EBM-from utilization of science-based tools and methodologies to governance and policy development, to engagement of stakeholders and implementation of best management practices.

In the East Asian region, concerns were identified with regard to EBM implementation. These include lack of capacity to promote the EBM concept, the need to compile lessons learned and good practices to help countries strengthen their programs and overcome any issues of insufficient knowledge, infrastructure and funding they might face, so that they can address pollution and other environmental problems more effectively. PEMSEA's current initiative in helping establish South-South and North-South twinning arrangements for EBM is designed to address these concerns. It aims to promote knowledge and experience sharing and collaboration for the implementation of management programs in potential environmental hotspots in the region including the Bohai Sea, Manila Bay, Gulf of Thailand, Masan-Chinhae Bay and Jakarta Bay, as well as other sites outside of the region such as Chesapeake Bay and Seto Inland Sea. The tiered framework developed earlier for managing river basins, estuaries and the associated coastal seas can be further developed depending on the capacity and resources available in different localities. The practical experiences of these important water bodies in implementing EBM could be transferred to other areas. Plans include the expansion of the initiative to other priority watershed areas, such as the Mekong, Red, Pearl, Jiulongjiang and Taedong Rivers, to facilitate capacity development in these areas.

The setting up of a regional secretariat for twinning arrangements, with RO Korea serving

as host country, will include among its responsibilities the organization of workshops, fostering knowledge exchange, promoting staff visits, working visits and study tours, and preparing and maintaining a list of experts and institutions on EBM. To facilitate interactions among member countries and experts, the regional secretariat is also tasked to develop a website aside from holding annual workshops, production and dissemination of publications on EBM and the development of small joint research programs.

For effective twinning arrangements, choosing the right ecosystem can be critical. Twinning selection criteria need to be developed and should avoid considering strictly political or economic aspects of the ecosystems, but rely upon shared problems. PEMSEA can provide the mechanism to facilitate sharing of information between nations that share ecosystems, provided that formal agreements can be established. Ultimately, this could lead to effective integration of modeling activities. Developed countries such as USA and Japan can play important roles in the twinning arrangements by providing "realistic visioning," facilitation, and technical support, as well as keeping focus on the problems and solutions in developing realistic best management practices. In addition, communicating the problems and solutions to the general public can be shared using local traditions in combination with advanced communication strategies.

Twinning arrangements between and among ecosystems can be a useful approach to share and learn about all aspects of EBM—from utilization of science-based tools and methodologies to governance and policy development, to engagement of stakeholders and implementation of best management practices.

Management Effectiveness of Marine Protected Areas

The effective management of marine protected areas (MPAs) can significantly contribute to the goals of EBM. MPAs are considered as powerful spatial tools for protecting marine species and habitats, conserving marine biodiversity and ecological processes, restoring fish stocks and minimizing use conflicts. In view of the many goals of MPAs, there is a growing interest to monitor and evaluate their effectiveness. Frameworks and guidelines have been developed for this purpose (Staub and Hatziolos, 2004; Pomeroy, et al., 2004). Integration of monitoring and evaluation into the overall MPA management process provides an efficient feedback mechanism for designing better management strategies.

The First International Marine Protected Areas Congress (IMPAC1), held in Australia in 2005, charted a course for managing MPAs worldwide. IMPAC1 emphasized that MPAs are a vital tool to ensure the sustainability of the world's marine resources and concluded with a call for greater cooperation between the conservation and fisheries sectors.

A range of experiences in MPA management can be gleaned from Australia, the Philippines and Vietnam. All have different objectives–from 'no take' areas for core conservation to multipurpose and fisheries MPAs, where resource management is the primary objective. One important consideration was that MPAs should be assessed and managed according to their purpose and objectives.

The steps taken in developing and implementing performance measures to monitor the effectiveness of the network of 24 MPAs in Victoria, Australia, provide a good example of how management effectiveness can be measured (Boxshall). The network of MPAs,

which are 'no take' highly protected areas, was established in 2002. A science-based approach was utilized in developing and implementing a statewide research and monitoring program to assess the threats, develop better responses and build a baseline to develop better tools for measuring ecological performance. Although the East Asian region may not be able to match Victoria's efforts in designating no-take areas covering entire MPAs, the no-take core areas within MPAs can serve the purpose on a smaller scale.

At the local level, the experiences of Masinloc, Philippines, in managing a 127.5 ha marine sanctuary showed the potential benefits of utilizing a co-management arrangement approach (Celeste-Dizon, et al.). Through a participatory and consultative process, a number of positive results have been obtained particularly in motivating the various stakeholders to actively take part in the overall management of their coastal and marine resources. The inclusion of local communities and stakeholders who are knowledgeable of local conditions coupled with the best scientific information are seen as a good combination in planning and managing MPAs.

In Vietnam, a study was undertaken focusing on modeling the effects of aquaculture activities on the establishment of MPAs. The aquaculture activities around the Hon Mun MPA are seen as an alternative source of income for fishers and have potential in relieving fishing pressure on existing stocks. Preliminary findings suggest that aquaculture activities may not pose a serious threat to fisheries since the total stocks in protected areas with or without aquaculture activities were almost the same. This study would provide important information in identifying appropriate management measures in cases where aquaculture activities are situated within MPAs.

MPAs need to to be adaptively managed based on available information generated from scientifically-based monitoring and evaluation programs. Adaptive management also ensures that the MPAs are managed to suit local conditions taking into account the social, economic and environmental settings. MPAs should be an integral component of integrated coastal management (ICM) with strong local inputs to define management objectives that are relevant to the local conditions. In RO Korea, for instance, more than 400 MPAs have been designated since the early 1960s resulting in a dramatic improvement in the management practices over the last two decades (Nam, et al.). However, limited public participation in the designation process, lack of support from the local residents and insufficient scientific surveys has hindered the effective management of the MPAs. Managing MPAs within an integrated management framework was seen as a feasible solution.

In the Asia-Pacific region, documentation of marine capture fishery regulations at the national/territorial level, as well as at the local level within MPAs, showed that a range of regulation tools are being used to manage fisheries. MPA-level regulations typically represent an EBM approach in protecting habitats and spawning and nursery grounds, incorporating 'no take' areas, and prohibiting the use of non-selective gears such as bottom trawling. For effective implementation of both fisheries and MPA regulations, key

Box 3. Key Messages on MPA Management.

1. **Identification of clear objectives for MPAs is required to underpin management.**
2. **A structured approach to information and research leads to improved and more cost-effective outcomes.**
3. **There are many models and approaches for MPAs—a bottom up approach has significant benefits in the context of the region.**
4. **'No take' is an important concept for resource habitat management and is an objective that can be effectively achieved in a variety of ways.**
5. **National laws on MPAs must be supported by local legislation to strengthen their planning, development and implementation.**
6. **Ensure sustainability of MPAs from the threat of changes in local executives of LGUs and termination of support to MPA.**
7. **MPAs cannot solve everything— they are part of a coordinated approach to management.**

areas of cooperation were identified including integration with ICM. For instance, the FAO Code of Conduct for Responsible Fisheries sets out actions that can integrate fisheries into ICM. In areas where fisheries are the main concern and where an ICM program is in place, the activities of the ICM program can be adjusted to address the needs and requirements of the Code.

The key messages on MPA management are presented in Box 3. With the necessary guidelines and frameworks in place, as well as practical examples from a number of MPAs, the stage is set for managers to take the next step in developing detailed, practical and targeted tools to further increase the effectiveness of management in their areas.

Yellow Sea Partnership for Enhanced Public Awareness and Participation

One of the key elements of EBM is promoting the involvement of stakeholders through a participatory process that addresses both local interest and those of the wider public. Enhancing public awareness and stakeholder participation is a large task, but can be effectively accomplished through the collaborative efforts of many partners. This key task is effectively put into practice by the Yellow Sea Partnership, which is currently composed of 19 organizations and programs with interests in the Yellow Sea. The Partnership has established an effective mechanism to raise awareness on the problems faced by the Yellow Sea Large Marine Ecosystem (YSLME) and the ways in which the management of the Yellow Sea can be improved. Efforts to raise public awareness, such as conducting a parliamentary conference, small grants program, youth program and local government training, are anticipated to strengthen public support and participation in actions leading to the mitigation or elimination of the identified problems.

In particular, Wetlands International China promotes the protection of migratory shorebirds in the Yellow Sea area through communication, education and awareness campaigns, establishment of conservation networks, conducting training courses on shorebird conservation and study tours. The Korea Ocean Research and Development Institute (KORDI), so far the only scientific research institution in the Partnership, involves the scientific community in the awareness efforts. The GEF/UNDP Yancheng Wetlands Project actively engages the government, schools, communities, business sector and other stakeholders in promoting environmental education on the conservation and sustainable use of the Yancheng Coastal Marshes, a Ramsar site. The Global Village Beijing, which has been actively conducting environmental education campaigns and working towards strengthening civil society, has

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Education and awareness campaigns for the protection of migratory shorebirds in the Yellow Sea.

Box 4. Proposed Joint Initiatives for Future Implementation under the Yellow Sea Partnership.

1. Preparation of a common logo for the Yellow Sea Partnership to illustrate the collaborative effort of the Yellow Sea partners' activity.
2. Publication of a book listing recommended Ramsar sites for the Republic of Korea.
3. Youth program to raise awareness of school children.
4. Organizing activities in celebration of the 2007 World Wetlands Day.

likewise stepped up its efforts in educating local residents in PR China in protecting the Yellow Sea using a variety of communication channels and materials.

On a broader scale, a transboundary, cross-sector and multidisciplinary partnership had been initiated in 2005 by the WWF/KORDI/KEI Yellow Sea Ecoregion Planning Programme and the YSLME Project for biodiversity conservation of the Yellow Sea. The conduct of a science-based biodiversity assessment of the Yellow Sea, which was facilitated by the multi-layered partnership, resulted in the identification of 23 potential priority areas (PPAs) for biodiversity conservation (Tobai, et al.). A transboundary representative network of MPAs to conserve the PPAs is being proposed, capitalizing on the partnerships already created. It is anticipated that the results of this initiative will be integrated into the strategies and action plans of the countries concerned and would further strengthen national and regional cooperation with regard to the protection and conservation of the Yellow Sea.

Improving the function of the partnership for the benefit of the entire Yellow Sea region requires:

1. identifying lessons learned and challenges in public awareness activities;
2. improving communication and coordination of activities among partners; and
3. identifying best management practices for maximum benefits.

A number of joint initiatives to harness the benefits of sharing resources in the implementation of common activities to achieve shared objectives and mutual benefits for the Yellow Sea are given in Box 4. These cooperative efforts may provide useful examples that can be replicated in other regions, in order to expand public awareness to broader stakeholders through pooling of resources.

Habitat Management and Restoration

From Knowledge to Practice

The coastlines of the countries in the region support diverse habitats and rich species diversity. Loss and degradation of these coastal habitats including mangroves, coral reefs, seagrass and wetlands have been identified as the most immediate problems requiring action. The need for actions targeted at these specific habitats at the policy and operational levels is recognized. In the South China Sea, specific strategies and targets for improving the management of these coastal habitats had been developed by the UNEP/GEF Project "Reversing Environmental Degradation Trends in the South China Sea and Gulf of Thailand." These strategies and targets, particularly for coral reef and seagrass management are being incorporated into national action plans and in the development of the regional strategic action programme (Box 5).

The importance of acquiring new scientific and socioeconomic data and knowledge regarding the distribution, abundance, use and value of marine resources are emphasized in several studies in the Southeast Asian region. For instance, studies focusing on the ecological and economic importance of coral reefs (Mu Koh Chang, Thailand), seagrass (Hepu, PR China; East Bintan, Indonesia; and Bolinao, Philippines) mangroves and wetland habitats (Shantou, PR China) of the Southeast Asian region and their management have been undertaken. To address the emergent threat of mass coral bleaching, the release of *A Reef Manager's Guide to Coral Bleaching*, which identifies strategies that reef managers can implement in

Box 5. Targets for Coral Reef Management.

1. **By 2015, at least 70 percent of the existing area of coral reefs in 85 target coral reef sites would be put under an appropriate form of sustainable management.**
2. **By 2015, reduce the regional decadal rate of degradation in live coral cover from the present rate of 16 percent to 5 percent.**

response to coral bleaching, is timely. It encourages 'managing for resilience' by adapting MPA design and management to targets for recreation, water quality and fishing.

In East Bintan, information collected from seagrass inventory and mapping, socioeconomic surveys and identification of threats provided important inputs in the development of a sound proposal for seagrass management. In Mu Koh Chang, promoting better coordination and strengthening co-management in implementing coral reef restoration activities requires significant networking activities among stakeholders. Active participation of local stakeholders remains a central component of habitat management and restoration.

The development and planning process for the conservation of seagrass at Hepu and Bolinao emphasized the key roles of stakeholders in actively participating in the day-to-day management of these resources in a sustainable manner.

For coral reefs in the Small Island Developing States, sound integrated policy initiatives and management approaches, as well as the important role of the communities in the development of policy, are also recognized.

Economic valuation of coastal goods and services provide better understanding on the need to manage the coastal resources in a sustainable manner as well as in identifying alternative modes of development. Despite the difficulties in developing and agreeing on appropriate total economic values of coastal habitats and ecosystems, the results from a number of studies provide useful information that can be used in decision-making regarding the sustainable use of coastal resources. A study which examined the current eco-environmental water requirements of the Shantou wetland (PR China) provides useful information for future planning as well as for forecasting the water requirements of the wetland for 2010 and 2030. In another study, the results of the evaluation and analysis of the loss of economic value of the Shantou wetland caused by land-based pollution emphasized the urgency of managing and restoring the wetland habitat.

Initiatives that were undertaken in Manila Bay and Bohol Marine Triangle (Philippines), Sanniang Bay, Qinhuangdao (PR China) and Lake Shihwa, Han River and Kyonggi Bay (RO Korea) emphasized a range of measures to strengthen the conservation and management of coastal resources and habitats (Box 6).

Manila Bay has been identified as an Important Bird Area (IBA) under the IBA Programme. Over 19,000 birds belonging to 99 species were counted during the monitoring of avifaunal resources in 2004-2005 (Aguinaldo and Baling). As a potential Ramsar site, further research is recommended to facilitate its inclusion in the Ramsar list. In contrast, monitoring of fishery

Box 6. Recommendations for Strengthening Conservation and Management of Coastal Resources and Habitats.

1. **Refine sampling designs and methods.**
2. **Improve control of fishing effort.**
3. **Implement policies on responsible fishing.**
4. **Form alliances among LGUs to implement ICM guidelines with shared vision.**
5. **Strictly protect areas with known populations of species of conservation value, e.g., dolphins.**
6. **Monitor the most pragmatic parameters and promote practical guidelines for local managers in the conservation and management of coastal resources and habitats. This responsibility resides in all stakeholders, most especially the LGUs supported by national and international partners.**
7. **Consider amending old regulations or legislations in accordance with new management schemes to improve and restore ecosystem integrity.**
8. **Consider the "cumulative effects" of various activities in planning for coastal development.**

Studies have shown that if an altered ecosystem has reached or exceeded a certain threshold, it may not be able to return to its previous state. Mangroves in the region, for instance, have declined in area and biodiversity over the recent decade due to conversion to pond aquaculture, clearcutting of timber for woodchip production, land clearance for urban and port development and human settlements and harvest of timber products for domestic use.

resources in Manila Bay showed that there is a change in the catch composition characterized by an increased proportion of invertebrates. Most noticeable was that fishers are currently catching smaller fish. Similarly, a decline in mangrove area in Manila Bay has been recorded. From the original 54,000 ha in 1890, it declined to 794 ha in 1995 and further to 413 ha in 2005. The loss of mangroves from 1995–2005, which is attributed to conversion into fishponds, salt beds and reclamation activities, is valued at US$372,000 (Vendiola). At the Bohol Marine Triangle (BMT), a prime ecotourism destination in the Philippines, management interventions have been put in place to address the threats related to habitat destruction, unsustainable harvesting of resources and pollution affecting the area. Improvements in ecological governance are attained through the establishment of an inter-local government and multisectoral management council where the members are committed to support and provide financial and manpower resource counterparts for the management of BMT.

China has recently begun to study seagrass ecology. The study conducted in Hepu, Guangxi and Qingdao is expected to generate relevant information for strengthening seagrass research in PR China. Qinhuangdao, on the other hand, which is known to support one of China's best beaches, has a long history of tourism development and management. Increasing tourism activities, however, have contributed significantly to the degradation of its foreshore areas. A strategic plan for the protection of the foreshore areas has recently been completed, providing an overall management plan, which includes extensive research and rehabilitation measures and identifies appropriate zoning schemes for the area.

In RO Korea, a numerical modeling approach coupled with biochemical observations was employed in an effort to provide scientific basis and input for the restoration of the ecological functions of the Han River and Kyonggi Bay. The results of the initiative will provide direction to the overall development of appropriate policy measures and guidelines for the restoration of estuarine and coastal ecosystems in RO Korea. In Lake Shihwa, the implementation of the Water Quality Improvement Master Plan in 1996 has improved the water quality of the lake. However, in order to meet the new water quality target set by the Korean government, measures to implement a more systematic water quality improvement plan are needed, and programs for an integrated watershed management must be developed.

Mangrove Rehabilitation and Management

Ecosystem-based management emphasizes the protection of ecosystem structures, functions and key processes. Studies have shown that if an altered ecosystem has reached or exceeded a certain threshold, it may not be able to

Kato, et al.

Rehabilitation of abandoned shrimp ponds in Southern Thailand.

return to its previous state. Mangroves in the region, for instance, have declined in area and biodiversity over the recent decade due to conversion to pond aquaculture, clearcutting of timber for woodchip production, land clearance for urban and port development and human settlements and harvest of timber products for domestic use. Despite this decline, the importance of fully functional mangroves as vital and valuable coastal ecosystems remain well recognized. Indeed, the ecological and economic value of these ecosystems has reached new levels since the 2004 Indian Ocean tsunami. There is clear and growing evidence that mangrove rehabilitation can be enhanced and improved, thus ensuring that mangroves would be able to continue providing the necessary goods and services to humans.

It has been demonstrated that mangrove rehabilitation can restore not only the mangrove trees but also the key food chains, especially the fish populations in the rehabilitated mangrove areas. In Thailand, the total area of abandoned shrimp ponds ranges from 24,000 to 32,000 ha. Mangrove rehabilitation efforts which started in 1998 were focused in Pak Phanang area where about 4.4 million mangrove plants were planted in an area of 900 ha (Kato, et al.). The increasing catches of fishers in the nearby areas prompted a detailed study on the complete food chain system in the rehabilitated areas using radio tracers (nitrogen stable isotope analysis). The study demonstrated not only the critical role of mangroves in supporting the food chain system but the importance of rehabilitation efforts in restoring the productivity of this important coastal habitat.

Apart from restoring abandoned shrimp ponds, mangrove rehabilitation efforts in Thailand were also undertaken to rehabilitate the tsunami-damaged areas. It was shown that a "one size fits all" approach is not appropriate in mangrove coastal rehabilitation, suggesting that the techniques and protocols in mangrove rehabilitation should be customized and designed to suit the

needs and conditions of specific sites. In this way, the complex interrelationship between site geomorphology, mangrove form and socioeconomic needs are addressed.

The importance of strong community participation and understanding of the mangrove rehabilitation schemes also need to be considered. The experiences in Thailand reinforced the concept that community-based mangrove management and rehabilitation can be very successful if based on strong science and if the effort is accepted by the community. These communities and their ongoing participation have served as models for active learning and skill transfer, which can serve as an example for other communities, both within Thailand and abroad.

Mangrove replanting is seen as an appropriate approach for coastal rehabilitation due to the increasing recognition of the goods and services that mangroves provide. A study that looked at the community benefits of mangrove reforestation showed that replanting can generate direct economic benefits from fisheries, which may exceed the local revenues from fish ponds, if the mangrove nursery function is accounted for. The study also used economic valuation to underscore the wisdom of applying well-planned science for mangrove restoration. Such planning can help identify and ensure that the "big picture" advantages of mangroves such as carbon sinks and coastal protection are matched with sustained local revenue generation from mangrove-based finfish and shellfish production. In Manila Bay, although mangrove resource reestablishment had made some progress, monitoring schemes must be put in place to gauge progress. From such monitoring, the economic value of mangrove resources can be measured and placed into the decision-making process. The need for a politically acceptable and scientifically sound economic value of mangroves and services was therefore highlighted. This would permit accurate and objective consideration of the current value of mangrove goods and services in development, planning and decision-making.

The Malaysian experience demonstrates the need for local, regional and nationwide governmental support for good practices in sustainable mangrove management. It was shown that the well-known Matang model of sustainable yield mangrove forestry management can be improved to fit current demands for sustainable development. Important considerations to ensure that the Matang model will build on its 100-year success story into the 21st century include a new focus on ecological function, biodiversity restoration, integrated management and community-based ecotourism.

Box 7 presents the emerging issues on mangrove rehabilitation and management. The models and methods of mangrove rehabilitation and management that have been developed in specific countries can serve as guidelines for other countries and sites that are planning to undertake mangrove rehabilitation

Box 7. Emerging Issues on Mangrove Rehabilitation and Management.

1. **Mangrove rehabilitation is not a "one size fits all" simple matter of planting whatever mangrove seedlings are available in any degraded former mangrove-dominated habitats. Issues such as biodiversity need to be addressed.**
2. **Mangrove rehabilitation is a labor intensive and demanding exercise and should be based on a sound scientific approach.**
3. **Community participation is vital but this participation needs to be based on well-designed, timely and appropriate education of community members to ensure that practical aspects of ecological principles are built into the mangrove rehabilitation programs. Equally important is the need to ensure the appreciation of the multiple socioeconomic values of restored mangrove ecosystems.**
4. **Aquaculture, such as extensive shrimp ponds offer, at most, short-term gains and require expensive eco-repair work. They should be replaced by ecologically sound aquaculture which is compatible with and integrated into the sustainable ecological functions of mangrove ecosystems.**
5. **Even the 100-year old Matang mangrove success story of sustainable, cyclic harvest/replanting needs fine tuning and is open to ecological upgrading.**

efforts. To date, however, planting/restoration of mangroves has focused on a single species (e.g., Rhizophora). Thus, there is a need to diversify the range of species used in rehabilitation. Sensitivity to and awareness of specific site conditions and specific community interests and needs are also essential. Such sensitivity and awareness can determine the success or failure of a given mangrove rehabilitation proposal, program or plan. It was also demonstrated that local and national challenges and problems were, in reality, regional matters which go beyond national boundaries, thus requiring transboundary regional cooperation.

Box 8. Ideal Characteristics of Ecological Indicators (Platt).

1. Represent a well-understood and widely-accepted ecosystem property.
2. Quantifiable unambiguously in standard units.
3. Rapidly measurable at low incremental cost.
4. Repeat frequency compatible with intrinsic timescale of properties under study.
5. Measurable at a variety of scales.
6. Possibility to create long (multi-decadal) time series.

Box 9. RAMP Assessment Components (Depledge and Huggins).

1. Heart rate provides a general indication of the metabolic status (well-being) of mussels and crabs.
2. Lysosomal Neutral Red Dye retention of bivalve molluscs, crustaceans and fish reflects the health of the organism.
3. Cholinesterase inhibition assay reflects the extent of exposure to, and effects of, organophosphorous and carbamate pesticides from freshwater runoff and atmospheric deposition.
4. The PAH fluorescence assay detects pyrenes and other PAHs and metabolites in urine and haemolymph samples of crabs and mussels respectively.
5. Immunoassay-based tests provide an inexpensive, rapid and highly selective means of measuring specific chemical compounds.

EBM and Forecasting

It is generally agreed that the stewardship of coastal ecosystems should be ecosystem-based. Management decisions should be made in such a way that the integrity of the ecosystem, structural and functional, is not at risk. As mentioned previously, the word "ecosystem" is to be interpreted broadly to include humans. At present, there is less general agreement on how to translate the goals of EBM into operational terms.

Coastal ecosystems, particularly those of East Asia, are under increasing stress from rapid population growth, industrial pollution and climate change. There is an urgent need to develop tools to characterize the accelerating changes and their effects on the ecosystems, including humans, whose livelihood often depend on the health of these ecosystems.

A variety of tools and innovative techniques to facilitate the detection of ecosystem change and threats to human health, identify the causative agents, and assess whether the remedial measures have been effective are available. These tools, frequently called ecological indicators, should have the characteristics shown in Box 8. Existing tools are often very costly, require extensive manpower, expertise and time, and thus may have limited utility as operational indicators, if cost prohibits their application.

Among the tools that will facilitate future decision-making include the use of simple, cost-effective modeling and rapid (remotely deployed) technologies, like satellite imagery. Remotely-sensed data offer many advantages in spatial resolution, high repeat frequency and low incremental cost. They can quantify important ecosystem properties, such as autotrophic biomass and production, and also objectively characterize the seasonal dynamics of the ecosystem, including inter-annual variations. Results can be made available on an operational timescale. Remote sensing is a capability that is developing rapidly in the region, but the outputs here, as in the rest of the world, could be exploited more strongly within the context of EBM.

Another practical tool to detect exposure to pollution is the use of biomarkers. The development of the Rapid Assessment of Marine Pollution (RAMP) Programme, a pilot programme of the Global Oceans

Observing System, involves the use of rapid, easy to use and inexpensive measurements of chemical pollutants and biomarkers that permit a preliminary assessment of the state of the coastal marine environment (Box 9). RAMP involves an integrated application of both chemical and biological indicators and thus contributes directly and cost-effectively to the identification of the sources of ecosystem stress.

The development of suitable tools for management can be linked to strong and relevant research programs. For example, the developing field of integrated multi-species aquaculture needs a sound research base. The studies being done in Sanggou and Huangdun Bays in China (www.biaoqiang.org) ultimately aim to provide managers with quantitative descriptors of environmental health, including simple screening models, as practical diagnostic tools, innovatively combining local and regional datasets. The need to ask research questions that will help in building simple, inexpensive, and objective tools that do not require an expert to implement them can be used against a baseline-changing environment.

There is also a need for similar predictions for planning climate change adaptation and mitigation methods. Climate change is real as evidenced from regional data. A concerted effort should therefore be made to bring together and analyze historical data on ecosystem change and its relationship with climate at a regional scale. New research and development programs within the context of SDS-SEA are required to address and manage its consequences.

EBM: A Look Forward

It was concretely shown that the implementation of EBM involves a series of steps and requires the use of a suite of tools and techniques to be able to contribute to the goals of protecting and restoring marine ecosystems and all their services. Examples of practices and initiatives from ecosystems of varying sizes – from large marine ecosystems, bays and gulfs, to river basins and coastal habitats such as coral reefs, mangroves, seagrass and wetlands – have provided the necessary foundation for charting and improving EBM implementation in East Asia. Estimating the ecosystem services and the interactions between ecological and socioeconomic systems that would help in improving the understanding among both policymakers and the public of the benefits provided by ecosystems is important. There is also a need for innovative tools that would facilitate restoration efforts as well as detect ecosystem change in a timely and cost-effective manner. The need for, access to and integration of scientific data from research and monitoring studies as well as their eventual communication to the relevant sectors and the public were recognized as critical factors in improving EBM.

The pathways leading to the successful implementation of EBM require further discussion. Based on current initiatives, however, success can be seen in terms of generating opportunities and sustaining management efforts. Improvements in management actions will be necessary as ecosystems and knowledge change. As one of the guiding principles of SDS-SEA, EBM can be implemented within the purview of the strategy, capitalizing on the existing partnerships that were developed through long years of cooperation in the region. ■

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Presentations

Aguinaldo, R. and N. Baling. "Pilot Monitoring of Avifaunal Marine Resources of Manila Bay." Special Seminar on Ecosystem-based Management (Part II).

Almonte, T., A. Celeste, M. Fortes, and N. Montano. "Sustaining Stakeholder Benefits at the Bolinao Seagrass Demonstration Site." Workshop on Habitat Management and Restoration (Workshop I - From Knowledge to Practices in Habitat Management and Restoration).

Bergstrom, P. "Top-down and Bottom-up Approaches to Habitat and Living Resource Restoration in Chesapeake Bay." Workshop on Ecosystem-based Management of Interrelated River Basins, Estuaries and Coastal Seas.

Boxshall. A. "Management Effectiveness in No Take Marine Protected Areas in Victoria, Australia." Workshop on Management Effectiveness of Marine Protected Areas.

Celeste-Dizon, M., O. Gregorio, J. Edora and P. Alino. "The Masinloc Coral Reef—Demonstrating Adaptive Co-management." Workshop on Management Effectiveness of Marine Protected Areas.

Chen, K. "Amicability Ambassador – Migratory Waterbirds in East Asia and Australasian Flyway: Wetlands Conservation in the Yellow Sea." Workshop on The Yellow Sea Partnership for Enhanced Public Awareness and Participation.

Chen, S. and W. Zheng. "Assessment Framework of Bohai Sea Ecological Assets: Implications for Ecosystem-based Management." Workshop on Ecosystem-based Management of Interrelated River Basins, Estuaries and Coastal Seas.

Chottong, B. and S. Aksornkoae. "Sustainable Community-based Mangrove Forest Rehabilitation in Thailand." Workshop on Habitat Management and Restoration (Workshop II - SCS/TEI Joint Session on Mangrove Rehabilitation and Management).

Damar, A., T. Kusumastanto and L. Adrianto. "Sustainable Development Strategies of Integrated River Basin and Coastal Management of Jakarta Bay, Indonesia." Workshop on Ecosystem-based Management of Interrelated River Basins, Estuaries and Coastal Seas.

Davis, C., A. Principe, R. De Leon. "Implementing the Manila Bay Coastal Strategy." Workshop on Ecosystem-based Management of Interrelated River Basins, Estuaries and Coastal Seas.

Depledge, M. and R.E. Huggins. "Ocean Futures and Human Health: Practical Management and Policy Issues in Coastal Marine Ecosystems." Workshop on Ecosystem-based Management and Forecasting.

Dumaluan, D., B. Uy, L. Bongalos and M. Tercero. "Bohol Marine Triangle Project: Modeling the Way for Coastal Resource Management." Special Seminar on Ecosystem-based Management (Part 1).

Dunnigan, J.H. Thematic Keynote. Thematic Workshop on Ecosystem-based Management: From River Basins to Coastal Seas.

Fan, H. and Y. Shi. "Resource and Ecological Study of Chinese Seagrass." Special Seminar on Ecosystem-based Management (Part II).

Fortes, M., K. Sour, X. Huang, T.E. Kuriandewa, N.V. Tien, O. Vibol, N.E. Montano, T. Almonte and S. Satumanatpan. "The UNEP Seagrass Demonstration Sites in South China Sea: A Milestone in Seagrass Research and Coastal Resources Management in Southeast Asia." Workshop on Habitat Management and Restoration (Workshop I - From Knowledge to Practices in Habitat Management and Restoration).

Gonzales, E. "Current Efforts towards Sustainable Development of Manila Bay." Special Seminar on Ecosystem-based Management (Part 1).

Gu, J., W. Gao, X. Duan and A. Liu. "Foreshore Protection and the Development of Ecotourism in Qinghuangdao, PR China." Special Seminar on Ecosystem-based Management (Part 1).

Hosokawa, Y. "Action Plan for the Rehabilitation of Tokyo Bay with Ecological Science and Technology." Workshop on Ecosystem-based Management of Interrelated River Basins, Estuaries and Coastal Seas.

Huang, X., S. Liang, H. Yao, Y. Ning and D. Huang. "Community and Government Involvement for Seagrass Conservation at Hepu Demonstration Site, South China." Workshop on Habitat Management and Restoration (Workshop I - From Knowledge to Practices in Habitat Management and Restoration).

Hutomo, M. and T.E. Kuriandewa. "Science for the Conservation of Indonesian Coastal Ecosystem: Case Study on the Development of Seagrass Management Demonstration Site at the East Bintan Coastal Area." Workshop on Habitat Management and Restoration (Workshop I - From Knowledge to Practices in Habitat Management and Restoration).

James, D. "Management Effectiveness of Marine Protected Areas." Workshop on Management Effectiveness of Marine Protected Areas.

Jiang, Y. and C. Chiang. "Reducing Environmental Stress in the Yellow Sea Large Marine Ecosystem." Workshop on The Yellow Sea Partnership for Enhanced Public Awareness and Participation.

Ju, K.K. "ICM Scaling up: Integrated Management of Taedong River Basin and Nampho Coastal Area." Workshop on Ecosystem-based Management of Interrelated River Basins, Estuaries and Coastal Seas.

Jung, K.T. "Introduction to KORDI's Ongoing Research Project on Management and Function Restoration Technologies in Han River and Kyonggi Bay, South Korea." Special Seminar on Ecosystem-based Management (Part 1).

Kato, S., P. S. Vijayanand, S. Panichchart, S. Boonming, V. Teratanatorn, S. Aksornkoae. "Rehabilitation of Abandoned Shrimp Ponds through Mangrove Planting in Nakorn Si Thamarat, Southest Thailand." Workshop on Habitat Management and Restoration (Workshop II - SCS/TEI Joint Session on Mangrove Rehabilitation and Management).

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Beyond the celeb
A commitment to the sustaina

The first-ever Youth Forum for the East Asian Seas (EAS) brought together 45 young people from diverse backgrounds to Haikou City, PR China, on 11-15 December 2006. They were selected from more than two hundred applicants based on their achievements and active involvement in youth and environmental organizations. For five days, all 45 participants focused their discussions on the "not-so-cool" topic of the sustainability of the marine environment. The Coastal Management Center (CMC) and PEMSEA co-organized the Youth Forum as a new endeavor. It was one of the highlights of the EAS Congress 2006, which served as a platform for the young participants to voice out their concerns and opinions.

A Milestone Event

From a spectator's viewpoint, the Youth Forum may seem like an ordinary gathering of young people out to have some fun. But those who got involved know that these young participants are passionate in contributing their knowledge, talents and creativity in order to make positive impacts for the environment.

The Youth Forum provided these young leaders a venue for dynamic knowledge sharing and youth empowerment. It also increased their awareness and appreciation of the rich marine heritage of the East Asian Seas region and enhanced their understanding of the dynamics of coastal and marine management and current trends through discussion and interaction with experts, authorities and fellow young environmentalists.

Overall, the Youth Forum and the EAS Congress highlighted the importance of giving attention to the role of the youth in addressing concerns and issues on the sustainability of the seas of East Asia.

No Hidden Agenda

Throughout the Forum, the delegates demonstrated their willingness and enthusiasm in development work and environmental management. In all of the activities, they demonstrated their overflowing creativity and energy, and their proficiency in the use of the latest technology. The delegates participated and contributed

ɔration of youth:
able development of the seas.

enthusiastically towards a schedule to celebrate youth and cultural diversity and, most significantly, to demonstrate their commitment to the seas of East Asia by crafting the Youth Agenda.

The Youth Agenda for the East Asian Seas, a document prepared and signed by the delegates, reflects the youth's ingenuity and commitment for the environment. The agenda was developed over a series of steps, starting from online discussions and preliminary drafting prior to arriving in Haikou City, to the group activities and consultation with experts during the Congress, then finally to the signing of the Youth Agenda and its presentation at the Closing Ceremony of the International Conference.

Each delegate contributed their knowledge, experience and hard work, aware that they represent the future generations who will inherit the long-term consequences of today's decisions and actions. Beyond being a shopping list of demands, the Youth Agenda is a concrete expression of commitment through practical actions and proactive ways in which young people can contribute to the sustainability of the seas of East Asia. The Youth Agenda highlights the aim of the youth to contribute to the efforts in the region and to be recognized not just as a beneficiary but as an active partner in sustainable development.

With support from experts, lead authorities and organizations, the potential of the youth sector can be further enhanced through continuous education and mobilization in on-the-ground activities. The involvement of youth can lead to innovative approaches and refreshing ideas which can inspire leaders, managers and experts, and lead to positive changes in the dynamics of environmental management in the region.

The delegates form the EAS Youth (EASy) Network, regularly communicating and sharing ideas and updates through a Yahoo! Group and the Yahoo! Instant Messenger™. The web-based EASy Hub at www.pemsea.org is open to all young persons interested to learn more about environmental management and to discuss and interact in a youthful and interactive approach.

"Inform, Inspire and Involve" Activities

Activities designed by CMC and PEMSEA to inform, inspire and involve the youth participants include:

Youth Exhibition

Entitled "Youth Forum: Bridging Generations," the exhibition highlighted the delegates perspectives on the sustainability of the East Asian Seas. The colorful panels were an assemblage of information materials contributed by the delegates from each country, composed of photos, sketches and paintings, as well as collages of cutouts from newspapers and magazines. The Youth Ship and the painted backdrop, which were prepared in Haikou City, emphasized the youth's role in securing the sustainability of the region's seas.

Interaction with Experts and Authorities and the Youth Jam

Lectures on "Marine Ecosystems Interconnectivity" and "The Seas of East Asia: Environmental Issues and Management Challenges" were given by Mr. Michael Atrigenio and Prof. Chou Loke Ming, respectively. An open forum followed each session, providing both the experts and delegates an interesting exchange of views and experiences. The delegates were also given time to attend the International Conference, which gave them an opportunity to learn about specific issues and concerns, and to participate in discussions with a wider number of experts and stakeholders.

The Youth Jam highly contributed to the refinement of the Youth Agenda. Invited panelists imparted their suggestions on how the Youth Agenda can be made more practical, creative and how it can be implemented more effectively. Discussions on other issues and concerns on the environment, the youth's role and governance made the Jam more lively and inspiring.

To enforce all the delegates' visions and goals into action, a leadership talk provided by Secretary Angelo Reyes of the Philippine Department of Environment and Natural Resources stressed authentic leadership as a good foundation in bringing about positive change to society.

Tree planting

The activity was held at the Evergreen Park along Binhai Road in Haikou City. The Haikou City Government donated three 3-meter tall pine trees that the entire "gang" planted, nourished with water and blessed with a special prayer.

Youth come to international meetings with a diverse range of interests, goals, backgrounds, and experiences, and often these differences can be more significant than the commonality of being young.

Navigating International Meetings, A Pocketbook Guide to Effective Youth Participation

From Agenda to Action

While many doors will open simply because one is young, environmental management is not one of the doors that many young people today walk through since there are far more enticing opportunities ahead. However, it is inspiring that there are a few who take the road less traveled to become guardians of nature and ensure that tomorrow's people would have fish on their table, clean water to swim in, and wonderful corals to witness under their snorkel.

More than six months after the Youth Forum, the youth leaders face the reality that there is work to be done,

but taking one step at time will translate each goal into action.

On 8 June 2007, the EAS Youth Forum participants joined in the electronic petition led by The Ocean Project and the World Ocean Network that aimed to have the United Nations officially designate June 8 of each year as World Ocean Day. Although unofficially designated, June 8 has been celebrated worldwide as World Ocean Day since its inception during the 1992 Earth Summit in Rio de Janeiro. This has served as an opportunity to celebrate the world's oceans and each person's connection to the sea.

But the youth leaders have also met with disappointment while trying to promote healthy environmental practices. Huang Haiyan from Hainan University, PR China, had difficultly convincing store owners to minimize the use of plastic bags, because of the implications on the stores' operational expenses and income if they shift from plastic. Nonetheless, that experience did not stop her from continuing as an active member of the Green Island Environmental Protection Association where she contributes to its projects and activities.

"Of all the activities done prior to and during the trip to Haikou City, the preparation of the Youth Agenda was and still is my favorite. Not only did it allow me to make more friends, it also helped broaden my academic and social knowledge.

Discussing the draft for the Agenda through e-mails and online chats served as a gateway for me to reach out to the outside world in terms of getting more information, knowing more people, and sharing more creative ideas. It contributed much to the drafting as well as the finalization of the Agenda.

Drafting involved a lot of discussions and debate — if and when possible. Surprisingly, it turned out that we complimented one another and worked very well together; and this is something that doesn't happen every day. Everyone in my group came from different backgrounds, and thus were likely to have different ideas and analyses, yet, we managed to integrate our ideas well. Just the fact that we could cherish our cultural diversity and use it to advantage already made me happy.

Another great thing was the fact that we took the Youth Agenda seriously, at the same time enjoying ourselves as much as we could. Telling jokes, having fun, sharing personal experiences on and off the subject, playing games – these just helped make the discussions and the preparation much less stressful, less demanding and less rigid.

Then came the most important part in preparing the Youth Agenda: the making of the Youth Agenda video to be presented during the Closing Ceremony. This was where commitment, persistence, hard work and cooperation were put into practice. I was very impressed with the idea of making the presentation into a video, also, just that people would stay up from 10 pm to 5 am for their turn to shoot their parts was truly inspiring – I hadn't imagined it to be possible. And the participants were still active and happy the next day despite not having that much sleep. It was just incredible.

The preparation for the Youth Agenda tested every one of us to show that difficulty doesn't mean impossibility; to prove that cultural diversity is an advantage, not a drawback; and to confirm that cooperation does matter. Hard work, laughter and tears of joy have brought us together and made an unbreakable bond between us. It is the product of collective strength and of mutual understanding. Having almost 50 people work on the Agenda and still have a fantastic experience is unique in itself."

Ratana Sopha
Institute of Foreign Languages
Royal University of Phnom Penh, Cambodia

Cleaning up communities, coasts and rivers

Young people from the municipalities, schools, environmental and youth clubs and religious organizations in Cavite participated in cleanup activities of the coast in a nearby public market.

During ANAK-Balayan's Earth Day activities, both children and young adults took part in river/creek coastal and community cleanups which were directed towards decreasing "heat-holder gases" in the atmosphere by waste reduction and recycling and greening the environment. ANAK-Balayan stands for Ang Nagkakaisang Mamamayang Kostal ng Balayan, Inc (unified citizens in the coastal areas of Balayan).

A coastal cleanup activity was also held on 4 May 2007 in Shandong University in PR China in celebration of Youth Day in the Marine Mammal Institute of the university.

The English Department of the Institute of Foreign Languages, Royal University of Phnom Penh, organized a Cleanup Day on 12 May 2007. It was a whole-day event which involved more than 500 participants working together in various environmental activities such as cleaning the campus areas as well as participating in open discussions and talks with experts about environmental conservation. A number of competitions were held, such as an environmental quiz, environment slogan/quote contest, recycling contest, and poster exhibition. A documentary about the Mekong River entitled "Exploring the Mother of Waters" was also shown during the event.

Introducing children to wonders of the sea

In Vietnam, young people volunteered as museum guides at the Institute of Oceanography in Nha Trang City, Vietnam. Sporting the Youth Forum jacket, Dao Tan Hoc introduced the gentle whale shark to young students.

Organizing young people for a cause

In the Universiti Sains Malaysia (USM), the Kelab Alam Sekitar (KAS) was revived. KAS is the Environmental Club of USM which had been inactive for some time. Its revival is an offshoot of the proposed establishment of an EASy Club in USM initiated by two Youth Forum participants. Since KAS focuses on the environment in general, a special focus on the marine environment will be included in response to the Youth Agenda.

The group's first project, supported by the school administrators and various organizations and groups in the university, is the Container Campaign which aims to reduce the use of polystyrenes by encouraging the campus community to use reusable containers through creative strategies and promotional schemes identified by the group. One such example involves entering into partnerships with food concessionaires who use a high volume of polystyrenes, where students would name these concessionaires as "Environmental Ambassadors" if they agreed to provide students with options to use either the Eco-pack container for an additional cost of only MYR 0.20 or $0.058) or their own recyclable container for meals bought at the canteen. Students who use their own container or Eco-pack container shall receive a Thank You bookmark, which serve as a motivational mechanism and also as a results indicator for the campaign.

Building Awareness

A group of volunteers from different groups and projects came together to form the Naked Hermit Crabs, whose aim is to bring attention to the shores in Singapore. The group brings families to a particular shore and introduces inter-tidal zones and marine organisms before these habitats disappear due to reclamation. This activity is aimed at building environmental awareness, so that people can come together and protect these natural wonders.

Linking Youngsters to the Earth

The EarthLink NTU has organized and participated in various environmental activities. This included a talk on "Environmental Guardianship" at the Millennia Institute by Chan Boowah, Earthlink NTU's President and a Youth Forum participant. Other EarthLink NTU activities included the "Use less plastic bag" Campaign, recycling activities as well as awareness campaigns that creatively use music and visual arts.

Continuing the Cycle

Some of the youth leaders will be older than 25 soon and can no longer be classified as youth within the Youth Forum's context, but their current drive to raise the awareness of children towards responsible stewardship over nature can help secure a more "harmonious co-existence between the environment and the human race."

The cycles of nature and human life are almost parallel and share the same destiny. If mangrove seedlings are carefully planted and fish fry are nurtured and protected in sanctuaries, then the same or even greater effort must be capitalized on young people to start rebuilding the bonds between humans and the environment.

By: Mervin Low, Universiti Sains Malaysia; Ratana Sopha, Institute of Foreign Languages, Royal University of Phnom Penh, Cambodia; November Tan Peng Ting, National University of Singapore; Danwei Huang, National University of Singapore; Chan Boon Wah, Nanyang Technological University of Singapore; Dao Tan Hoc, Institute of Oceanography, Vietnam; Li Xiang, Marine Mammal Institute, Shandong University, PR China; Cris Evert Lato, University of the Philippines; and Khristine R. Custodio, PEMSEA, Philippines

The Youth Agenda, the Youth Forum Story, and the Report on the Outputs and Outcomes of the Youth Forum are accessible at www.pemsea.org.

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"There was much to be done upon our return from Hainan. With the Youth Agenda fresh in our minds, there was a high level of motivation to get started on the conservation of the East Asian Seas. I am part of a marine conservation society in Singapore known as the Blue Water Volunteers (BWV), and involve myself in local efforts through two activities. As a nature guide, I take people on walks around coral reefs at low spring tides. My mission is to share with them the diversity of marine habitats, interesting anecdotes of our interactions with the environment, the importance of marine life to humans and why it is worthwhile to conserve the environment. I have been guiding for several years now, but the awareness that many other youth in the region are also putting in efforts to protect the East Asian Seas gives me additional motivation to do my job well, and to learn more about the marine environment. It was even more satisfying to share stories about the work in the EAS Youth Network during these walks.

On the other hand, marine research has become a big part of my life. Another component of BWV is the survey and monitoring of coral reefs in Singapore. Having realized the importance of good data for management and conservation decisions, as highlighted in several talks at the EAS Congress, I now put in more effort to ensure that the entire process of data collection and processing is as rigorous and accurate as possible. It has been a great time serving the environment, and I look forward to more young people taking responsibility and leadership in the region's environmental preservation efforts. Overall, I see the EAS Youth Forum as a lifelong journey, which started in Hainan, for the sustainable involvement of youth in the conservation of the East Asian Seas."

Danwei Huang
National University of Singapore

Youth Agenda for the Seas of East Asia

Youth Forum, East Asian Seas Congress
Haikou City, Hainan Province, The People's Republic of China
15 December 2006

Vision

We envision the seas of East Asia with healthy marine life and abundant resources, where there is harmonious co-existence between the environment and every sector of society and where people of every generation work hand in hand to secure the sustainability of the East Asian seas.

Recommendations

$I^3 = E$
Inform × Inspire × Involve = Empower

Inform

- Provide education to bring about positive change for the environment
- Exchange and share information among various stakeholders on sustainable development strategies
- Develop more opportunities for youth to learn how to protect and preserve our marine resources for the future generations
- Intensify research efforts to develop eco-friendly technologies and to use new information technologies such as internet, GoogleEarth

Inspire

- Increase appreciation of the value of the environment
- Promote protection of the environment as an integral part of each person's culture
- Incorporate education for sustainable development as a compulsory element starting from preschool through all educational levels

Involve

- Encourage public, civil society, private companies and government involvement to reduce land-based pollution, practice sustainable ecotourism and green consumerism
- Increase youth involvement in environmental issues including outreach activities for out-of-school youth
- Create opportunities such as research grants and competitions to encourage youth to apply science & technology in marine conservation

Plan of Action

Inform

Short-term

- Conduct information dissemination drives (IDD) such as room-to-room discussions on marine environmental issues
- Use GoogleEarth to input data on local environmental problems for sharing on the World Wide Web
- Inform young people on the importance of keeping the environment clean by using pictures, simple illustrations, newspaper articles, internet (blogs, online resources)
- Appeal to colleges/universities to integrate issues relating to marine conservation in their curriculum

Medium-term

- Organize seminars and training courses for fisherfolks and farmers about sustainable fishing or farming such as nondestructive fishing methods and organic farming

- Publish consumer guides to encourage consumers to purchase only products from sustainable farming or fishing
- Set up exhibitions in campuses, town centers and streets to provide easy access to information on environmental protection
- Translate the useful information materials into local languages

Inspire

Short-term

- Promote green consumerisms at local households
- Adopt eco-friendly practices in our homes and campuses such as by using reusable bags instead of plastic bags, saving electricity, taking public transportation and not littering
- Submit articles on environmental activities and success stories to local newspapers, magazines and the internet

Medium-term

- Approach companies and encourage them to participate in various environmental events or campaigns

Long-term

- Voice out to local government units to adopt environmental sustainability when creating and/or updating local development plans
- Report any incidents of illegal and destructive practices on the marine environment to the authorities
- Promote corporate social responsibility within the private sector by encouraging corporate firms to adopt green technologies (request diving companies to adopt ecofriendly practices; educate pet owners)
- Organize international exchange programs among the youth to celebrate the cultural diversity in the region

Involve

Short-term

- Organize expeditions and field trips for young people
- Join environmental groups
- Conduct open discussions about environmental issues with friends and/or families
- Practice the 3Rs: reduce, reuse and recycle

Medium-term

- Organize fun-filled environmental activities and events such as competitions and concerts featuring celebrities who advocate environmental causes
- Establish and expand a youth network to connect environmental groups from different countries to exchange information and best practices
- Conduct grassroots donation programs for environmental research such as by placing cash donation boxes in public areas
- Help train out-of-school youth to work in the ecotourism industry (tour guides, service providers)
- Continue to organize the EAS Youth Forum

Long-term

- Network with concerned government agencies, NGOs and POs in conceptualizing and implementing mechanisms to bring national policies to the community level
- Involve youth as volunteers in creating an inventory of available resources
- Set up an integrated network to ensure sustainability of forums and conferences
- Contribute ideas to experts and policymakers in developing and implementing effective monitoring that will ensure compliance to sustainable resource use
- Volunteer to replant and restore coastal forests and mangroves
- Volunteer to control forest fires

Signed this 15th day of December 2006 at the China Institute for Reform and Development, Haikou City, Hainan Province, People's Republic of China.

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Kendall, M. "Monitoring the Marine Environment at a Time of Changing Baselines." Workshop on Ecosystem-based Management and Forecasting.

Kim, J.D. "Regional Secretariat for Twinning Arrangements in Ecosystem-based Management of Interrelated River Basins, Estuaries and Coastal Seas." Workshop on Ecosystem-based Management of Interrelated River Basins, Estuaries and Coastal Seas.

Kim, S.W., K. Choi, H. Kim and D.S. Kim. "Long-term Change of Water Quality in Lake Shihwa, Korea, during the Last Decade (1994-2004)." Special Seminar on Ecosystem-based Management (Part 1).

Lee, C.H. "Implementation of New Integrated Coastal Water Quality Management Initiatives in RO Korea." Workshop on Ecosystem-based Management of Interrelated River Basins, Estuaries and Coastal Seas.

Lee, W.C. "Sharing Experience on Building a Partnership for Environmental Management of Masan Bay." Workshop on Ecosystem-based Management of Interrelated River Basins, Estuaries and Coastal Seas.

Li, Y., M.D.M. Otero, J. Yuan and Y. Guo. "Yancheng Coastal Marshes – A Demonstration of Partnership Building in Environmental Education." Workshop on The Yellow Sea Partnership for Enhanced Public Awareness and Participation.

Liu, W., Y. Peng and G. Chen. "Evaluation and Analysis of the Loss in Economic Value Due to the Impacts of Land-based Pollution in the Shantou Wetland." Workshop on Habitat Management and Restoration (Workshop I - From Knowledge to Practices in Habitat Management and Restoration).

Monte, J. and E. Torres. "Laguna de Bay - Its Challenges and Workable Solutions." Workshop on Ecosystem-based Management of Interrelated River Basins, Estuaries and Coastal Seas.

Moua, K. "Transboundary Cooperation for Sustainable Development of the Lower Mekong River Basin." Workshop on Ecosystem-based Management of Interrelated River Basins, Estuaries and Coastal Seas.

Nam, J.H., W.K. Chang, J.Y. Choi, H.J. Choi and K.H. Yook. "Implementation of Marine Protected Area Policies in RO Korea." Special Seminar on Ecosystem-based Management (Part 1).

Nemazie, D. Engagement of Stakeholders to Reduce Nutrient Loading of Pollutants into Chesapeake Bay." Workshop on Ecosystem-based Management of Interrelated River Basins, Estuaries and Coastal Seas.

Ngoc, Q.T.K. "Marine Protected Areas: A Literature Review and Some Preliminary Findings for Aquaculture Effect." Workshop on Management Effectiveness of Marine Protected Areas.

Padilla, N.E. "Valuation of Coastal Ecosystems under the UNEP/GEF Project 'Reversing Environmental Degradation Trends in the South China Sea and Gulf of Thailand'." Workshop on Habitat Management and Restoration (Workshop I - From Knowledge to Practices in Habitat Management and Restoration).

Pernetta, J. "Mangrove Management and Restoration." Workshop on Habitat Management and Restoration (Workshop II - SCS/TEI Joint Session on Mangrove Rehabilitation and Management).

Platt, T. Ecological Indicators to Aid Ecosystem-based Management of the Ocean." Workshop on Ecosystem-based Management and Forecasting.

Qiu, W. and E. McManus. "Fishery Regulations in the Asia-Pacific: Implications for Fisheries Management and Marine Biodiversity Conservation."

Schuttenberg, H. and P. Marshall. "A Reef Manager's Guide to Coral Bleaching." Special Seminar on Ecosystem-based Management (Part II).

Shi, H., W. Zheng, S. Chen and D. Ding. "Uncertainty Analysis on Regional Marine Ecosystem Services Value." Workshop on Habitat Management and Restoration (Workshop I - From Knowledge to Practices in Habitat Management and Restoration).

Sik, H. and Y.R. Choi. "KORDI's Public Awareness Activities in the Yellow Sea Partnership." Workshop on The Yellow Sea Partnership for Enhanced Public Awareness and Participation.

Somkleeb, N., N. Ruengsawang, M. Sutthacheep and T. Yeemin. "Coral Reef Management and Restoration in Mu Koh Chang National Park, Thailand." Workshop on Habitat Management and Restoration (Workshop I - From Knowledge to Practices in Habitat Management and Restoration).

South, G.R. and P. Skelton. "Turning the Tide for SIDS: Policies for Sustainable Management of Coral Reefs." Workshop on Habitat Management and Restoration (Workshop I - From Knowledge to Practices in Habitat Management and Restoration).

Tan, K.H. "Challenges to Sustainable Management and Development of Mangrove Resources in Matang, Perak, Malaysia." Workshop on Habitat Management and Restoration (Workshop II - SCS/TEI Joint Session on Mangrove Rehabilitation and Management).

Teratanatorn, V., N. Paphavasit, S. Panichchart and S. Karnchanapaiharn. "Proposed Mangrove Rehabilitation in Areas after the Tsunami in Southern Thailand." Workshop on Habitat Management and Restoration (Workshop II - SCS/TEI Joint Session on Mangrove Rehabilitation and Management).

Tobai, S., S. Pae, C.H. Lee and W. Songlin. "Cross-sector, Transboundary and Multiscale Partnership for Yellow Sea Biodiversity Conservation." Workshop on The Yellow Sea Partnership for Enhanced Public Awareness and Participation.

Vendiola, E. "Pilot Monitoring of Mangrove Forests of Manila Bay." Workshop on Habitat Management and Restoration (Workshop II - SCS/TEI Joint Session on Mangrove Rehabilitation and Management).

Walton, M., G. P. B. Samonte-Tan, J. Primavera and L. Le Vay. "How Effective Is Mangrove Restoration? The Community Benefits." Workshop on Habitat Management and Restoration (Workshop II - SCS/TEI Joint Session on Mangrove Rehabilitation and Management).

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The East Asian Seas Congress 2006

12-16 December
Haikou City, Hainan Province, PR China

Applying Management-related Science and Technology

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Applying Management-related Science and Technology

MBEMP IEMP-TWG.

Efforts are constantly being made in various applied sciences and environmental fields to strengthen the role of science in the sustainable management of the environment and resources of the East Asian region. This is particularly evident since countries in the region have committed to collaborate for the protection and management of the marine and coastal environment using the Sustainable Development Strategy for the Seas of East Asia (SDS-SEA) as a common framework.

Policies and actions should be guided by appropriate understanding of marine ecosystem processes and their interaction with various natural and human influences, from facts provided by a continuous progression of scientific observations and research, with significant inputs from local knowledge and information. As new and more reliable information comes, this understanding is refined and, ideally, results to better decisions and actions. Environmental policy and management actions, therefore, should be supported by adequate and reliable scientific basis. Environmental monitoring and related scientific undertakings, on the other hand, should be aimed at providing necessary information, in a timely manner, to support coastal and environmental management.

Despite recognition that the use of scientific information is essential to sustainable management of marine and coastal resources, the ability of most stakeholders to factor environment and ecosystem concerns into their planning and decision-making is still constrained by information, capacity and coordination issues. Insufficient information, poor access to data and a lack of coordination among

stakeholders have been major impediments to successful coastal management in most countries in the region. Insufficient information may stem from inadequate capacity to generate information (through monitoring and research), share information, and analyze, interpret and translate scientific data and information into formats comprehensible to specific end-users (e.g., policymakers, managers and public).

It is recognized that there is a wide disparity in the capacities of the countries in the East Asian Seas (EAS) region to generate, manage and apply scientific and technical information in marine and coastal management. This disparity needs to be narrowed down to enable the countries to work in a concerted fashion and mutually contribute to the sustainable management of the seas of East Asia. Acquiring a comprehensive overview of all ongoing activities in the region is currently difficult, along with getting an overview of data and information produced within the countries and the region.

It is in this context that the Thematic Workshop on Applying Management-related Science and Technology was organized as part of the International Conference of the EAS Congress 2006. Various organizations and technical experts within and outside the region came together to share knowledge and experience on cost-effective approaches and technologies in marine monitoring and assessment, integrated coastal and marine information management, and state of the marine environment reporting. This article summarizes the presentations, discussions, conclusions and recommendations from the workshops and seminars.

Consequently, gaps in scientific data/ information necessary to support effective coastal management are considerable. These gaps need to be filled if the region is to make a concerted move toward sustainable coastal and ocean governance.

Innovative Approaches and Technologies in Pollution Assessment and Monitoring

Monitoring is done to determine status and trends in ecosystem conditions, monitor the consequences of management actions (or inaction) and determine necessary policies and management interventions to address adverse conditions or changes. Monitoring is a demonstration of commitment to safeguard human and ecological health and contribute to the sustainable management of the region's seas and coasts.

As mentioned, capacities in environmental monitoring and assessment vary widely among countries in the region. Environmental management and related scientific activities entail large costs and, in most of the region's developing economies where providing basic societal needs takes precedence, environmental concerns are often relegated to the backseat. Consequently, gaps in scientific data/information necessary to support effective coastal management are considerable. These gaps need to be filled if the region is to make a concerted move toward sustainable coastal and ocean governance. Monitoring approaches and technologies, which are practical, cost-effective and provide meaningful information, need to be applied. Conventional approaches that have limited usefulness for assessment and management of the region's resources and the threats to these resources would need to be supplemented or supplanted by more practical alternatives.

Biological Monitoring

Chemical-based monitoring, which involves the measurement of contaminant levels in different environmental compartments and comparison with prescribed environmental limits obtained using lethal and sub-lethal toxicity tests on

a limited range of species, is now increasingly being considered as inadequate for protecting ecosystem health. This approach does not provide information on biological impacts, which need to be established if the ultimate goal is to protect the ecosystem and resources. The global trend has been to shift from contaminant or chemical-based monitoring to effects or biological monitoring. Risk assessment and risk management, another environmental assessment tool that goes beyond the chemical-based approach, has also gained global acceptance. Table 1 presents a comparison of the above techniques.

Biological monitoring uses biological responses (bioindicators) at different biological organization levels (e.g., molecular, biochemical, physiological, organismal, population/community and ecosystem levels) to indicate significant environmental changes, which could potentially lead to identification of exposure to specific contaminants, monitoring of spatial and temporal changes in pollution and early warning of potential environmental deterioration and/or occurrence of adverse ecological consequences. Bioindicators, at different levels, differ in specificity, sensitivity, reproducibility and importance of information for ecosystem management and hence, should be used in cost-effective combinations to address the questions asked. Changes or endpoints that demonstrate the effect of a particular chemical or a mixture and its likely outcome on a living organism are specifically called biomarkers.

Biomarkers are becoming increasingly popular for the environmental assessment of persistent organic pollutants (POPs) and other toxic contaminants. Many bioindicators have been successfully developed and used cost-effectively

Table 1. Comparison of Chemical-based Monitoring, Biological Monitoring and Risk Assessment/Risk Management.

Chemical-based Monitoring	Biological Monitoring	Risk Assessment and Risk Management
• Chemicals exist in different forms, which vary in bioavailability and toxicity	• Indicates bioavailability of contaminants	Goes beyond the hazard posed by a chemical (or process) and considers the target's exposure to the hazard and the effects on the target
• A suite of chemicals may interact either additively, synergistically or antagonistically hence it is difficult to isolate the impacts of chemicals on targets	• Accounts for environmental fate of contaminants,	
• Does not provide information on biological impacts; presence of contaminants/ chemicals in the environment at certain levels may not necessarily translate to harmful effects on targets	• Provides clues for biological effects	
• Indirect interpretation of results; major problems exist in predicting biological effects based entirely on chemical data	• Provides direct interpretation of results	
• Costly and laborious in sampling and analysis	• Often requires easier sampling and analysis and hence more cost-effective	
• Temporal and spatial variations of chemical parameters are often large; frequent sampling is required	• Evens out temporal variations; provides time-integrated estimates on pollution level	
• Lower concentrations, making analysis difficult (e.g., pre-concentration required)	• Higher concentrations of contaminants in biota, making analysis easier	

in North America, Europe, Australia and New Zealand, e.g., National Oceanic and Atmospheric Administration of the USA (NOAA), U.S. Environmental Protection Agency (USEPA), International Council for the Exploration of the Sea (ICES), Oil Spill Preparedness and Response (OSPAR) and Mussel Watch. However, applications of biomonitoring are limited in East Asia. A US$1.1 million study was commissioned by the Environmental Protection Department of Hong Kong SAR, PR China, in 2001–2003 to develop a biological indicator system for marine pollution monitoring in Hong Kong.

Biological monitoring also includes measurement of the body burden or concentration of contaminants in biological tissue. For monitoring of heavy metals, this is considered to be more cost-effective than measurement in the water column and sediment, which are constrained by various factors that affect the accuracy, precision and interpretation of data. Measurement of heavy metals in marine biota such as mussels provides a time-integrated picture of contamination and indication of human health risks from consumption of contaminated seafood. Metal concentrations in mussel samples, however, are significantly affected by physical and environmental conditions in the area where they come from, and biological factors that affect uptake of metals from the surrounding environment, which can constrain interpretation and comparison of data. Natural distribution of species is also limited to specific geographic areas.

A new chemical sampling device for monitoring heavy metals in aquatic environments has been developed, consisting of a polymer ligand (Chelex-100) suspended in artificial seawater within a Perspex tubing and enclosed with semi-permeable gel at both ends. Called Artificial Mussel (AM), this device can take up and release metals similar to mussels, but since it is less affected by physical factors and unaffected by biological factors, metal content/uptake directly reflect environmental concentrations. Artificial mussels have also been shown to take up bioavailable fractions, and thus provide information on time-integrated environmental concentrations of bioavailable metals with the additional advantage of allowing comparisons of trace metals in varied aquatic environments and geographical areas. This provides much potential for comparisons of trace metals in varied aquatic environments and geographical areas.

Risk Assessment/Management

Environmental risk assessment (ERA) is a tool to objectively determine the likelihood that contaminant releases (or processes), either past, current or future, pose an unacceptable risk to human health or the environment. As opposed to a hazard-based approach of managing contaminants or processes based on their intrinsic capacity to cause harm, ERA evaluates the likelihood of harm to occur taking into consideration the target's exposure to the hazard. ERA can lead a risk manager to decide whether a substance or activity is: 1) safe (there is no significant risk); 2) unsafe (risk is too high, abandon the project); or 3) safe but exposure must be limited to maintain the desired margin of safety (i.e., risk management is needed).

Risk-based approaches provide support to decision-makers in assessing potential impacts of various actions based on the weight of scientific evidence. Since risk is often differently perceived by the public, experts and other stakeholders, proper risk communication is very important. ERA is widely adopted in developed nations but has recently been implemented in the East Asian region. Applications in Hong Kong include assessing risks associated with seafood safety, contaminated mud on dolphins, bridge construction over oyster farms, and harmful algal blooms. The GEF/UNDP/IMO Regional Programme on Building Partnerships in Environmental Management for the Seas of East Asia (PEMSEA) also uses risk assessment as a tool to

In the management of pollution from land-based sources, various treatment systems for wastewater and contaminated sediments are available. Conventional technologies can involve large capital investments, high operating costs, and skilled technical support, which means that they are usually unaffordable for small coastal areas.

scientifically identify priorities for management actions in integrated coastal management (ICM) and pollution hotspot demonstration sites.

Environmental Carrying Capacity

Another essential tool for environmental and resource management is the estimation of environmental or ecological carrying capacity (ECC). ECC is the ability of an ecosystem or environment to accommodate a certain activity without unacceptable impact. Estimation of ECC requires a clear definition of the problem, site conditions and water quality objectives and the use of hydrodynamic and water quality models. Carrying capacity (e.g., allowable organic and nutrient loading) was estimated and applied in formulating a sewage management strategy for the Hong Kong Harbour, which was severely contaminated by untreated sewage. The Harbour Area Treatment Scheme (HATS) is one of the most significant environmental infrastructure programs ever pursued in Hong Kong, costing US$27.7 million in the first two of its four stages. Carrying capacity was also estimated in a marine fish culture zone in Hong Kong to assess proper siting of fish farms and control stock density.

DNA-based Technologies

With the continuous increase in population at the coastal zone, sewage contamination of coastal waters and risk of waterborne infections caused by different types of bacterial pathogens constitute a major public health concern. Timely and effective prevention and control of water-borne disease outbreaks is critical but are constrained by current tedious, time-consuming and monospecific methods which fail to detect viable but unculturable organisms and incur large sampling errors at low pathogen concentrations. Counts of *Escherichia coli (E. coli)*, the pathogen more commonly determined, also lack correlation with incidences of pathological waterborne infections.

A hollow-fiber filtration system facilitating rapid and reproducible recovery of bacterial cells from water samples, and two DNA-based detection technologies (quantitative multiplex polymerase chain reaction or Q-mPCR and GeneChip) that allow simultaneous detection of multiple water pathogens in a single test, have been developed. Q-mPCR can simultaneously detect *E. coli, Salmonella* spp, *Shigella* spp and *Vibrio cholerae* while the Genechip can determine *Vibrio cholerae, V. vulnificus, V. parahaemolyticus, V. mimicus* and *V. alginolyticus*. These techniques provide specific, sensitive, accurate, rapid, cost-effective, and affordable alternatives to the determination and monitoring of bacterial pathogens in coastal waters.

Harmful Algal Blooms (HABs) Management

Another major threat to sustainable coastal development, HABs is a phenomenon that is dramatically increasing with regard to number of toxins and species detected, frequency and intensity of occurrence, areas and types of resources affected, and consequent economic losses. Some aspects of the HAB expansion have been linked to human activities, although HABs have also been observed in waters unimpacted by human activities. Scores of multidisciplinary HAB researches have dramatically improved capacity to monitor, forecast, control and manage HABs. Available technologies enable: 1) rapid, accurate and cheap detection of

toxins and enumeration of HAB cells; 2) deployment of remote instruments such as molecular probes to detect HABs cells and toxins; 3) remote sensing detection and tracking of blooms; 4) analysis of past blooms and forecasting of new ones using large-scale physical/biological models; 5) mitigation and control of blooms using various strategies and methods; and 6) maintenance of healthy and productive fisheries in areas subject to HABs. Opportunities for technological advancements to improve protection of public health and management of resources and industries affected by HABs abound. Projected inputs of nutrients, however, suggest that the HAB problem is likely to worsen in some areas. Hence, coordinated multidisciplinary national and international HAB programs with links to ocean observing systems are necessary to continue the progress in addressing this challenging occurrence.

Alternative Wastewater Treatment Technologies

In the management of pollution from land-based sources, various treatment systems for wastewater and contaminated sediments are available. Conventional technologies can involve large capital investments, high operating costs, and skilled technical support, which means that they are usually unaffordable for small coastal areas. Taking this into consideration, two alternative treatment technologies that are simple and flexible, easy to operate, cost-effective, natural and environment-friendly (no secondary pollution problems) and applicable to local conditions have been developed and applied in Hong Kong. The first one uses a constructed mangrove wetland for secondary treatment of municipal/domestic and nutrient-rich sewage, with the possibility for treatment of strong industrial sewage and remediation of toxic pollutants, such as polycyclic aromatic hydrocarbons (PAHs). Mangroves have high tolerance to nutrients and pollutants and wetlands can be constructed where wastewater is produced. The system has the advantage of low energy requirements, simple technology, easy maintenance and associated aesthetic and ecological values. The second method involves the use of algal biosorbents made from microalgal cells (produced from municipal sewage) immobilized as algal alginate beads for removal of metals and tributyltin (TBT) and removal and degradation of POPs, such as PAH, from industrial waste.

Pollution Assessment and Monitoring: A UK Perspective

In the United Kingdom, pollution management has also shifted from the chemical-based approach to a range of contemporary methods based on identification of biological damage and use of risk-based approaches. These include a hierarchical approach to risk assessment-ecosystem management (ECOMAN) that involves the use of increasing amounts of scientific information to increase the weight of evidence and decrease uncertainty in the assessment. As necessary, the assessment would involve evaluation of background information on ecosystems, contaminant discharges and planned developments; then measurements of chemical and biological markers in a broad range of species at different trophic levels; and then detailed chemical, biological, ecological, socioeconomic and health studies of specific locations. ECOMAN is applied in combination with other tools especially modeling techniques and virtual ecosystems.

Model Applications

In Canada, a model that simulates the fate and transport of a low-level toxic constituent of wastewater, produced from an offshore petroleum platform in the Hibernia Site, was developed by Concordia University and the Bedford Institute of Technology. The model supports the assessment of environmental risks from the operation. Produced water, the water associated with oil and gas reservoirs and an incidental byproduct of oil and gas drilling, is the largest volume of waste stream associated with offshore oil and gas production (e.g., 800 m^3/hr). The Princeton Ocean Model (POM) was used to simulate ambient oceanographic conditions and provide three dimensional hydrodynamic inputs to a Random Walk model to examine the dispersion of the toxic component of produced water effluent at a regional scale. The simulation of the dispersion of lead indicated no impacts to the regional marine environment at the current stage.

To evaluate ecological degradation trends and the impacts of fishing efforts in the Pearl River Delta coastal area in the People's Republic of China, the Ecopath with Ecosim (EwE) model was applied. EwE is an ecological software suite being developed at the University of British Columbia's Fishery Centre for more than a decade, which has widespread applications throughout the world. Ecopath provides a static, mass-balanced snapshot of the system while Ecosim is a time-dynamic simulation module for policy exploration. Application of the model showed that the Pearl River Delta ecosystem has been greatly influenced by overfishing and is dominated by small and low-valued fishes.

Alternative Technology for Seaweed Culture

In the Philippines, application of "ocean fertilizer" containing 20 percent ferrous sulfate undertaken in two local areas has cost-effectively enhanced the production of the red alga, *Kappaphycus alvarezzi* and *Gracilaria heteroclada* at certain levels and duration of application. It is also hoped that this would minimize the occurrence of whitening events in seaweed farming. Ocean fertilization should, however, be cautiously and prudently applied, particularly in the coastal areas.

Regional Issues

Advances in science and technology in the last two decades have changed our understanding and priority of environmental concerns. The above examples demonstrate new approaches and techniques that could further enhance our understanding and management of marine environmental concerns.

Though risk assessment and management is now a mainstay in environmental management worldwide, this has received less attention in the East Asian region. There is a need to establish more ERA precedents in the region and take concerted efforts to derive ecologically relevant environmental quality guidelines (i.e., threshold effects levels), reference doses and toxic reference values for more accurate ERA.

There is also a global trend to supplement chemical and physical monitoring by biological monitoring, yet this is still uncommon in the region. High national priority should be accorded to adopt and validate the use of bioindicators in the local seas, so as to improve the cost-effectiveness and management relevance of the current monitoring programs in the region.

The region, as a whole, has been slow in responding to the above technological changes. At this stage when resources are getting scarce and management efforts could hardly keep pace with the rate of deterioration, conventional techniques to detect and mitigate threats need to be enhanced or succeeded by viable alternatives. A variety of novel and cost-effective technologies is now readily available for practical use in environmental management in the region.

In Hong Kong, the Centre for Marine Environmental Research and Innovative Technology (MERIT), in collaboration with institutional partners including the Plymouth Marine Laboratory (UK) and Woods Hole Oceanographic Institution (USA), is at the forefront of developing state-of-the-art but cost-effective approaches and technologies in pollution assessment and monitoring for practical use in the region. Through the operation of the PEMSEA program for Areas of Excellence (AOEs), MERIT will be an active partner of PEMSEA in strengthening the linkage between scientific institutions and decision-makers in government and at the community level, and promoting the use of scientific knowledge and innovative technologies in support of coastal strategy implementation.

Partnership arrangements will also be forged with other internationally and regionally recognized AOEs, engaging these organizations and institutions in the implementation of the SDS-SEA through the AOE program. A regional network of universities/scientific institutions supporting SDS-SEA implementation at the national and local levels will also be established.

Radioisotope Technology for Coastal and Ocean Management

A radioisotope is an unstable isotope of an element that spontaneously undergoes radioactive

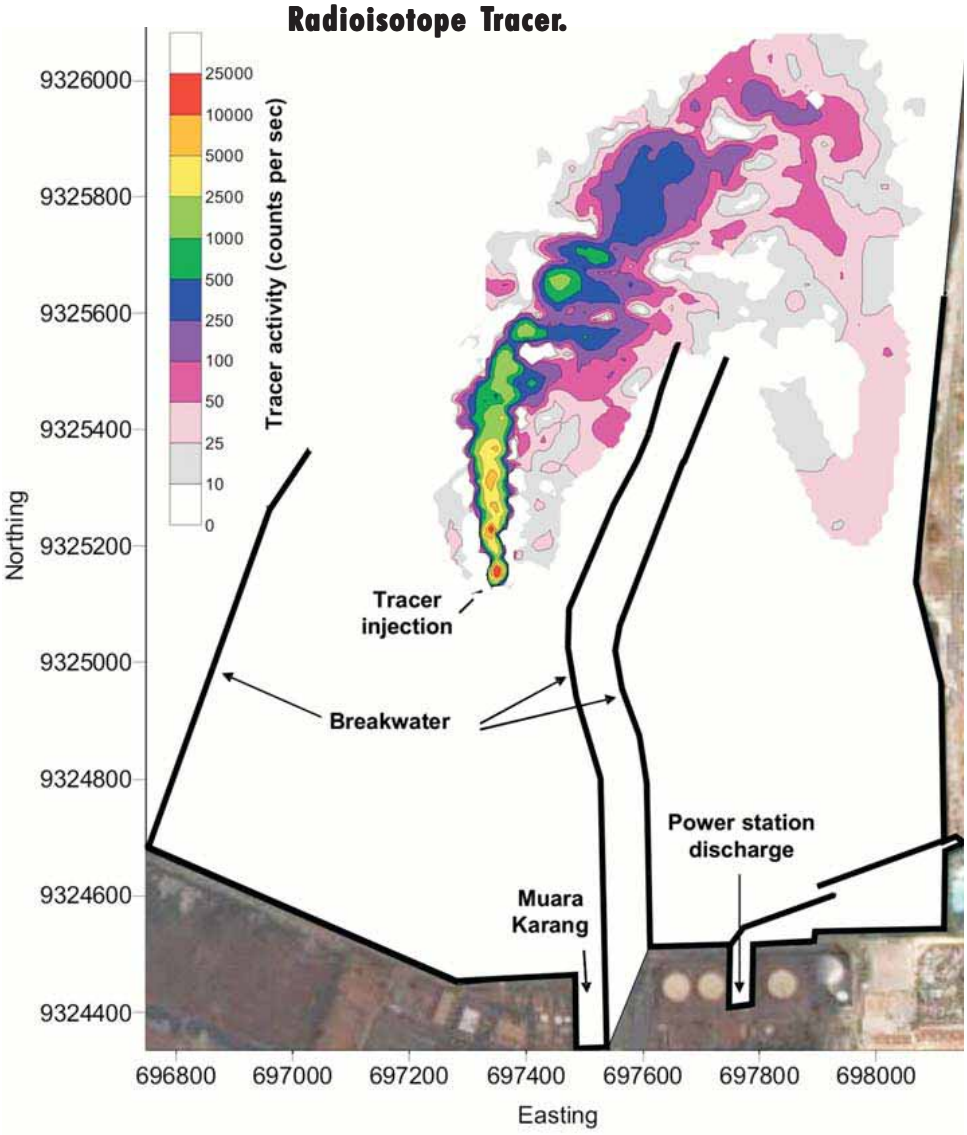
decay or disintegration toward a more stable form. Radioisotopes with special properties have been used for medical diagnosis through introduction into the human body and detection of their movement within the body and presence in specific areas. Similarly, radioisotopes could also be used as environmental tracers to elucidate inter-relationships and rates of various environmental processes. These can be used to measure flow rates and directions in rivers, oceans and groundwater; determine dispersion and mixing of contaminant plumes; trace movement of sands and contaminated sediments in ports, estuaries and beaches; and measure uptake of contaminants into biota such as fish and shellfish. Radioisotope techniques provide accurate information on natural processes and assessment of environmental problems, and will greatly assist in effective ecological risk assessment.

Through the International Atomic Energy Agency (IAEA)/Regional Cooperative Agreement (RCA) Project on Improving Regional Capacity for Assessment, Planning and Responding to Aquatic Environmental Emergencies, nuclear-based technologies developed in Australia are shared with developing countries in order to improve regional capacity for the management of aquatic radiological and environmental risks and to develop capacities in the RCA countries to assess, plan and respond to pollution events in aquatic environments.

In Jakarta Bay (Indonesia), a demonstration site for the RCA Project, integrated application of modeling and radiotracer tools was done to assess ecological risks arising from both chronic and unplanned aquatic pollution events. Jakarta Bay is a shallow bay that receives a large volume of untreated waste while supporting local fisheries and shellfisheries. A 3-D hydrodynamic and contaminant transport model was developed for the bay and validated and calibrated using technetium (Tc-99m) from a medical generator to trace the movement and dispersion of water in nearshore and offshore zones (Figure 1). Contaminant concentrations predicted using the model were used in probabilistic risk assessment modeling for key local species using another model (AQUARISK). Modeling of contaminant transport and ecological risk provides sound scientific basis for environmental decision-making and management in Jakarta Bay. The use of radioisotope tracer enhances the reliability of the assessments.

In another study in Jakarta Bay, the chronologies of trace metal pollutants

Figure 1. Water Movement and Dispersion in Jakarta Bay Determined through the Use of Tc-99m, a Radioisotope Tracer.



as well as accumulation rates of sediments in the bay were elucidated using Pb-210 dating technique. Zinc and chromium concentrations in dated sample cores showed increasing concentrations starting in the 1960s with surface concentrations two to three folds higher than the background. Sedimentation rates before the 1960s have also increased by three to four times. The changes have been linked to increased industrial activities, environmental degradation and land use changes in the Jakarta Metropolitan Area. Pb-210 dating has been shown to be a powerful tool for retrospective assessment.

In the Philippines, where toxic algal blooms have had severe economic and health impacts, radioisotope techniques have been useful tools to monitor, understand and manage HABs and its impacts. The regulatory limit for paralytic shellfish toxin (saxitoxin) in the Philippines (40 µg/100 g shellfish meat) is lower than the world limit (80 µg/100 g shellfish meat) due to previous fatalities caused by shellfish meat with toxin below the world limit. The Philippine limit is also near the detection limit of the standard mouse bioassay (MBA) method which makes MBA less reliable for routine determinations. An alternative method being integrated into regular monitoring efforts is the receptor binding assay (RBA), a more sensitive and rapid isotope-based technique that uses tritium-labeled saxitoxin. Research on the use of RBA labeled with iodine-125 and carbon-14 is also being done to monitor the uptake and release of saxitoxins by mussels in the field and provide information on duration of blooms and a basis for public health toxicity risk assessment and management of shellfish harvest. Integrated hydrodynamic modeling and radiotracer techniques have also been applied in Manila Bay for monitoring transport of contaminants, nutrients and HAB cells to identify focus areas for monitoring and management. Radioisotope dating is also being done to document and understand past blooms and to predict future occurrences.

Other radioisotopes have been applied in Manila Bay as tracers of pollution transport. Cs-137 and Pb-210 have been used in a variety of environments as indicators for erosion and depositional processes, assessing sedimentation rates and for dating sediments. As tracers for sediment movement, these could also be used further as indicators for possible pollution from agricultural sources. Surface sediment concentrations of Cs-137 and Pb-210 were studied as part of the pilot phase integrated environmental monitoring program (IEMP) for Manila Bay. The results showed higher Cs-137 concentration in inshore agricultural areas, indicating high sediment movement and potential agricultural inputs. Pb-210 levels, on the other hand, were observed to be low in the same area, indicating higher sediment accumulation, and again, potential agricultural inputs. In the refinement of the IEMP, the Pb-210 and Cs-137 distributions were taken into account in pesticide monitoring design. The radioisotope distributions could also potentially be used to guide monitoring of other agricultural inputs such as nutrients and agrochemicals and particle-reactive toxic trace elements.

The Marine Environment Laboratory of IAEA in Monaco has also undertaken field and laboratory studies on the use of radiotracer techniques to investigate various exposure pathways for bioaccumulation of contaminants from land-based sources, including those which have been relatively understudied, such as direct accumulation of contaminants from seawater by embryonic fish and transfer of contaminants from food via maternal transfer to embryonic stages. These studies are relevant to the assessment of seafood safety and the identification of effective biomonitors for metal contaminants. In collaboration with the Food and Agriculture Organization (FAO) of the United Nations, the World Health Organization (WHO) and member states, IAEA is also implementing a new research program to identify needs for more scientific data on contaminants in seafood and to generate data relevant to the management of these contaminants using radiotracer and radioassay technologies. Particular focus is given to assessing HAB paralytic shellfish poisoning and ciguatoxin and cadmium in oysters, scallops and cephalopods.

The above applications of nuclear technology for assessing and responding to marine environment contamination demonstrate that, in contrast to the popular perception of

being a tool for destruction, nuclear technology could also be a beneficial tool to protect human life and the environment. Specifically, nuclear techniques allow accurate and specific validation of contaminant transport model which is otherwise not often or not well done. Nuclear techniques also provide a precise and cost-effective way to acquire site-specific contaminant dose-response data that are valuable for assessment of risks from and management of chemical contaminants. Accurate model validation and better understanding of ecological relationships and rates are extremely important in effective ecological risk assessment and management. Securing social acceptance of nuclear technology including operation of power plants and minimizing environmental impacts is very important for sustainable development. There are plans to construct approximately 50 nuclear power plants in the region; hence, marine monitoring capabilities using radioisotope techniques need to be further developed and improved.

Integrated Coastal and Marine Information Management

Currently, there are 77 databases in the region containing marine and coastal ecosystem data belonging to various organizations and institutions (Box 1). Data and information are being collected and produced by various agencies and institutions at various levels in the region. However, it is noted that it is still very difficult to assess what coastal and marine data/information are currently available, and what other data would need to be collected. There is also no single body responsible for collecting information and monitoring the progress of various programs and projects.

Box 1. Online Coastal and Marine-related Databases, Metadatabases and Information Systems (Cooper, Jarayabhand and Liss).

77 databases in East Asia

- **28 Global organizations with 36 databases**
- **6 UN organizations with 20 databases**
- **8 Regional organizations with 8 databases**
- **13 National organizations with 13 databases**

Following is an overview of some of these databases and information systems, ranging from national to regional levels of coverage, and including varying ranges of information related to the management of coastal and marine areas.

Indonesia has a marine data and information management system comprised of a national data center at the Southeast Asia Center for Ocean Research and Monitoring (SEACORM) and various member nodes or data provider institutions that collect marine data. Serving a large variety of requirements in marine and maritime management, the database operates through web portals, which supply various marine information and a list of member nodes. It is equipped with a search engine that can perform information searches for each member node.

PEMSEA has developed and established in its integrated coastal management (ICM) and risk assessment/risk management (RA/RM) demonstration sites the Integrated Information Management System for Coastal and Marine Environment (IIMS). IIMS is a comprehensive database containing a wide range of data, including biological resources, social, economic, pollution sources, water quality and physiographic data. Designed to serve as a decision-support system for ICM, it aims to promote sharing and integration of data/information from various sectors and the use of scientific information for better informed coastal decision-making and management. IIMS has a user-friendly query system, can be linked with external software (such as a geographic information system or GIS) for enhanced analysis and can be configured for local, national and regional application. IIMS has been applied in PEMSEA demonstration sites across the region to support various activities, such as environmental profiling, coastal strategy preparation, risk assessment, coastal use zoning and environmental investments. Web-based networking in Manila Bay (Philippines) and Danang (Vietnam) and networking through a local area network in Nampho (DPR Korea) has

enhanced sharing and use of data and local ownership for the database. The Manila Bay Information Network currently consists of various bureaus and offices of the Department of Environment and Natural Resources (DENR). The network arrangements, supported by an administrative order, have produced a *Manila Bay Area Environmental Atlas* showing the applications of IIMS in various activities in the bay, and the Manila Bay Spatial Database. For wider application, the network will be expanded to include key national government agencies, academic institutions, concerned local government units and private sector groups.

In the Bohai Sea Environmental Management Project (PR China), a PEMSEA site on RA/RM, IIMS was recommended to be linked with existing GIS database (e.g., China Nearshore Marine Environmental Information Management System or CNMEIMS developed by the National Marine Data and Information Service). The linkage is expected to enhance spatial and temporal data analysis and improve access and use of information by various provinces along the Bohai Sea and eventually by the ICM parallel sites in China.

In the aftermath of the 2004 tsunami, the World Conservation Union (IUCN), in coordination with its tsunami coordinating centers in Thailand and Sri Lanka, established a regional information hub to facilitate effective and efficient post-tsunami reconstruction that mainstreams ecosystem concerns and sustainable coastal ecosystem management across the South and Southeast Asian region. The hub includes information on technical experts on environmental conservation and post-disaster ecosystem rehabilitation, technical references, and interventions and lessons learned from environmental components of post-tsunami reconstruction projects. It has promoted sharing of information and better coordination among agencies involved in post-tsunami rehabilitation.

The Southeast Asia Regional Learning Centre (SEA-RLC), a part of the Global Environment Facility (GEF) International Waters Learning Exchange and Resource Network (IW:LEARN) project, works with GEF projects and their partners to support their information needs and various efforts through improved online access to environmental information and communication technologies (ICTs). SEA-RLC provides ICT support and project management services using Plone-based content management systems and web-based ICT tools including GIS (webGIS). SEA-RLC has worked with the UNEP/GEF South China Sea Project and Southeast Asia START (Global Change SysTem for Analysis, Research and Training) Regional Centre of Chulalongkorn University in Bangkok, Thailand, to develop the South China Sea GIS Regional Database and South China Sea Meta-Database; and with the IW:LEARN office in Nairobi to develop a webGIS tool for the IW:LEARN Website Toolkit, an initiative to provide a more user-friendly alternative for delivering maps and geospatial content over the Internet. SEA-RLC is also developing information resources for an online library addressing diverse environmental issues.

Recognizing the numerous and varied efforts to generate and manage scientific data and information to support effective coastal and marine environmental and resource management in the East Asian region, the United Nations Environment Programme (UNEP) East Asian Seas Regional Coordinating Unit (EAS/RCU), in collaboration with the Tropical Marine Science Institute (TMSI) of the National University of Singapore, has initiated the development of a "one-stop-shop" EAS Knowledge-base. The Knowledge-base, a growing database which is still under development, is intended to track the progress of scientific data/information and determine what marine and coastal information is available. It will also access data and information on the coastal and marine environment, including establishing a regional database on existing programs, projects and activities. A pilot national database on the marine and coastal environment was initiated at the Center of Environmental Monitoring, Data and Information (CEMDI) of the Vietnam Environmental Protection Agency.

In the long term, other national databases will be developed and the

regional and national databases would be linked using best available internet technologies, allowing users to access data and information over the Internet. The EAS Knowledge-base would offer a platform to share information in the form of directories, resources by themes, metadata on coastal and marine-related projects and activities, project reports and lessons learned.

The pilot Vietnam National Database on the state of the marine environment was initiated in parallel with the Knowledge-base to address the need for a focal organization in the country to serve as a portal to access and share information at the national and regional levels. In the process of development, difficulties were encountered with regard to access, compatibility/comparability and sufficiency of data and information. There was no uniform standard and format for information and data collected. Inappropriate and overlapping coastal and marine management efforts and insufficient collaboration and coordination among concerned agencies and organizations further complicated the process. Despite the challenges, Vietnam, with its own resources and through the support provided by international organizations such as the UNEP EAS/RCU, has succeeded in developing a national database and portal on the state of the coastal and marine environment. This database facilitates access to coastal and marine environmental information for decision-makers, specialists and the general public.

The EAS Knowledge-base would offer a platform to share information in the form of directories, resources by themes, metadata on coastal and marine-related projects and activities, project reports and lessons learned.

Currently, there are numerous efforts involving in-country coordination and regional cooperation to generate and use best scientific evidence for fisheries development and management, build capacity on various aspects of data collection, management and application, harmonize statistical standards and classification, and share expertise, data and information. Further improvements are necessary, including:

- high-level policy recognition and support for better data and information management for planning and management;
- application of an integrated approach in planning and managing multiple water resource uses;
- enhanced collaboration and networking among agencies concerned with aquatic resource utilization and management;
- stakeholder participation using a co-management approach;
- enhanced use of information technology to facilitate data and information collection, integration and sharing;
- institutional and human capacity building;
- development of national reports on fisheries status and trends; and
- establishment of a regional scientific advisory arrangement for management.

Lessons learned from collaborative projects in Thailand, undertaken by the Plymouth Marine Laboratory, UK; The Museum of Natural History, UK; and the Department of Marine Science, Kasetsart University, Thailand, highlight the lack of biological information that limits the region's capacity to track biological effects of natural and human-related hazards. Much of the coastal biota is poorly studied, there are few specialists, and the limited information collected is not widely available. In the course of leading capacity-building activities to undertake biological surveys of coastal benthic fauna, as a basic building block in developing capacity for marine survey and monitoring, the following needs were recognized:

- political will to monitor;
- sharing of information at the national and regional levels;
- identifying specific areas of expertise to be built and

Box 2. Ways to Improve Access to Data and Information.

1. Linking existing databases in the East Asian seas region, using experiences from other regions, to enhance the access to available information;
2. Sharing lessons learned between countries inside and outside the East Asian seas region on successful data management initiatives;
3. Ensuring project data and information is archived and maintained for the stakeholders as effectively demonstrated by the IW:LEARN project;
4. Establishing and supporting a regional knowledgebase of programs and projects to encourage collaboration and information sharing among organizations and agencies in the region;
5. Synthesizing and interpreting available data and information to make it understandable for stakeholders in different countries;
6. Strengthening community involvement in data collection, management and dissemination in order to increase awareness and participation in conservation and resource management; and
7. Ensuring support from governments for long-term sustainability of useful project databases.

coordinating capacity-building activities within the region;

- using various media, including traditional methods, for data and information exchange and dissemination in addition to the internet;
- commitment to update and manage regional databases if these are to be established; and
- maintenance of skill base and security of trained specialists.

Two key deficiencies that the above cases have been aiming, and are still continuing, to address are access to data and inadequate data collection and monitoring. (See Box 2 for ways to improve access to data/information.)

Data collection and monitoring could be strengthened by: 1) Ensuring quality assurance and quality control to guarantee the precision, reliability and comparability of scientific data; and 2) Developing biological indicators and markers at species and community level to better measure pollution impacts, in line with the global trend.

Use of GIS and Database Tools for Natural Resource Management

A specialized tool for information management, the GIS is a powerful tool for synthesizing scientific data, identifying potential problems and solutions, promoting transparent use of information for science-based policy and strategy formulation, and improving effectiveness of coastal and environmental management. Experiences in the Republic of Korea, Thailand and Australia show that it is also an effective tool for strengthening stakeholder interest and involvement, encouraging a consensus approach in identifying issues and/or conflicts, and developing a shared vision and practical actions for conservation and sustainable resource use and management.

In RO Korea, several heavily contaminated coastal areas have been designated as special management areas, with the management scope including lands that are exerting impacts on particular marine and coastal environments. For each area, a Coastal Environmental Management Areas Information System (CEMAIS), is being established, which consists of integrated information on the marine environment and contaminants from land-based sources presented through an integrated webGIS, consisting of a web-based GIS system and coupled water quality and ecosystem models. The entire system has been completed in Kwang Yang Bay and development has started in Masan Bay and Shihwa Lake-Incheon Coastal Area, with planned replication in more areas. Development of the database is expected to promote more transparent and effective science-based management policies and legal and institutional arrangements, increase public awareness on marine ecosystem protection and enhance collaboration between the government and stakeholders.

In Thailand, the Capacity Strengthening for Management of Thailand's Andaman Sea Coastal Zone Project has used the process of GIS and database development and application to foster a collaborative approach to the management of two areas in the Andaman Sea coastal

zone (Trang Province and Similan Islands), drawing from experiences in Australia, particularly the Great Barrier Reef in using web-based GIS and databases to improve decision-making and enhance public awareness and participation in coastal management. The project is funded by the Australian Government's AusAID and the Royal Thai Government's Department of Marine and Coastal Resources (DMCR) and implemented by DMCR in conjunction with the SEA START RC, Sustainable Development Foundation (SDF) and Save Andaman Network (SAN).

Applied environmental GIS has facilitated consensus building among stakeholders.

In Trang province in southern Thailand, participatory methods in the development of GIS for ICM in an area near the Had Chao Mai National Park has produced a community-based GIS illustrating natural resources, legal zones, community fishing gears and fishing zonation, which revealed five types of legally managed zones in the area, with overlapping laws in some areas, and different degrees of conservation. Community-use zones also overlapped with the national park area where fishing is not allowed. This complexity has led to difficulties in law enforcement, disagreement within government, confusion within communities and even corruption and public disobedience, and highlighted the need to review and reshape conservation areas and consider new laws that ensure community rights and duties to protect local resources. Applied environmental GIS has been a valuable tool in promoting consensus regarding priority issues, developing common objectives, identifying potential solutions, and generating awareness, cooperation and goodwill for the implementation of multistakeholder ICM activities. The participatory methods employed in the development of the community-based GIS involved careful selection of stakeholder representatives, systematic consultation process and information gathering, and participatory mapping.

In the Similan Islands, coral reef assessments have been based on limited systematic surveys by scientific experts without consideration of relevant information and concerns from locals, divers and park rangers. A pilot web-based information system was developed to provide a transparent platform for accessing and sharing information and concerns on coral reef conditions among all stakeholders. Comprised of a GIS map server that uses high resolution aerial photographs as base maps, the database catalogues information from all sources since 1980, and allows open and restricted modes of access. Open access allows divers and the public to enter general information and photographs on particular reefs and to locate them on maps, and authorizes data providers to enter observations and raw data online through interactive data entry pages. Restricted access, which requires registration, enables reporting on specific issues such as illegal fishing and habitat damage, tracking of management actions taken by appropriate authorities and further communications with contributors. The system provides tourism operators, tourists and scientists with good information that could catalyze conservation and promote ecotourism. The system will be maintained by the DMCR through its

information technology (IT) unit, and will be expanded to cover other areas in the Andaman Sea and Gulf of Thailand.

Visual images in GIS conveys relevant environmental information more powerfully than words, making it a great awareness-raising tool. The participatory approach in developing GIS databases promotes collaboration and communication between the government, experts and communities, and encourages a consensus approach and shared vision for sustainable resource and environmental management. Successful implementation of applied environmental GIS requires support from the government and the meaningful participation of stakeholders. Web-based GIS makes information available to all stakeholders, enabling optimum use of common information and facilitating contributions and improvement to ensure that the GIS continues as a living resource.

Common Framework for State of the Coasts Reporting

Data, information and trends gathered from monitoring are only of value if the information are used successfully to effect sensible management and policy decisions. Effective reporting should inform managers on the effectiveness of management; policy and decision-makers on the need for decisions (and kinds of decisions); and the public on the status and need for action. Reporting demonstrates action and commitment by management and governments.

In Chonburi, Thailand, for example, a ship-based cassava flour loading activity, which is operated year-round in Sriracha Bay, has been considered an environmental concern for years by the surrounding municipalities. No concrete action was undertaken by concerned authorities, however, until monitoring results showed adverse conditions in the loading area with regard to sediment quality and benthic fauna relative to a reference area. Total suspended particulates were also higher in the vicinity of the loading area. Potential linkages of the results to cases of respiratory ailments and HABs in the area were suggested. The results of the study have been used to catalyze dialogues among concerned government units and agencies at the national and local levels, private enterprises, technical experts and other sectors to assess the process and impacts of ship-based cassava flour loading/unloading and to evaluate policies and legal arrangements pertinent to the operation.

More often, however, environmental reports remain as technical records of trends and conditions, and fail to stimulate necessary remedial actions. Considering the high cost of monitoring and the typically limited resources, monitoring information should be used more judiciously to effect meaningful decisions and actions.

Environmental reporting should be improved to enable it to catalyze necessary actions from various concerned parties for sustainable use and management of the marine resources and environment. At the regional level, effective environment reporting becomes more essential with the implementation of the SDS-SEA, to monitor progress and impact of SDS-SEA implementation, and determine future courses of action.

Many regional and global reporting initiatives exist and sharing of lessons learned from these initiatives allows report writers to understand best practices of successful reporting in order to improve subsequent reports and catalyze action for the sustainable use of the region's environment and resources.

The Global Coral Reef Status Reports

The experience of the Global Coral Reef Monitoring Network (GCRMN), the operational unit of the International Coral Reef Initiative, in the compilation, production and dissemination of four global coral reef status reports from 1998 to 2004 (and the tsunami report in 2005), has shown that a four- to six-paged summary report on volumes of national, regional and global reports, if it at all catches the attention of the media, may merit only 20 seconds in

the broadcast media and three paragraphs in the newspapers. Such news items focus on numbers that hit with the public and decision-makers, such as specific percentage decline in coral reefs. Taking into consideration that target groups receive competing messages daily and have short attention spans, it is highly important, in preparing a report, to have key messages that are delivered clearly and backed with numbers that are newsworthy. Reports should thus be produced in consultation with managers, stakeholders and resource users to ensure that the information is understandable and suits their specific needs, and to ensure that it is disseminated widely. GCRMN operates via 17 Nodes covering more than 85 countries.

The Environment Monitor

The World Bank, which prepares the *Environment Monitor*, a series of publications on environmental trends, applies a broad participatory process supported by a professional team for report drafting, and wide dissemination through a variety of media including videos for children. The *Environment Monitor* provides overviews of the state, trends, and pressures on environmental resources, assessment of economic impacts and costs of environmental degradation, review of policy and institutional issues, and key future challenges for sustainable environmental and resource management. The *Philippine Environment Monitor for 2005 on Coastal and Marine Resource Management* highlighted the economic value of the coastal resources, the severe pressure on these resources, the high cost of degradation and higher cost of restoration, the need for an integrated approach to management, the importance of appropriate policies and institutions and the role of environment champions and civil society. The report contains a trend scorecard that illustrates general trends, current status, pressures on the environment and institutional priorities (Figure 2); a map of hotspots that usually gets the attention of politicians; and numbers and economic terms that get the attention of decision-makers (e.g., percentage of decline in coral reefs, values and costs). Environment Monitors are prepared for Cambodia, Indonesia, Lao People's Democratic Republic, Mongolia, Papua New Guinea, Philippines, Thailand and Vietnam.

Integrated Report Card for the Great Barrier Reef

In Australia, environment reporting has largely been based on the "pressure-state-response-implications" standard model of the Organization for Economic Cooperation and Development (OECD). The OECD model served as starting point for the Australian State of the Environment report. The above approach, however, has been found to have little impact unless the knowledge and understanding of coastal resource users are integrated in the process of developing meaningful indicators of ecosystem health. Ecological, social and economic boundaries for the indicators (thresholds) also need to be developed to enable appropriate management responses. For the Great Barrier Reef and its catchments, an integrated report card system that incorporates such indicators and thresholds is being implemented by the Reef and Rainforest Research Centre through the Australian Government's Marine and Tropical Sciences Research Facility, in collaboration with scientific institutions, government agencies and community organizations. Reporting is now moving from the OECD approach to a more targeted issue-based format involving more stakeholder communication and incorporating more socioeconomic consequences into the assessments. This is expected to enhance the relevance of environment reports to policymakers and the public.

Transboundary Diagnostic Analysis

The guideline for Transboundary Diagnostic Analysis (TDA) developed by the SEA-RLC for implementation by associated GEF projects considers the following as essential principles in TDA formulation: 1) full stakeholder participation; 2) fact-finding and transparency; 3) ecosystem approach; 4) adaptive management and accountability; 5) inter-sectoral policy development and step-wise consensus building; 6) risk management; 7) inclusion of

Figure 2. A Trend Scorecard from the *Philippine Environment Monitor on Coastal and Marine Resource Management* Presenting Indicators, General Trends, Current Status and Priority Level.

INDICATOR	GENERAL TREND	STATUS AND COMMENTS	PRIORITY LEVEL
State of coastal and marine resources			
Condition of coral reefs	↘	Although reefs are considered to be declining nationwide, active coastal and marine protected areas in the Central Visayas are showing improvements in coral cover and fish abundances.	
Mangrove cover	→	In 1918, mangroves covered 450,000 hectares as opposed to 138,000 hectares today. Presently, mangroves are relatively stable and even increasing in selected areas of management in Visayas so that the overall rate of decline has lessened.	
Seagrass cover	↘	About half of the seagrass beds have been lost or degraded since 1950, and the rate of degradation is increasing due to land reclamation and pollution.	
Beach forest cover	↘	Almost all beach forest has been converted into settlements and coconut plantations. Larger blocks of intact beach forest exist only in very remote areas such as the coastline of Isabela Province, Luzon islets in the Sulu Sea, and the South China Sea including coastal protected areas of St. Paul's Subterranean River in Palawan.	
Fish stocks	↘	The main fish species and marine organisms are showing severe signs of overfishing. Despite the continued expansion of the country's commercial fishing fleet, total fish catch levelled off in the early 1900s.	
Catch per unit effort	↘	All fisheries are showing decline in total catch and per unit effort (total number of fish caught per unit of time) despite increasing effort. Fish are being harvested at a level 30 to 50 percent higher than the natural production capacity.	
Protection of marine species	↘	Many of the important marine species are threatened or have dissappeared from most of their former breeding ranges.	
State of coastal erosion	↘	Coastal erosion is increasing in areas adjacent to or near urban development centers. Sea level rise will exacerbate coastal erosion, especially in low-lying areas or near development.	
Pressure on coastal zone			
Population in coastal zone and its growth	↗	About 62 percent of the population lives in the coastal zone. The Philippines has one of the highest population growth rates in the world with an average annual rate of increase of 2.75 percent during the last century.	
Solid waste generation	↗	The generation of solid waste continues to increase from a minimum of 10.67 million ton per year in 2000 to a projected 14.05 million ton per year in 2010. Waste generation is highest in large cities and densely populated areas.	
Water pollution	↗	Most shore ecosystems near urbanized areas are threatened by nutrient loading. A recent study of 12 bays (major fishing grounds) found that organic nutrients were affecting water quality including high levels of heavy metal in some areas.	
Demand for fish and fishery products	↗	Estimates show that if the present rapid population growth and declining trend in fish production continue, only 10 kilograms of fish will be available per Filipino per year by 2010, as opposed to 28.5 kilograms per year in 2003.	
Erosion and sedimentartion	↗	Logging and unsustainable farming practices in recent decades have led to increasing soil erosion and frequent flooding. Soil erosion causes sedimentation that reduces light, smothers marine organisms, and prevents recovery areas that have been silted over.	

Low Priority  Medium Priority  High Priority 

partnerships and incremental costs; and 8) aligned actions and government commitment. The TDA formulation process involves the appointment of regional and national coordinators and multidisciplinary task teams; information and data collection and analysis; impact assessment; governance analysis covering stakeholder, institutional and legal and policy aspects; causal chain analysis to identify immediate root causes of priority environmental problems; preparation of draft synthesis national and regional TDA reports for public consultation; and adoption by governments. The process is highly participatory. The

TDA report is used as the basis for developing a Strategic Action Programme.

Recommendations for Effective Environmental Reporting

The above examples highlight that for environmental reports and processes to be effective in catalyzing necessary actions from various parties, a clear purpose and defined target audience at various levels (i.e., global, regional, national, sub-national), should be primarily considered. The reports should not appear as technical records but should be written in forms understandable to each target group, showing:

- clear statement of purpose;
- clear report of status and trends (unambiguous statements backed with quotes and data);
- concise concluding messages;
- suggested lines of action; and
- benefits of action (as well as losses of inaction).

Reports should integrate ecological and socioeconomic information, and should be prepared in consultation with stakeholders and users of the coastal environment. Clear and simple messages should be used, and repeated as appropriate, so that they become entrenched. Numbers should be used to highlight status and trends. Recommendations should adopt a positive outlook. Visuals and events should also be used advantageously to capture attention. Appropriate timing for delivery of messages is also important, such as related meetings or periods with no competing events.

The importance of a state of the coasts reporting system for the East Asian region was recognized by participants. However, taking into account the diversity of needs and approaches in environmental assessment and monitoring, a "common framework" may not be possible, and a few templates that work at a variety of scales may need to be developed.

Mainstreaming Science into Coastal Management

Major threats to the region's coastal marine ecosystems must be managed through full use of available scientific tools, techniques, data and information, as well as partnerships and collaborative arrangements, to support integrated policy development and coastal management. Constraints with regard to data and capacity gaps, and information generation, management, sharing and effective use would need to be addressed in a coordinated and systematic manner if effective coastal management at the national and regional levels is to be achieved.

Scientific expertise and tools to support various aspects of sustainable marine and coastal management are available in the region, waiting to be shared. New technologies for marine monitoring and information management, such as innovative and cost-effective pollution detection and management techniques, nuclear isotope techniques, integrated coastal and marine information management systems, applied environmental GIS, and integrated modeling should be adopted and adapted for specific regional needs. A holistic approach in coastal and ocean assessment and management, integrating a variety of techniques, should be applied.

With typically limited levels of national funding allocated for environmental management, sharing of resources might be a cost-effective approach to build and maintain the necessary capacity to monitor and manage the region's coastlines. This kind of cooperation could only be established with backing from governments, international agencies and other partners.

SDS-SEA and PEMSEA

The signing of the Haikou Partnership Agreement and Partnership Operating Arrangements by governments, non-government partners and international agencies during the EAS Congress 2006 has initiated a country-driven regional partnership that will guide regional cooperation in various aspects of ocean and coastal governance. The Agreement specifically establishes implementing arrangements for the SDS-SEA, which was adopted by

Box 3. Mechanisms to Address Disparities in Technical Capacities towards SDS-SEA Implementation.

- Establishing a Regional Task Force and country-based National Task Forces to serve as technical support network for countries;
- Engaging internationally and regionally recognized Areas of Excellence to facilitate inputs to improve awareness and understanding of coastal and marine ecosystems and their linkages with human activities, promote sound public policies and decision-making regarding sustainable development, apply scientifically sound technologies and practices in management interventions, and facilitate linkages among the scientific community, government, people, business and the environment, within the framework of the SDS-SEA;
- Linking with national universities and donors to augment scientific support to national and sub-national ICM programs and ecosystem-based management of watersheds and coastal areas;
- Organizing professional upgrading initiatives through internships, fellowships and specialized training at the national and sub-regional levels on various technical tools to facilitate scientific inputs to environmental management; and
- Establishing an internet-based information portal for building awareness and transferring knowledge and lessons learned regarding ICM and local, national and international partnership arrangements for SDS-SEA implementation, building upon PEMSEA's IIMS while strengthening linkage with and use of innovative technologies and software developed by the GEF IW-LEARN project. Linkages and collaborations with national and regional programs with established databases on marine and coastal environment and projects will also be strengthened.

countries in the region in December 2003, through the Putrajaya Declaration, as the region's common platform for achieving the goals and objectives of the World Summit on Sustainable Development (WSSD) Plan of Implementation and the United Nations Millennium Development Goals concerning sustainable coastal and ocean development. A 2006 report on the implementation of the WSSD goals on oceans shows that there are many efforts underway at the national and regional levels; however, crosscutting goals such as ecosystem management and integrated ocean and coastal management are not being tracked and results of efforts on the ground are not known. Implementation of the SDS-SEA would facilitate the attainment of these goals in the region as well as monitor on-the-ground outcomes and impacts.

To facilitate the implementation of the SDS-SEA, special focus will be given to applying innovative monitoring and assessment technologies and knowledge management strategies and tools to effectively utilize and augment the region's intellectual wealth on the oceans and coasts. Various mechanisms to address disparities in technical capacities and to mobilize technical assistance and support services for SDS-SEA implementation will be put in place (Box 3).

To monitor the progress and impacts of the implementation of the SDS-SEA, national State of the Coasts (SOC) reports will be prepared by national teams, following agreed framework and processes, and synthesized into a regional report by a regional team. The SOC will be prepared every three years coincident with the EAS Congress, which will be the primary venue for monitoring, reporting and evaluating the progress of SDS-SEA implementation. Clear reporting of the state of the marine environment is a very useful tool for communication to policymakers and all stakeholders regarding priority environmental concerns and the measures and resources required to assess and address these concerns.

The Meeting of Experts to Discuss the Framework for the SOC Reporting for the Seas of East Asia held in December 2006 in Haikou City, Hainan Province, P.R. China, agreed that the SOC reports should be management-oriented, presenting case studies to highlight good results and achievements at the local level. Common themes could be identified to plot the progress of SDS-SEA implementation. Preparation of the reports, which could be used as a vehicle for capacity building, should make use of existing assessments and partnerships. Some degree of flexibility will also be considered as there is no one-size-fits-all scenario in environmental reporting. PEMSEA was tasked to initiate the consultation process to get the consensus of countries regarding the preparation of the reports.

Successful implementation of the SDS-SEA would require bringing

together the region's intellectual and human resources to work in concert toward achieving the shared vision of a healthy and progressive environment and society in East Asia. Fueled by contributions from countries, international organizations and other partners, and standing on the strength of partnerships and commitment, implementation of the SDS-SEA will greatly rely on sound, relevant and timely scientific contributions to provide the basis for long-term efforts to safeguard and improve the quality of life and environment of the people of East Asia. ■

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Presentations

Anderson, D. "Multidisciplinary Approaches to Monitoring, Control and Management of Harmful Algal Blooms (HABs)." Seminar on Innovative Approaches and Technologies in Pollution Assessment and Monitoring.

Au, D. W. T. "Biological Monitoring: Why Bother and Successful Examples." Seminar on Innovative Approaches and Technologies in Pollution Assessment and Monitoring.

Chen, Z., L. Zhao and K. Lee. "Modeling and Assessment of the Produced Water Discharges Emitted from Offshore Petroleum Platform." Seminar on Innovative Approaches and Technologies in Pollution Assessment and Monitoring.

Cicin-Sain, B. "Preparing a Global Report on How Well Are We Doing in Meeting the 2010 WSSD Goals on Ecosystem Management and Integrated Coastal and Ocean Management." Seminar on the Common Framework for the State of the Coasts Reporting.

Cooper, R. "Developing Online Environmental Information Resources for International Waters Management in Southeast Asia." Seminar on Integrated Coastal and Marine Information Management.

Depledge, M. "Novel Approaches and Technologies in Pollution Assessment and Monitoring: A UK Perspective." Seminar on Innovative Approaches and Technologies in Pollution Assessment and Monitoring.

Duan, L., S. Li, Y. Liu, T. Jiang and P. Failler. "An Application of the Ecopath with Ecosim Model to the Pearl River Delta Coastal Sea." Seminar on Integrating Science into Coastal and Ocean Management.

Gervacio, B. "Enhancing Sustainable Management of the Coastal and Marine Areas through the Integrated Information Management System for Coastal and Marine Environment." Seminar on Integrated Coastal and Marine Information Management.

Hanggono, A. "Marine Data Management in Indonesia." Seminar on Integrated Coastal and Marine Information Management.

Hoang, D. T. "Vietnam's National Database on the State of Marine Environment." Seminar on Integrated Coastal and Marine Information Management.

Hotta, K., R. Guerrero III, S. S. Yong, Y. D. Kim and K. Okamoto. "An Experimental Study on the Effect of Ocean Fertilizer on the Growth of Seaweeds in the Philippines." Seminar on Integrating Science into Coastal and Ocean Management.

Hughes, C., A. A. Lubis, W. Glamore, R. Szymczak and J. Twining. "Hydrodynamic Model and Radioisotope Tracer Study to Predict Contaminant Transport for Ecological Risk Assessment of Jakarta Bay, Indonesia." Seminar on Radioisotope Technology for Coastal and Ocean Management.

Jeffree, R. "Applications of Radiotracer Techniques for the Assessment of Contaminant Bioaccumulation in Coastal Biota." Seminar on Radioisotope Technology for Coastal and Ocean Management.

Kendall, M., G. L. J. Paterson, and C. Aryuthaka. "Building and Maintaining the Capacity for Biological Monitoring." Seminar on Integrated Coastal and Marine Information Management.

Kim, J.D., H.J. Choi and W.K. Chang. "Geographic Information System for Marine Hotspots in RO Korea." Workshop on the Use of GIS and Database Tools for Natural Resource Management

Kirkman, H. and J. Kirkman. "Databases in Southeast Asia and the Need for Enhanced National and Regional Access." Seminar on Integrated Coastal and Marine Information Management.

Kong, R. Y. C., M. M. H. Mak and R. Wu. "DNA Technologies for Monitoring Waterborne Pathogens: A Revolution in Water Pollution Monitoring." Seminar on Innovative Approaches and Technologies in Pollution Assessment and Monitoring.

Lam, P. "Biomarker Assessment of Persistent Organic Pollutants in the Marine Environment." Seminar on Innovative Approaches and Technologies in Pollution Assessment and Monitoring.

Lee, J., K. W. Choi, P. Shin and R. Wu. "Determination of Carrying Capacity for Marine Coastal Waters: Challenges and Issues)." Seminar on Innovative Approaches and Technologies in Pollution Assessment and Monitoring.

Leung, K. M. Y. "Coastal Management: A Risk Assessment and Management Approach." Seminar on Innovative Approaches and Technologies in Pollution Assessment and Monitoring.

Lovei, M. "Coastal and Marine Resources Management in the Philippines: Challenges and the Road Ahead from the Philippines Environment Monitor 2005." Seminar on the Common Framework for the State of the Coasts Reporting.

Lubis, A. A., B. Aliyanta, C. Hughes and R. Szymczak. "Historical Record of Heavy Metals in Jakarta Bay, Indonesia Derived from Pb-210 Profiles." Seminar on Radioisotope Technology for Coastal and Ocean Management.

Ma, Z., Y. Yang, J. Dong and D. Ji. "The Future of the Integrated Information Management System and the PR China Nearshore Marine Environmental Information Management System." Seminar on Integrating Science into Coastal and Ocean Management.

Perera, N. "Improving Information and Communication for Coastal Resource Management in a Post-tsunami Context." Seminar on Integrated Coastal and Marine Information Management.

Prasertcharoensuk, R., J. Shott and D. S. Weston. "Applying Participatory Methods to the Development of a GIS for Integrated Marine and Coastal Management in Trang Province, Thailand." Workshop on the Use of GIS and Database Tools for Natural Resource Management.

Raju, D. and S. Jarayabhand. "Developing an East Asian Seas Knowledge-base for Coastal and Marine Information and Resources." Seminar on Integrated Coastal and Marine Information Management.

Reichelt, R. and S. Morris. "Integrated Report Card: Coastal Environments and Community Engagement." Seminar on the Common Framework for the State of the Coasts Reporting.

Sabater, M. and H. Narisma. "Enhancing the Management of Manila Bay Area through Integrated Information Management System." Seminar on Integrating Science into Coastal and Ocean Management."

Shin, P., K. W. Choi, J. Lee, and R. Wu. "Determining Carrying Capacity for Mariculture Sites: An Example from Hong Kong." Seminar on Innovative Approaches and Technologies in Pollution Assessment and Monitoring.

Snidvongs, A., W. Laongmanee, B. Siriampairat and C. Nungkamma. "Web-based Information System for Multiple Communication among Stakeholders in Coral Reef Management at Similan Islands, Thailand." Workshop on the Use of GIS and Database Tools for Natural Resource Management.

Sombrito, E., A. Bulos, E. Sta.Maria and R. Olivares. "Environmental Radioisotopes as Tracers of Pollution Transport." Seminar on Radioisotope Technology for Coastal and Ocean Management.

Sombrito, E., A. de Vera, M. C. Honrado, R. S. Tabbada and A. dela Rosa. "Isotope-based Techniques in the Management of Toxic Algal Bloom." Seminar on Radioisotope Technology for Coastal and Ocean Management.

Suraswadi, P., C. Chotiyaputta, M. Duangsawasdi, R. Prasertcharoensuk, A. Snidvongs, C. Wilkinson, R. Reichelt and D. Souter. "Application of Community-based GIS Approaches in the Development of Policies for Integrated Coastal Planning and Management at Local, Provincial and National Levels in Thailand and Australia." Workshop on the Use of GIS and Database Tools for Natural Resource Management.

Szymczak, R. "Development and Application of Coastal Ecosystem Contaminant Management Tools Utilizing Nuclear and Isotopic Techniques." Seminar on Radioisotope Technology for Coastal and Ocean Management.

Tam, N. F. Y. "Novel Technology in Pollutant Removal at Source and Bioremediation." Seminar on Innovative Approaches and Technologies in Pollution Assessment and Monitoring.

Teng, S.-K. and R. Cooper. "Practitioner Guidelines for Formulation of Transboundary Diagnostic Analysis (TDA) and Strategic Action Programme (SAP) in East Asian Seas Region." Seminar on the Common Framework for the State of the Coasts Reporting.

Tunkijjanukij, S., A. Intarachart and C. Thimkrajang. "Using Scientific Information to Address Specific Management Issues in Chonburi, Thailand: The Study on the Impacts of Transfer of Dusty Cassava Flour and Other Commodities in Sriracha Bay and Sichang Island, Thailand." Seminar on Integrating Science into Coastal and Ocean Management.

Wilkinson, C. and D. Souter. "Lessons Learned from Reporting on the Status of the World's Coral Reefs; the Global Coral Reef Monitoring Network Reports." Seminar on the Common Framework for the State of the Coasts Reporting.

Wongsanga, P. "Improving Better Understanding and Knowledge of Fisheries for Planning and Management in Southeast Asia: Experience and Challenges." Seminar on Integrated Coastal and Marine Information Management.

Wu, R., T. C. Lau, W. K.M. Fung, P. H. Ko, and K. M. Y. Leung. "An 'Artificial Mussel' for Monitoring Heavy Metals in Marine Environment." Seminar on Innovative Approaches and Technologies in Pollution Assessment and Monitoring.

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www.pemsea.org

The East Asian Seas Congress 2006

12-16 December
Haikou City, Hainan Province, PR China

Side Events

GEF SGP and PEMSEA Join Hands in Promoting Participation in SDS-SEA Implementation

The UNDP GEF Small Grants Programme (SGP) and PEMSEA facilitated the First Joint Meeting of the PMO Managers and National Coordinators to discuss the implementation of the PEMSEA-SGP Joint Communiqué on Community Participation on Sustainable Development. It aimed to: 1) review the objectives, goals and the processes of the SGP-PEMSEA Joint Communiqué; 2) identify project direction for the next three years; and 3) explore potential projects for implementation.

The meeting was attended by 33 participants from the Project Management Offices (PMOs) of the six participating countries, including: Cambodia, Indonesia, Malaysia, Philippines, Thailand and Vietnam. In addition, four SGP National Coordinators from four countries (Cambodia, Philippines, Thailand and Vietnam) were in attendance. The joint meeting provided an opportunity for both groups to interact and be familiar with the process of implementation of the Joint Initiative.

Being the first meeting of the PMO Managers and the SGP National Coordinators, the participants discussed the process of implementation and the roles and responsibilities of Partners in the implementation of the Joint Initiative. It was clarified that the PMO's role would be to: 1) verify the credibility of the proponents, ensuring that they have the capacity to implement the project and sustain it after the funding from SGP ceases; 2) facilitate the approval process by providing assistance to the proponent to package the proposals based on the criteria set by SGP and the needs of the sites as stipulated in the site's Coastal Strategy; 3) coordinate with local organizations in the development of the proposals; and 4) screen and prioritize proposals before submitting them to PEMSEA for further evaluation.

During the meeting, it was imparted that the partnership aims to maximize the capacities and expertise of both the SGP and PEMSEA. As a partnership initiative, all parties involved in the implementation process should recognize and be more conscious of the strengths and limitations of their counterparts. The Joint Initiative is based on the recognition that no single organization can have the full capacity and authority to implement and sustain the project and, as such, all parties should seriously consider their commitments to the projects.

During the meeting, the partners were also encouraged to conduct planning at the country level so that the implementation and monitoring framework can be established on how the Joint Initiative will work for each of the six participating countries. The plan of implementation has two major targets common to all countries: each site should have at least one project approved and implemented within the year; and there should be greater participation by nongovernmental, people's and community-based organizations in meetings and conferences at the sub-national and national levels.

The PMO managers and staff expressed their support to the initiative, particularly in the process of assisting local organizations in the development of project proposals and if approved, its implementation. They expressed support in realizing the objectives of the SDS-SEA and their site's respective coastal strategies.

The meeting was organized by PEMSEA and chaired by Ms. Angie Cunanan, National Coordinator of the UNDP GEF SGP — Philippines. More information about the project can be accessed at www.pemsea.org. Inquiries can also be directed to info@pemsea.org.

Experts Meet for State of the Coasts Reporting Framework for the Seas of East Asia

The need to establish a regular reporting system for the State of the Coasts (SOC) at the regional and national levels to monitor the progress of implementation of the action programs contained in the SDS-SEA was recognized by participating countries, stakeholders, and key partners. To materialize this objective, the Meeting of Experts to Discuss the Framework for the SOC Reporting for the Seas of East Asia was conducted as one of the side meetings of the East Asian Seas Congress 2006. Held 15 December 2006 at the China Institute for Reform and Development, the purpose of the meeting was to discuss the development of an efficient and cost-effective monitoring system involving stakeholders at the national and local levels, as well as the production of an SOC report every three years.

During the meeting, experts agreed on the need for the SOC to monitor the implementation of the SDS-SEA and to build on existing assessment. They also agreed to: identify common themes to plot the progress of SDS-SEA implementation; use existing partnerships that have already been forged through long years of cooperation; use the development of the SOC as a vehicle for capacity building, allowing for some degree of flexibility be considered as there is no "one-size-fits-all" scenario; and use case studies to highlight good results/achievements at the local level. They also agreed that the report should be management-oriented.

Results and recommendations from the EAS Congress 2006 Seminar on the Common Framework for the State of the Coasts Reporting were also presented and discussed in the meeting. These were viewed to be particularly beneficial because of the global nature of the marine and coastal assessment and reporting systems presented. The seminar highlighted the development of regular reporting systems and processes, a clear purpose, and the identification of the target audiences at the global, regional, national and sub-national levels.

The SOC Report was designed to provide information to policymakers, environment and natural resource managers, and those interested in the development of the ocean and coastal resources or on the current conditions of the marine and coastal resources. The Report will also look into the current trends and changes; the driving forces behind these trends; the social, economic and environmental implications of identified changes; and the responses of countries and other sectors as related to the implementation of the SDS-SEA and the effectiveness of such responses. The SOC Report will be released on a triennial basis to coincide with the EAS Congress, with the first report to be released in December 2009.

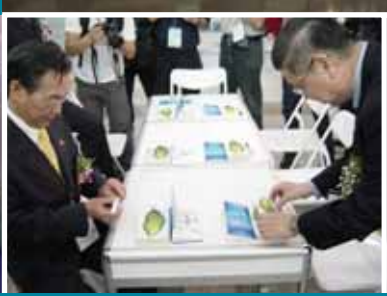
The meeting was co-chaired by Dr. Aprilani Soegiarto, Advisor, Indonesian Institute of Sciences, and Dr. Gil Jacinto, Professor, Marine Science Institute, University of the Philippines. Dr. Russell Reichelt, Managing Director, Reef and Rainforest Research Centre, Australia, presented the results and recommendations from the EAS Congress 2006 Seminar on the Common Framework for the SOC Reporting. The background on the proposed SOC Reporting for the Seas of East Asia, including the details of the proposed process and expectations of the meeting was presented by Ms. Nancy Bermas-Atrigenio, PEMSEA Technical Officer. Fourteen experts representing Australia, France, PR China, Indonesia, Malaysia, Philippines, Republic of Korea, Singapore, Thailand and Vietnam participated in the meeting.

Ripples of Change: The EAS Congress Exhibition

About 40 PEMSEA Partners and sites shared their outputs, progress, success and lessons in their efforts towards sustainable coastal development in the East Asian Seas Congress Exhibition under the theme "Ripples of Change." These partnerships developed in the East Asian region for ocean and coastal management have created continuous ripples of change through activities and programs initiated at the local, national and regional levels; through leveraged multistakeholder partnerships; and by developing a self-sustaining mechanism of regional cooperation.

The exhibition also featured a Partnership Tree, which was created "one leaf at a time." Dignitaries and participants signified their efforts and commitment towards sustainable development by filling the branches of the Tree with signatures.

In line with the theme, the PEMSEA Central Theme Exhibit symbolized "One Drop Creating Ripples of Changes." Focusing on the value, interconnectivity and people of the Seas of East Asia, it also presented a timeline of PEMSEA key milestones, including the Sustainable Development Strategy for the Seas of East Asia, the Putrajaya Declaration and implementing arrangements of regional cooperation. The collaborative efforts of PEMSEA Participating Countries, with a common vision to ensure sustainable development, form one significant drop, creating the many ripples of change that can reverse the tides of environmental degradation and bring forward sustainable development for the coasts and seas of the region.

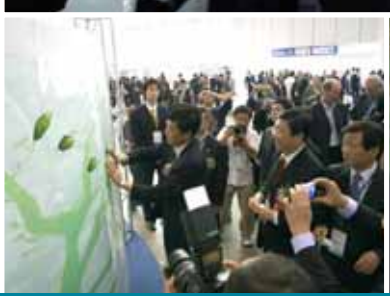



EAS Congress
Partnership Tree 伙伴树


C1
C2


PEMSEA Publications
PEMSEA


Partnership Tree 伙伴树



EAS Congress Participants Explore Haikou City and Surrounding Areas

One of the EAS Congress Side Events, the field trip was held on 15 December 2006 and was attended by more than 250 participants. The field trip enabled participants to visit areas around Haikou City, with the trip focusing on resource conservation, pollution prevention and sustainable management in the City.

The participants explored the Haikou Shishan Volcano Group, a national geologic park, located in Shishian and Yongxing Villages about 15-km southwest of Haikou City. The Haikou Shishan Volcano Group is a unique geological wonder covering 40 volcanoes formed ten thousand years ago. The volcano group is a natural museum featuring basalt gardens, unique rock formations, lava tunnels and *pahoehoe* lava flows (basaltic lava with a smooth or ropy surface), mystical craters and volcanic stone implements.

Participants then visited the beautiful beaches along the west coast of Haikou City. Here, participants also witnessed the development undertaken along the coastal areas to boost the City's tourism industry.

The Haikou Baishamen Sewage Treatment Plant (STP), located on the northern shores of Baishamen in Haidan, Haikou, was also part of the field trip. The STP was designed to capture wastewater from the central district of Haikou City. The system consists of inlet works with coarse and fine screens, aerated grit/grease chambers, a high load biological process with sedimentation, sludge thickening, digestion and dewatering, as well as biogas utilization.

The effluent water is discharged to the sea through a sea outfall consisting of a pipe approximately 1.4 km long and 2 m in diameter. The stabilized sludge from the dewatering unit is utilized as fertilizer.

The Hainan Dongzhaigang Mangrove Reserve is a Ramsar site and is known as the largest and the first mangrove natural reserve area in China. It is located about 30 km northeast of Haikou City with a total area of about 5,400 ha. The reserve consists of one ecological unit of a tropical inter-tidal mangrove forest with associated mudflats and sandflats. The mangrove reserve is home to 17 endemic mangrove species and about 159 species of birds, including those considered threatened and rare. The reserve also supports three globally threatened species of birds and a large number of fish species and marine invertebrates.

A boat trip around the mangrove allowed the participants to witness the richness of the mangrove reserve. Local mangrove-based ecotourism is well established in the area, featuring boat trips and restaurants serving seafood and other local delicacies.

Adjoining the Dongzhaigang Mangrove Reserve is the town of Yanfeng which is known for its ecological villages. The town is the first ecological community established in the province of Hainan. Among the 208 villages in Yanfeng Town, 92 villages are located in the northern section, which are established as demonstration sites of the whole province in establishing ecological communities. The villages develop sustainable tourism and agriculture based on the mangrove habitat and resources and undertake initiatives to protect the environment and preserve their ancient culture. Villages established parks, roads and wall paintings, initiated a waste management system, set up village cultural centers, and formulated village regulations and management plans.

The old villagers' living relics, such as old wells, huts and houses showcased the harmony between the natural environment and human activities, environmental protection and economic development, and traditional culture and contemporary living.

The ecological villages of Yanfeng Town represent not only the typical contemporary countryside but also the future trend of rural areas in Hainan. It is also a reflection of the comprehensive benefits that can result from successful mangrove preservation.

The Solution is with the People

continued from page 2

Supporting these initiatives are civil society organizations, and academic and scientific institutions that guide communities and decision-makers with an opportunity to shift from a "trial and error" management approach to a more informed, participatory and scientifically-based decision-making process. In many cases, civil society organizations have made it possible to bridge the gap brought by differing ideologies and beliefs between the local communities and their governments. Academic and research institutions also continually try to find useful solutions to better understand the complex problems of coastal and marine management. The use of scientific advice, however, does not necessarily equate to technologically advanced and expensive equipment but a better understanding of the available resources and best methods with which to use these tools.

Initiatives to promote the ecosystem-based approach and the use of scientific methods in management facilitate improved understanding of the capacities and dynamics of relationships between and among actors and players in coastal management. The effective use of management tools requires the gradual shift of values and norms among social groups that will ultimately utilize such advances. Capacity disparity continues to be a challenge across sectors, institutions, and governments, necessitating continual capacity development efforts in order for these approaches to be appreciated and fully utilized.

A systems approach to capacity development – one that targets individuals and institutions – is most effective. Such an approach not only addresses the issue of what needs to be done (prioritization), how it should be done (technical capacity), but more importantly, it deals with the question of "who benefits?" For example, the move to mainstream the participation of women and youth is seen as a critical aspect of capacity development. These two groups have been historically marginalized from the process of decision-making and implementation of management programs, even though they compose a large percentage of the population in the region.

Overall, the conference emphasized that the localization of the Sustainable Development Strategy for the Seas of East Asia (SDS-SEA), through the development, adoption and implementation of coastal strategies at the municipal and provincial levels, helps to elevate the participation of communities in the implementation of the regional strategy. The participation of local communities effectively grounds the regional management framework in local realities, thereby resulting in a practical, problem-solving mode of operation. Such an approach is appealing to governments, non-government partners, the academe, the business sector and international agencies and organizations alike, and further solidifies SDS-SEA implementation and its goal of sustainable development.

Resonant of the non-fisher's suggestion, a philosopher once claimed that history repeats itself – first as a tragedy, second as a farce. Third offence is not an option. As we continue to swim against the tide of change, diversity and plurarity, we can only hope that change happens before the second or third offence and continue the fight for sustainable coastal and marine management. In a region beset with poverty and its complex manifestations and root causes, coastal and marine management means managing the most important resource – the people. Where problems are about the people, the solution is still with the people. It is time that we prove this true. ■

Ecosystem-based Management

continued from page 49

Xiao, Y., G. Chen and Y. Peng. "Quantitative Study on Eco-environmental Water Requirements for Coastal Wetland and Its Application to Shantou Wetland Demonstration Site in South China Sea." Workshop on Habitat Management and Restoration (Workshop I - From Knowledge to Practices in Habitat Management and Restoration).

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The East Asian Seas Congress 2009

Partnerships At Work: Local Implementation And Good Practices

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The East Asian Seas Congress 2009

Partnerships At Work. Local Implementation And Good Practices

For inquiries, contact:

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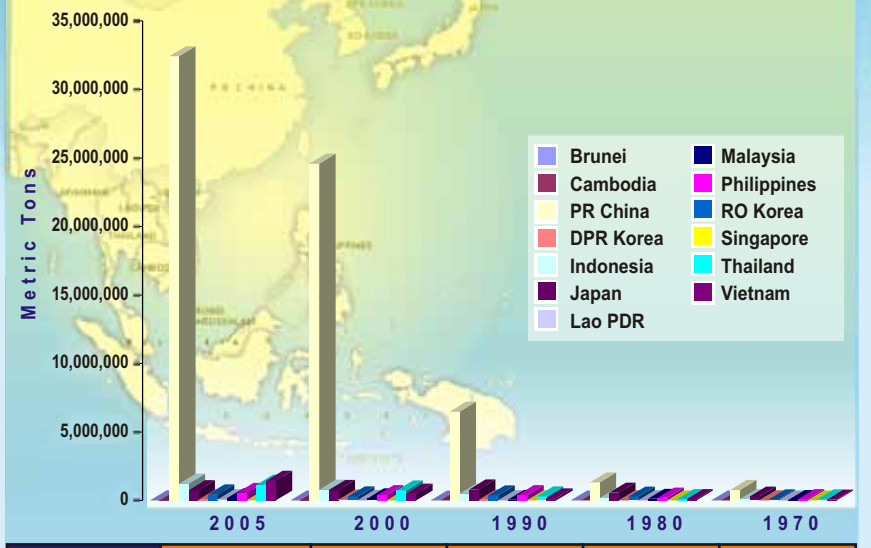
Total Aquaculture Production



Country	2005	2000	1990	1980	1970
BRUNEI	708	113	6		
CAMBODIA	26,000	14,430	6,400	106	
PR CHINA	32,414,117.9	24,580,671	6,482,402	1,316,278	764,380
DPR KOREA	63,700	66,700	55,000	9,267	1,845
INDONESIA	1,213,457	788,500	499,824	182,522	106,867
JAPAN	746,221	762,824	804,293	572,938	289,204
LAO PDR	78,000	42,066	10,000	1,408	160
MALAYSIA	175,834	151,773	52,919	125,334	34,296
PHILIPPINES	557,251	393,863	379,940	286,757	80.773
RO KOREA	436,232	293,420	376,683	211,753	176,928
SINGAPORE	5,917	5,112	1,857	91	10
THAILAND	1,144,011	738,155	291,719	95,966	80,876
TIMOR-LESTE					
VIETNAM	1,437,300	498,517	160,076	98,160	64,750

Note: In metric tons

Number of People Employed in Fishing and Aquaculture*

Country	% Population Within 100 km of Coast 2000	2000	1990	1980	1970
BRUNEI	99.9	1,355	1,900	722	1,130
CAMBODIA	23.8	73,425	37,695	13,100	10,000
PR CHINA	24	12,233,128	9.092,926	2,950,344	2,300,000
DPR KOREA	92.9	129,000	129,000	140,000	133,000
INDONESIA	95.9	5,118,571	3,617,586	2,231,515	841,627
JAPAN	96.4	260,200	303,400	376,880	437,900
LAO PDR		15,000	15,000	11,800	10,000
MALAYSIA	98	100,666	88,494	119,642	81,729
PHILIPPINES	100	990,872	898,000	781,500	1,047,441
RO KOREA	100	176,928	211,753	298,122	367,645
SINGAPORE		364	836	2,025	1,919
THAILAND	38.7	354,495	207,019	86,188	74,086
TIMOR-LESTE		4,057			116
VIETNAM	82.8	1,000,000	800,000	330,000	317,440

* People employed in fishing and aquaculture includes the number of people employed in commercial and subsistence fishing (both personnel on fishing vessels and on shore), operating in freshwater, brackish and marine areas, and in aquaculture production activities.

People, Production and Pressure

Globally, 2.2 billion people or 39% of the planet's population live within 100 km of the coast (CIESIN, WRI and IFPRI, 2000). In the East Asian region, about 1.3 billion people live within 100 km of the coastline (Chua, 2006). The region's coastal and marine resources provide a rich source of food and livelihood, not only for the region, but also globally.

As of 2000, about 20.5 million people were employed in fishing and aquaculture. The Food and Agriculture Organization statistics show that mariculture production has grown from 12 million tons in 1995 to around 27 million tons in 2004, with China contributing the biggest volume.

With rapid urbanization, development and population growth, tremendous pressure is exerted on the coastal and marine environment. These trends show that the need to achieve sustainable development is crucial more than ever.

Unfortunately, government-managed models have proved to be largely unsuccessful in managing fishery resources, especially in developing countries. Based on experience in many parts of the world, it has become increasingly obvious that policy and management will not be effective unless those that harvest and benefit from the resource (communities, fishers and fish workers) are fully involved in the process. Focus has therefore now shifted from scientific/economic management models to those of participatory community-based management in cooperation with government. This merger has resulted in a co-management system in many areas that involve both governments and communities/resource users in sharing decision-making and planning to varying degrees.

Co-management describes the spectrum of shared management between the extremes of exclusively community-based management (with full devolution of responsibility to communities/fishers) through to central government management (with full responsibility controlled by government).

Recent experience with piloting co-management in many countries in the region has shown that the process can be very successful and that those harvesting the resources are capable of managing the fishery for specific purposes (this may not always focus in the resource that may be more directed towards conflict reduction, removal of destructive gear, etc). Unfortunately, these management systems are often donor-driven and there are many examples where co-management initiatives were not sustained after project and donor support were removed. For the approach to be successful, co-management must be mainstreamed into everyday management practices.

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