Tropical Coasts

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CALL TO ACTION

Disaster Risk Reduction and Post-Tsunami Reconstruction

Safer Coasts, Living with Risks

Danilo Bonga
Issue Editor

Seven months after the tsunami, images of devastation still linger on everyone's mind. There is no doubt that the disaster has stirred compassion and empathy and a greater resolve from our leaders not to let this event of horrific magnitude happen again. Tsunamis and other natural coastal hazards are inevitable but their impacts can be mitigated. Disaster management practitioners have time and again highlighted that disasters can, in most cases, be prevented. It is thus unconscionable that the usual attitude and response to disasters remain a vicious cycle (disaster–relief operations–damage assessment–planning workshop) in due time the strategies will soon be forgotten until another disaster strikes again.

This time has to be different. The guiding mantra — though cliché — "It is the most opportune time to make things right" has to ring true. The tsunami is too great a loss that the 'political commitment window' has been opened much wider given the tremendous mileage from the media coverage, the vast information disseminated and the apparent locking of heads of various institutions, governments and states.

The tsunami reconstruction is now serving as a significant platform given the tragedy's immense power to focus empathy into strategic actions. But the bottom-line is to pursue objectives that serve multi-hazard mitigation as these guidelines, when properly established, are strategies that can apply also to other natural and man-made hazards, be they recurrent or extreme infrequent events. It is also imperative that vulnerability issues (poverty, pollution and other environmental degradation, settlement, urbanization, sanitation, etc.) be central to disaster management. Klaus Toepfer, Executive Director, UNEP, refers to the 'silent tsunamis' — poverty, hunger, dirty water, poor sanitation — that greatly exacerbate the impacts of hazards.

This issue of the *Tropical Coasts* adds another layer to the vast and instructive documents and case studies that have since been published regarding natural hazard and disaster management. Albeit very limited in scope, this issue aims to target the coastal management practitioners, who may have inadvertently missed out on the relevance and importance of integrating 'natural hazard thinking' to integrated coastal management (ICM).

The articles are grouped into four sections. *Towards Integrated Disaster Risk Reduction Strategies* showcases the articulation of the culture of prevention, safety and mitigation that underpin the goals of the overarching sustainable development principles. Such are envisioned to decrease vulnerabilities, hence increasing the communities' resilience, to disasters and to create a "safer world for all" (Kelman and Abramovitz). Narcise's article underscores the role of the ICM process and framework in integrating hazard management to development planning and coastal management. She opines that there is no need to reinvent the wheel as the "implementation arrangements, processes, tools and applications are already in place and could be expanded to support hazard management considerations." *On Post-Tsunami Reconstruction* articulates several dimensions of the process of instituting strategies that must encompass not only reconstructing infrastructure but also ensuring protection of biodiversity and rebuilding sustainable livelihoods as well. Datta and Adriaanse, Llewellyn, et al., and Manuta, et al. highlight the principles and the wide-ranging scope and breadth to reconstruct human dignity in the aftermath of the tsunami.

The Approaches — albeit, very limited — encompasses measures to create life-saving belts (Harakunarak and Aksornkoae) and on rehabilitating degraded mangrove areas (Tamin) to re-establish the natural defense walls of the coasts. Delica-Willison, on the other hand, exhorts the widespread practice of community-based disaster risk management (CBDRM). She argues that awareness and preparedness education are vital as they show that inability to respond during emergencies is basically relative to inadequate knowledge; once shown how, communities can willingly muster enough resources and creative solutions. The articles on mitigating red tide (Bajarias and Arcamo) and oil spill emergencies (Chan) point out that monitoring, surveillance and contingency-planning strategies can avert disasters that are basically man-made. *Reflections* section gathers opinions and contentious issues on two specific concerns: Harris reflects on the inappropriateness of Sri Lanka's move to strictly enforce the Coast Conservation Act (1981), particularly the no-build zone, given the prevailing conditions and stakeholders that have tremendously changed from those that were initially targeted by the law. Johnstone-Bryden, on the other hand, zeroes-in on climate change/global warming and how 'scientifically fashionable' it is to pin all blame solely on pollution and anthropogenic inputs at the expense of other equally important issues that could comprehensively address climate change.

May this issue be an eye-opener for ICM practitioners to heed wisdom gained from the tsunami tragedy. The call is to see the opportunities from the crisis and greater articulation on how to operationalize the culture of prevention and safety. Given that risks to disasters have become commonplace and have increased the vulnerability of people living at the coasts, the opportunity is to institute immediate actions that would keep the momentum gained from ICM. The operative challenge is to include both the natural and man-made hazards into the ICM processes. The bottom-line is that ICM managers and local leaders have the moral obligation to institute mitigation measures and not wait for disasters to happen. The paradigm must shift into creating a culture where 'disasters that did not happen' are the norm instead of counting the number of deaths and destroyed properties when natural and man-made hazards wreak havoc.

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On the Cover

Call to Action: Disaster Risk Reduction and Post-Tsunami Reconstruction

In this issue of Tropical Coasts, disaster mitigation and prevention practices in Asia are shared. These successes prove that though natural hazards cannot be prevented, major disasters and tragedies can be mitigated.

Mangrove photo courtesy of Ampai Harakunarak

special feature

in this issue

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Thinking Ahead of Disaster

Coastal Risk and Opportunity

The sea provides resources essential for building and maintaining sustainable livelihoods and communities for people living along coastlines, yet it poses immense perils. The sea is not alone in presenting coastal dangers and opportunities; interactions amongst saltwater, freshwater, the land and the air drive forces that both create and destroy.

Wind can be harnessed to produce energy and drives storm surges to the shore, inundating coastal communities. Wave and current action erodes cliffs, forcing settlements to retreat inland, but shape natural harbors and build beautiful beaches. Tidal zones provide a rich variety of marine resources for harvesting yet they are sensitive to salinity or sediment conditions affected by upstream rainfall or drought, or water quality and temperature that can be altered by human, industrial, commercial or agricultural effluents.

Photo courtesy of the National Geophysical Data Center's photo library, National Oceanic and Atmospheric Administration, Department of Commerce, U.S.A Government.

A view of tsunami and related fire damage on southeast Okushiri Island in the community of Aonae following the 12 July 1993 tsunami.

Opportunities can be influenced by risks and risks can provide chances for opportunity. In the dynamic coastal zone, at the interface of land, water and air, extreme natural cycles and powerful environmental processes are the norm. From the daily, monthly, yearly and decadal tidal cycles to the rare appearance of a new volcanic isle, managing life, livelihoods, and the built and natural environments in coastal zones means managing change. If such change is not recognized or not accepted, or if it is poorly managed, then disasters are inevitable.

Despite millennia of experience with the environment and its extremes, many people and communities do not see, or choose to ignore, the linkages which underpin a productive yet secure existence with the natural forces of change. There is a crucial set of relationships amongst sustainability, development, and managing extreme events which needs to be cultivated so that extreme, and often infrequent, events do not become disasters (e.g., see ISDR, 2004a; 2005).

Many of these changes and threats increasingly result from human activity. Pollution in the East Asian seas ranges

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from livestock effluent affecting migratory birds on the Manko tidal flat, Okinawa Island (Tashiro, et al., 2003) to oil spills in the Malacca Straits (Chua, et al., 2000). The Malacca Straits epitomize much of the chronic human-induced damage being done to the region's seas. Harmful algal blooms (HABs) have been reported on both sides of the Straits and along most of China's coastline. Overfishing occurs along the Straits and in the Gulf of Thailand where serious conflicts have occurred between commercial operators and small-scale subsistence fishers.

The latter example illustrates the rush towards economic development with scant regard for environmental and natural resource stewardship. Rapid, short-term economic gain is seen as more important than the rapid, long-term losses which are incurred. Using dynamite and cyanide for fishing, prevalent around the Philippines, is another example. While these may be easy methods for rapidly generating revenue, they soon leave a legacy of environmental destruction that precludes fishing-related livelihoods for generations.

When livelihoods and coasts are damaged through such pursuits, the population's vulnerability increases to extreme events as well as to a slow decline in health, communities and opportunities. Such risks must be faced within the wider context of rapid global changes. An altered

Photo by Ilan Kelman, 2004.

The south coast of Viti Levu, Fiji.

Box 1: Selected Examples of Coastal Risks and Opportunities.

Location	Event	Risk and Opportunity
Bangladesh	Cyclone and storm surge	Two events of similar intensity yielded different consequences: on 25 May 1985, 11,069 people were killed but on 19 May 1997, due to early warning and appropriate action, 127 people died (Akhand, 1998).
Fiji	Coastal pollution	Agricultural and waste run-off along with soil erosion has been killing coral reefs along Viti Levu's south coast. Environmental restoration projects to regenerate and protect corals include partnerships with tourist resorts to reduce pollution in effluent, tree planting in the highlands and mangrove planting along the coasts (ADB, 2003).
Indian Ocean countries	Earthquake-generated tsunami	On 26 December 2004, one of the most powerful earthquakes during the last century occurred off Sumatra's coast and produced an immense tsunami. More than 300,000 people perished across more than a dozen countries around the Indian Ocean. Yet on the Indonesian island of Simeuleu near the epicentre, only a few people died because the people remembered from a 1907 event that a tsunami could follow an earthquake. They immediately fled the coast after they felt the tremor, and survived.
Philippines	Coastal erosion	In San Fernando, La Union, natural processes and human damage combine to yield significant coastal erosion. Attempts to use structural measures to protect the coastline failed. A combination of solutions is now being adopted, including mangrove rehabilitation and building structures on stilts above the water to minimize interference with sediment transport. Human impacts on the environment and the subsequent coastal erosion impacts on human livelihoods are being reduced (ISDR, 2005).

climate leading to more frequent and severe storms poses dangers for the East Asian seas along with associated rising sea levels which could make many coastal areas, including small islands, uninhabitable.

An International Framework for Disaster Risk Reduction

Disaster risk reduction is the conceptual framework of elements considered with the possibilities to minimize vulnerabilities and disaster risks throughout a society, to avoid (prevention) or to limit (mitigation and preparedness) the adverse impacts of hazards, within the broad context of sustainable development (ISDR, 2004b).

The United Nations' International Strategy for Disaster Reduction (ISDR) and its interagency secretariat (www.unisdr.org) advocates disaster risk reduction principles and practices by advancing them within international, regional, national and local sustainability and development frameworks. The ISDR aims at building disaster-resilient communities by promoting increased awareness of the importance of disaster reduction as an integral component of sustainable development, with the goal of reducing human, social, economic and environmental losses due to natural hazards and related technological and environmental disasters.

Photo by Ilan Kelman, 2004.

The riverfront of Shanghai, a coastal megacity subject to risks such as storm surge, windstorms, subsidence, disease and pollution.

Commitments to environmental management, sustainable development, good governance and human rights are all pertinent for effective disaster risk reduction. Similarly, for success to occur in these areas, disaster risk reduction is essential. To reduce disaster risks, a change of values is necessary. Rather than people relying on emergency response in reacting to disasters after damage has been done and losses have been incurred, their attitudes and behaviour should reflect knowledge of conditions and demonstrate actions based on that knowledge before events become catastrophic. Efforts are needed to implement long-term processes which minimize the likelihood of catastrophes.

To address such issues on a global basis, the United Nations convened the intergovernmental World Conference on Disaster Reduction (WCDR) in January 2005, in Kobe, Hyogo, Japan. The WCDR promoted "a safer world for all" and was held to:

- Increase the international profile of disaster risk reduction;
- Promote integration of disaster risk reduction into development planning and practice; and
- Strengthen local and national capacities to address the causes of disasters that continue to devastate and impede the development of many countries.

The conference concluded by adopting the Hyogo Framework for Action 2005-2015 (UN, 2005). By reaffirming that "sustainable development, poverty reduction, good

governance, and disaster risk reduction are mutually supportive objectives," five priorities for action were embraced in order to achieve "the substantial reduction of disaster losses, in lives and in the social, economic and environmental assets of communities and countries":

1. Ensuring that disaster risk reduction is a national and a local priority with a strong institutional basis for implementation;
2. Identifying, assessing and monitoring disaster risks, and enhancing early warning;
3. Using knowledge, innovation and education to build a culture of safety and resilience at all levels;
4. Reducing underlying risk factors; and
5. Strengthening disaster preparedness for effective response at all levels.

Specific activities are recommended in the Hyogo Framework which can be applied to East Asian coastal areas. One example mentioned for coastal floodplains is to "incorporate disaster risk assessment into rural development planning and management… including through the identification of land zones that are available and safe for human settlement." The suggestion to "provide easily understandable information on disaster risks and protection options" should incorporate relevant traditional knowledge and indigenous cultural heritage, tailored for different target audiences.

Fishing off the shores of Tongatapu, Tonga.

Photos by Ilan Kelman, 2004.

Selling the day's produce on Tongatapu, Tonga.

Coastal megacities — for instance, Jakarta, Manila and Tokyo — present particular challenges in this regard because many inhabitants have moved from their traditional settlements to the coastal cities. Traditional coastal and marine knowledge might be absent amongst such migrants. The heritage and knowledge of migrants, which can help them build livelihoods in the coastal environment, need to be identified and supported. At the same time, the inland factors which lead to migration towards the coast need to be addressed. This point is highlighted by the Hyogo Framework's suggestion to "promote diversified income options for populations in high-risk areas to reduce their vulnerability to hazards." Coastal areas are not only high risk, but are also opportune in lending themselves to diversified income possibilities from land, sea and the tidal zone in between.

There should be no implicit assumption that an event must happen before prevention and mitigation could be considered.

Disaster Risk Reduction around the East Asian Seas

The disaster risk reduction challenges faced by this region are large, but they can be surmounted. The key is linking coastal and marine livelihoods to the vulnerability and risks which are created. People do not live in coastal areas because they cannot understand the threats there. They live along the coasts because of the opportunities which have traditionally been present; livelihoods are made possible by the resources available. Effective disaster risk reduction needs to address the reasons why people continue to use coastal and marine resources, to support these activities, and to use elements within people's day-to-day lives to reduce their vulnerability to disasters.

The Pacific region illustrates an approach which could hold value for communities in the East Asian seas. The Comprehensive Hazard and Risk Management (CHARM) programme is focused within local communities but also assimilates risk awareness into the national planning processes. This process is supported by skill development, continuous training and advocacy for the implementation of risk reduction measures. Key principles include ensuring ownership by local participants within the country and links with national strategic plans. Consultation and frequent communication among communities, donors and development partners convey a message that risk reduction is vital to national development. CHARM has become a powerful public safety tool, changing perceptions about the practical feasibility of local risk reduction. Based on local community activities, it is cost-effective and has become part of an agreed regional programme able to attract external support.

Early warning projects around the East Asian region include the UN Environment Programme-Global Environment Facility's 2003 project "Emergency Response to Combat Forest Fires in Indonesia to Prevent Regional Haze in South East Asia." An early warning detection mechanism for fires has been established, including local risk assessments, an aerial surveillance regime for Sumatra and communication system improvements. Such efforts mitigate the risks to shipping evident from earlier haze emergencies while also reducing the amount of sediment run-off from burned areas into the ocean. Coastal environments are healthier, and fishing and sea-related trade become less dangerous.

The Asian Disaster Preparedness Center (ADPC) based in Thailand is a regional leader in developing and organizing education programmes. With its vision of "Safer communities and sustainable development through disaster reduction," ADPC's research and training includes topics on community-based disaster risk management, disaster mental health issues and training of trainers. This work highlights coastal areas as being particularly prone to hazards, with typhoons and salinity intrusion mentioned as key threats in Vietnam and storm surges, tsunamis and sea-level changes prominent hazards in the Philippines (Bildan, 2003).

The Asian Disaster Reduction Center (ADRC) in Japan has similarly strong programmes for disaster risk reduction in coastal areas of the East Asian seas. ADRC's tsunami education programme in Papua New Guinea was tested in 2000 when an earthquake-generated tsunami destroyed thousands of buildings along Papua New Guinea's coasts. Because of warning and education, there were no casualties (ISDR, 2004a). ADRC also implements their "town-watching" tool for which local residents team up with government officials and external experts to walk around a settlement identifying perils and opportunities (ISDR, 2005). This method has been successfully implemented in the coastal areas of Indonesia, Japan and Vietnam.

Since 1994, the Vietnam National Red Cross Society has been protecting and planting additional mangrove forests in coastal parts of the country to reduce wave and surge damage (IFRC, 2002). In addition to reducing damage from sea storms, the mangroves are a habitat for shellfish, which families harvest for food and trade, reducing malnutrition and providing income. Coastal livelihoods and disaster risk reduction can be supported through the same programme.

Conclusion

Coastlines of East Asian countries have provided lessons for the world which should not only be learned, but also applied. Considerable experience already exists to reduce disaster risks and case studies prove to be an effective means of transferring this knowledge into people's daily lives and livelihoods. Calls for action are not always matched by the resources to make activities happen — until a disaster occurs.

In previous years before the Indian Ocean tsunami in December 2004, several calls for a tsunami early warning system in the region have not been heeded. After the catastrophe, despite some initial hesitation by many governments, a global commitment of tens of millions of dollars for tsunami protection, specifically for early warning, was quickly realized. Any such initiative is far too late for the thousands who perished for lack of basic knowledge and simple warnings, which in hindsight would have been greatly economical considering the eventual losses incurred.

Yet a headlong rush into warning systems for the disaster which has already happened could compound an earlier error of ignoring clearly-identified threats. If the systems implemented do not apply lessons from past mistakes and do not match the Hyogo Framework's priorities for action, then how much would have been gained? Post-catastrophe resources and opportunities should be used for much more than only averting a recurrence of the just-experienced event.

There should be no implicit assumption that an event must happen before prevention and mitigation could be considered. Living productively and safely in coastal zones requires people to think about the risks before a disaster occurs. Coastal and marine resources must be used to build and sustain livelihoods and communities without increasing vulnerability. Thinking ahead of disasters would avoid being sidetracked by specific events and focus instead on the emphasis provided at the World Conference on Disaster Reduction to produce a safer world. Where the land, sea and air meet in the countries of the East Asian seas, the continuing process of coastal disaster risk reduction can and should be built around coastal resources, communities and livelihoods. ■

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Stemming the Tide of Disasters: Vulnerabilities and Disaster Risk Management

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The Rising Tide of Disaster

December 2004 marked the latest devastating reminder of our vulnerability to the power of natural disasters. An estimated 300,000 people died with another 1.6 million displaced by the tsunami caused by a 9.0 magnitude earthquake off the coast of northern Sumatra. A dozen nations in South Asia and East Africa were directly affected.

Recent decades have seen a dramatic rise in the frequency, severity, and cost of natural disasters. In fact, the 1990s set a new record for disasters worldwide. During the decade over $608 billion in measured economic losses resulted from natural catastrophes, an amount greater than during the previous four decades combined (Figure 1). The number of "great" catastrophes (requiring substantial outside assistance) has also increased, according to Munich Re, a reinsurer that collects global data. Economic losses can be especially devastating to poor countries.

While the wealthiest countries sustained 57.3 percent of the measured economic losses to disasters between 1985 and 1999, this represented only 2.5 percent of their GDP. In contrast, the poorest countries endured 24.4 percent of the economic toll of disasters, which added up to 13.4 percent of their GDP. And for the poorest countries, and the poorest people, little if any of the losses are insured. Worldwide, only one-fifth of all disaster losses were insured. The vast majority of insured losses, some 92 percent, were in industrial nations.

During the 20th century, more than 10 million people died from natural catastrophes. In earlier times it was not uncommon to lose hundreds of thousands of lives in a single great disaster. In the last 20 years, however, there have been only two such events — the cyclone and storm surge that hit Bangladesh in 1991 and took 139,000 lives, and last year's tsunami which claimed 300,000 lives.

Early warnings and disaster preparedness have been a significant factor in keeping the death toll of recent decades from reaching even higher — when they are in place. Sadly, the absence of an early warning system in the Indian Ocean contributed to the huge tsunami death toll. Advances in basic services, such as clean water and sanitation have reduced post disaster epidemics. Improved communications and rapid humanitarian response have also proved invaluable in saving lives.

While the death toll per event has declined in recent decades, the number of people affected has grown. In the last decade over 2 billion people worldwide

have been affected by disasters, about 211 million people per year. More people are now displaced by disasters than by conflict, according to the World Disasters Report.

Asia has been especially hard hit. The region is large and heavily populated, particularly in dangerous coastal areas. Asia's natural and social vulnerability is borne out by the statistics. Between 1985 and 1999 alone, Asia suffered 77 percent of all deaths, 90 percent of all those affected by disasters, and 45 percent of all recorded economic losses due to disasters, according to Munich Re.

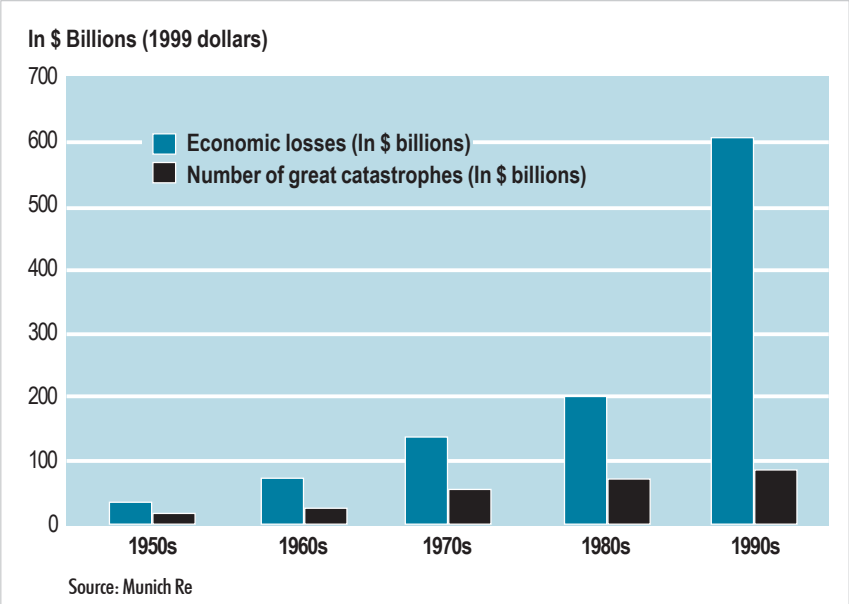


Figure 1. Rising Tide of Disasters by Decade.

Three major trends of the 20th century have greatly increased our vulnerability to natural hazards: demographic changes, ecological mismanagement, and climate change. Understanding these trends, and taking steps to address them, can help make us safer in the future.

Social Vulnerability

The enormous expansion of the human population and our built environment in the 20th century and the migration of people to cities and coasts mean that more people and more economic activities are vulnerable to the full array of natural hazards. And these disasters often take their heaviest toll on those who can least afford it — the poor.

Approximately 37 percent of the world's population — more than 2 billion people — live within a hundred kilometers of a coastline. In many coastal zones around the Indian Ocean and Southeast Asia, the population density exceeds 75,000 people per km^2. Coastal zones are especially vulnerable to storms, high winds, flooding, erosion, tidal waves and the effects of inland flooding.

Similarly, there has been an explosive growth of cities. Since 1950, the world's urban population has increased nearly fourfold. Today, the urban population — almost half the people in the world — is growing three times faster than the rural population. Many cities are also in coastal areas, further compounding the risks. Of the world's 19 megacities — those with over 10 million inhabitants — 13 are in coastal zones.

Ecological Vulnerability and Unnatural Disasters

Around the world, a growing share of the devastation triggered by "natural" disasters stems from ecologically destructive practices and from putting ourselves in harm's way. Many ecosystems have been frayed to the point where they are no longer resilient and able to withstand natural disturbances, setting the stage for "unnatural disasters," those made more frequent or more severe due to human actions. Deforestation impairs watersheds, raises the risk of fires, and contributes to climate change. Destruction of coastal wetlands, dunes, mangroves and reefs eliminates nature's shock absorbers for coastal storms. Such human-made changes end up making naturally vulnerable areas even more vulnerable to extreme

weather events. In effect, we have been unraveling the strands of a complex ecological safety net.

Our usual approach to natural disturbances is to try to prevent them through shortsighted strategies using methods that all too often exacerbate them. Dams and levees, for example, change the flow of rivers and can increase the frequency and severity of floods and droughts. Such ecological mismanagement is evident in China's Yangtze River. The watershed has lost 85 percent of its forest cover in recent decades. In addition, the Yangtze's natural flood controls had been undermined by numerous dams and levees, and a large proportion of the basin's wetlands and lakes, which usually act as natural sponges, had been filled in or drained. The areas previously left open to give floodwaters a place to go have been filled instead with waves of human settlements. All these changes reduced the capacity of the Yangtze's watershed to absorb rain, and greatly increased the speed and severity of the resulting runoff. The flooding in 1998 caused more than 4,000 deaths, affected 223 million people, inundated 25 million hectares of cropland, and cost well over $36 billion.

Climate Change

In the future the weather is likely to become more erratic and extreme as a result of climate change, according to the Intergovernmental Panel on Climate Change (IPCC). Impacts include increased coastal flooding and infrastructure damage due to sea-level rise and storm surges; higher maximum temperatures with more droughts, heat waves, and fires in many areas; more intense tropical storms; and more intense precipitation events over most regions that will increase floods and landslides.

Sea levels are already rising. During the 20th century, global average sea level rose by 10-20 cm, according to the IPCC, and it is projected to rise another 9-88 cm by 2100. But these are just averages. Some areas will likely experience sea level increases much higher than the global average. (It's also worth realizing that a 10-cm rise doesn't necessarily equate to a 10-cm loss of land. On flat sandy beaches, for example, a 10-cm rise can result in a 1,500-cm loss.) Some of the most heavily populated and disaster-prone areas of Asia, such as Bangladesh, Indonesia and Vietnam, are projected to lose substantial portions of their land to sea-level rise, with tens of millions of people directly affected, according to IPCC estimates (Table 1).

Coastal cities, river deltas and small islands will be especially vulnerable. Major river deltas like Bangladesh, the Amazon, the Mekong, the Mississippi, the Nile, and others would be at risk. Some small island nations may see their national territory disappear.

Storm surges will pose additional risk. The IPCC projects that the average number of people who would be flooded by coastal storm surges would increase severalfold, meaning some 75 million to 200 million more people would be affected every year, even under a mid-range increase in sea level. However, by taking measures to adapt to climate change these impacts could be reduced (Figure 2).

Some of the costs of climate change have already been felt, and they are projected to increase in the future. The direct economic costs of climate change worldwide could top $300 billion per year, according to Munich Re and the United Nations Environment Programme (UNEP). Individual nations could experience tens of billions of dollars in damage to coastal infrastructure from sea-level rise, notes the IPCC. It reports that evidence of climate change has already been observed in Asia, and that signs will become even more obvious in the next 10-20 years. The scientists' panel warns that "if this time is not used to design and implement adaptations, it may be too late to avoid more upheaval," and that such adaptations in Asia and elsewhere will be needed even if future greenhouse gas emissions are reduced.

Reducing Our Risks

The ever-rising human and economic toll of disasters provides clear evidence that a new way of managing ourselves and nature is in

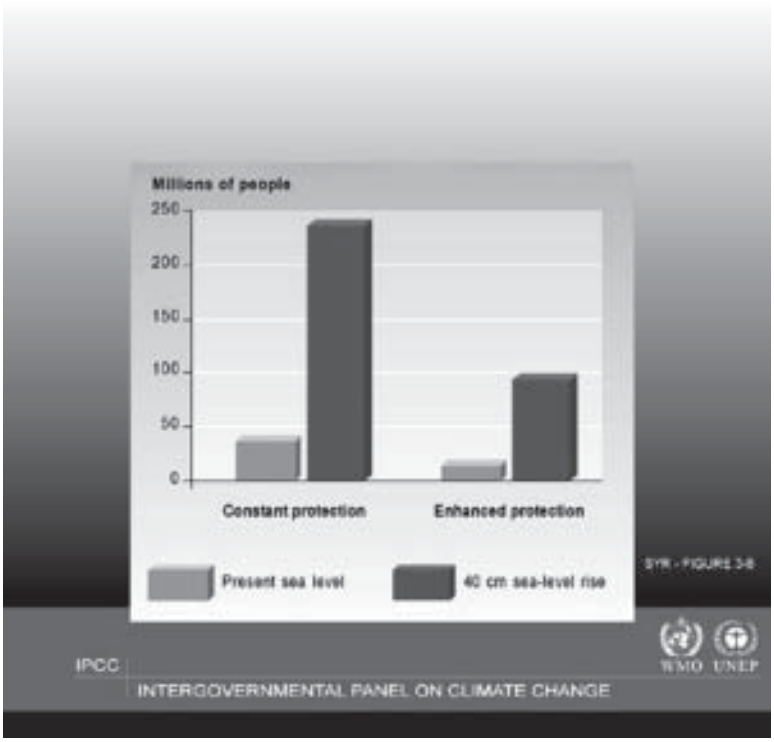
Table 1: Projection of Potential Land Loss and Population Exposed by Sea-level Rise in Selected Asian Countries.

	Sea-level rise (cm)	Potential Land Loss (km^2)	(%)	Population Exposed (million)	(%)
Bangladesh	100	29,846	20.7	14.8	13.5
India	100	5,763	0.4	7.1	0.8
Indonesia	60	34,000	1.9	2	1.1
Japan	50	1,412	0.4	2.9	2.3
Malaysia	100	7,000	2.1	>0.05	>0.3
Vietnam	100	40,000	12.1	17.1	23.1

Note: Estimates based on 1-meter rise, except for 0.5 meters in Japan and 0.6 meters in Indonesia.

Source: IPCC, 2001a.

Figure 2. Adaptation and Average Annual Number of People Flooded by Coastal Storm Surges, Projection for 2080s.



order. This shift is all the more urgent as the current trends that make us vulnerable continue: the concentration of people and infrastructure in cities and along coasts, pressures on ecosystems and climate change.

While we cannot do away with natural hazards, we can eliminate those that we cause, minimize those we exacerbate, and reduce our vulnerability to most. Doing this requires healthy and resilient communities and ecosystems. Viewed in this light, disaster mitigation and adaptation to climate change are clearly part of a broader strategy of sustainable development — making communities and nations socially, economically, and ecologically sustainable.

How can communities and nations begin to mitigate disasters and reduce human and economic toll? They can make sure that they understand their risks and vulnerabilities. They can use this knowledge to ensure that their development efforts do not inadvertently increase the likelihood and severity of disasters. To the extent possible, people and structures should be located out of harm's

While we cannot do away with natural hazards, we can eliminate those that we cause, minimize those we exacerbate, and reduce our vulnerability to most. Doing this requires healthy and resilient communities and ecosystems. Viewed in this light, disaster mitigation and adaptation to climate change are clearly part of a broader strategy of sustainable development-making communities and nations socially, economically, and ecologically sustainable.

way. When hazards are unavoidable, development can be made to withstand them — for example, buildings in earthquake zones should be designed to weather earthquakes. Disaster preparedness, too, is an integral part of saving lives and lowering the economic toll. And every segment of the community needs to be actively engaged in planning and implementing disaster mitigation efforts.

Governments can invest in hazard and risk assessments. They can establish and enforce land-use policies and building codes, limit subsidization of risk and destructive activities, use incentives to encourage sound land use and sustainable hazard mitigation. They can collaborate with civil society to ensure that corruption and vested interests do not undermine these essential efforts.

Maintaining or restoring healthy ecosystems is essential for disaster mitigation and sustainable development. It's time to tap nature's engineering techniques, to use the services provided by healthy and resilient ecosystems. Wetlands, floodplains and forests are sponges that absorb floodwaters. Dunes, barrier islands, mangrove forests and coastal wetlands are natural shock absorbers that protect against coastal storms. Nature provides these valuable services for free, and we should take advantage of them rather than undermining them. The Food and Agriculture Organization (FAO) reports that during the recent tsunami, areas with extensive mangrove forests, even those close to the quake's epicenter, sustained far less damage and loss of life than areas without such protection.

Ecosystem restoration and rehabilitation are also effective tools in hazard mitigation. In Vietnam, 2,000 ha of mangroves were planted to act as a buffer against frequent coastal storms and to provide local livelihood benefits by boosting production of a range of mangrove-dependent sea products. When the area was hit by the worst typhoon in a decade, there was no significant damage. After the 1998 Yangtze flood, China introduced a logging ban and is replanting trees in the upper watershed, because they now recognize that forests are 10 times more valuable for flood control and water supply than they are for timber.

Identifying and delineating natural resources (like watersheds and floodplains), hazards (such as flood zones), vulnerable infrastructure, as well as vulnerable communities and resources — and doing so at scales that are meaningful to communities and decisionmakers — is an essential step. Yet such mapping is incomplete, outdated, or non-existent in many communities and nations. And mapping rarely accounts for likely climate change effects.

Expanding systems for predicting disasters and disseminating warnings to the local level should continue to be a high priority. The recent tsunami exposed dangerous gaps in these systems, especially the lack of a tsunami detection system in

the Indian Ocean. An International Early Warning Programme was launched January 2005 at the World Conference for Disaster Reduction. They plan to have a global tsunami warning system up and running within 18 months.

When early warning systems are in place, rapid dissemination to the local level is essential, as is advance community disaster preparedness. In India, the cyclone and tidal wave that hit Gujarat and killed 10,000 people in 1998 was predicted by the federal government, but the warnings were not disseminated by local authorities. On the other hand, a comprehensive disaster preparedness system has helped reduce the loss of life in Bangladesh, 90 percent of which is vulnerable to cyclones. Warnings are quickly disseminated to tens of thousands of community volunteers, who work in teams to provide warnings, evacuation, search and rescue, and other emergency assistance. They are credited with saving 30,000 people in the powerful 1991 cyclone and countless others in recent events.

We need to shift from a culture of response to a culture of mitigation. Long-term recovery and disaster prevention efforts rarely elicit the same level of empathy and support as rescue and relief. Foreign aid budgets are small, and disaster prevention allocations are minuscule. Efforts to restore people's livelihoods and help the poorest of the poor are also shortchanged. Too often aid neglects people in favor of infrastructure. Jan Egeland, UN Undersecretary General for Humanitarian Affairs, recently proposed that 10 percent of the billions spent on disaster relief should be earmarked for disaster risk reduction. Such a modest investment would yield enormous dividends for the world's people. Clearly, donors could provide leverage and resources to promote development policies that include disaster mitigation and climate adaptation.

The value of incorporating disaster mitigation and adaptation to climate change into efforts to achieve sustainable and equitable development is highlighted in the latest IPCC reports. The "win-win" solutions are summed up: "Policies that lessen pressures on resources, improve management of environmental risks, and increase the welfare of the poorest members of society can simultaneously advance sustainable development and equity, enhance adaptive capacity, and reduce vulnerability to climate and other stresses."

The international community has additional avenues for action, including the International Strategy for Disaster Reduction. The Framework Convention on Climate Change also provides a way to bring together the goals of adapting to climate change, mitigating disasters, and fostering equitable and sustainable development. The parties to the convention have agreed to establish a fund to help developing countries finance such adaptation.

If we continue on a course of undermining the health and resilience of nature, putting ourselves in harm's way, and delaying mitigation and adaptation measures, we set ourselves up for more unnatural disasters, more suffering, more economic losses and more delayed development. If instead we choose to work with nature and each other, we can reduce the waves of unnatural disasters that have been washing over the shores of humanity with increasing regularity and ferocity.

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ICM as a Framework for Coastal Hazard Management

Window of Opportunity

Though natural disasters are forceful reminders that we cannot go against forces of nature, these should also teach us that we are not absolutely powerless against them. With conscious, concerted and continuous efforts toward managing the factors that make us vulnerable to the impacts of natural and man-made hazards, we can learn to live with, and not die from, these hazards. In the case of the 2004 tsunami, the extensive devastation and ensuing rehabilitation efforts also provide a window of opportunity for rectifying previous practices and conditions that exacerbated the impacts of the tsunami. Reconstruction and rehabilitation efforts must not only aim to bring the affected areas back to pre-tsunami conditions but to a more resilient state that can withstand or minimize the impacts of natural hazards. This is in line with the increasing commitment to risk reduction as adopted in the Hyogo Framework for Action 2005-2015: Building Resilience of Nations and Communities to Disasters (UN, 2005), which envisions "the substantial reduction of disaster losses, in lives and in the social, economic and environmental assets of communities and countries."

Figure 1. ICM Program Development and Implementation Cycle.

One of the strategic approaches proposed for the rehabilitation of the tsunami-affected areas is to implement integrated coastal management (ICM) in harmony with hazard management. This is a new challenge for ICM which, although widely recognized as a comprehensive and holistic approach to manage marine and coastal resources and environment, is seldom implemented in relation to natural hazards. In light of the tsunami disaster — and in recognition of the increasing global trends in disaster occurrences, burgeoning threats due to climate change and other latent natural and man-made hazards the impacts of which are influenced by the environmental, social and economic conditions of the receiving environment — taking stock of the current ICM context and how it can incorporate hazard mitigation is considered the way forward.

This paper is about how ICM contributes to hazard management and how it can be further strengthened to support risk reduction strategies.

Hazard Management: Reducing Vulnerability

Planning for the integration of hazard management into ICM requires an understanding of the concepts of hazard and vulnerability. To quote J. Twigg (ISDR, 2004):

> **"There are no such things as natural disasters, only natural hazards like typhoons and earthquakes. A disaster takes place when a community is affected by a hazard, which is usually defined as an event that overwhelms that community's capacity to cope. In other words, the impact of the disaster is determined by the extent of a community's vulnerability to the hazard. This vulnerability is not natural. It is the human dimension of disasters, the result of the whole range of economic, social, cultural, institutional, political, and even psychological factors that shape people's lives and create the environment that they live in."**

Vulnerable conditions and the presence of a hazard combine to give risk. Risk is the probability of harmful conditions to occur as a result of the interaction of a hazard with vulnerable conditions, expressed as Risk = Hazard x Vulnerability. Capability to control both factors would lead to risk reduction. However, for natural hazards, which cannot be prevented from occurring, the above relationship implies that the key to reducing the impact of a disaster is to reduce the community's vulnerability (or increase its resilience) to the hazard.

ICM and Risk Reduction

One of the factors that influence a community's level of vulnerability or resilience to hazards is the capacity of the ecosystem to absorb sudden shifts in climatic, geological or biological conditions. Environmental degradation affects natural processes, increases a community's vulnerability and exacerbates the impact of natural disasters (ISDR, 2004).

As a comprehensive system for natural resource and environmental management that works to protect and maintain coastal environmental functions and services, ICM already serves as a cost-effective tool for disaster reduction. Each ICM activity plays a role in maintaining the integrity of the coastal environment and contributes to risk reduction.

However, the growing awareness and evidence of potentially more perilous conditions in the coastal area have reinforced the pressing need to step up risk reduction efforts. ICM can support risk reduction efforts by integrating "hazard-thinking" and risk reduction into environmental management activities, in relation to human-induced as well as natural hazards.

Integrating Hazard Management into the ICM Framework

The overall objectives of ICM and disaster management are closely related — both ultimately aim to promote sustainable development. Not surprisingly, the strategic goals, objectives, approaches, and initiatives of both fields are related. Conceptually therefore, both disciplines can be implemented using a common platform, such that in areas where the ICM management framework and processes are already in place, ICM implementation can be expanded to serve the needs of disaster reduction as part of sustainable development planning. The ICM framework and process, which hinges on inter-sectoral and multi-disciplinary coordination, policy and functional integration, stakeholder consultation and participation, institutional and legal arrangements, and local capacity to plan and manage, is also well-positioned to incorporate hazard mitigation, which operates correspondingly using these basic elements. The integration of hazard management into ICM can be initiated by strategically incorporating elements of hazard management while building on the arrangements, processes and activities of ICM.

In the ICM framework (Figure 1) of the Global Environment Facility/ United Nations Development Programme/International Maritime Organization Regional Programme

on Partnerships in Environmental Management for the Seas of East Asia (PEMSEA), incorporating hazard management does not require re-inventing the wheel. The implementation arrangements, processes, tools and applications are already in place and could be expanded to support hazard management considerations. Doing so would reflect some of the priority actions identified in the Hyogo Framework of Action 2005-2015 (UN, 2005) and other initiatives and publications concerning risk reduction (Abramovitz, 2001; Bildan, 2003; ISDR, 2004; 2005a; 2005b; UNEP, 2005).

Using the ICM framework, coastal hazard identification, assessment, planning, management, and communication could be fit into current ICM practices. The following discussion evaluates key activities in the ICM sites and how these can be strengthened with regard to hazard management. It should be emphasized that among the various ICM tools, the fundamental requirement for hazard management is risk assessment. Without an adequate understanding of risks, it would be difficult to identify and design measures that will properly address the identified risk factors.

Environmental Profiling and IIMS

A coastal environmental profile is an important reference document for planning an ICM program. It provides a comprehensive review of the environmental state with regard to bio-geophysical characteristics, resource-use patterns, the socioeconomic setting, and legal and institutional arrangements as well as highlights existing problems and issues related to the status, use and development of the area. More importantly, the environmental profile identifies and prioritizes resource use and management issues based on a synthesis of available data and points out the information gaps. It defines the framework for the next phase of the planning process that involves formulation of specific action plans. The environmental profile contains information useful for various ICM activities such as environmental risk assessment, coastal strategy development, coastal use zoning and institutional arrangements.

One major source of secondary information, which forms a significant component of the profile, is the Integrated Information Management System (IIMS) database which can generate information needed in compiling the profile. Database management is a useful tool in ICM to facilitate access or provision of timely and appropriate data for management and decisionmaking. The IIMS established at ICM sites are customized for coastal and marine environmental management. It contains information on geographic locations, demography, biophysical characteristics, socioeconomic, institutional and physiographic data, sources of pollution, environmental monitoring data. Linking IIMS with external software such as a geographical information system (GIS) or with predictive models enhances its capability to perform spatial and temporal analysis, and provide more variety of uses to support ICM. Establishment of IIMS network through the internet can facilitate data sharing among various users and providers from different sites.

Since the environmental profile provides fundamental basis to ICM program formulation, incorporating hazard management into ICM should start with incorporating elements of hazard management into the profile (such as the types and characteristics of hazards within the management area, vulnerabilities to the hazards, capacities for withstanding the impacts of the hazards, and linkages with environmental and socioeconomic conditions and issues). This will allow comprehensive analysis of problems through the environmental and hazard management perspectives, and provide recommendations and actions that will address both concerns. Applications of IIMS for hazard management are presented in Box 1.

Coastal Strategy

A coastal strategy (CS) is formulated to serve as a common

Box 1. IIMS Applications.

IIMS can be applied to provide environmental, social and economic information requirements for ICM and hazard management by:

- Providing information to undertake applications such as environmental profiling/compilation of baseline data, environmental risk assessment (ERA), integrated environmental impact assessment, coastal use zoning, CS development and implementation, resource valuation, oil spill contingency planning, environmental investments, gender analysis, public awareness and civil society mobilization, etc.

- Managing information to evaluate trends in environmental conditions in relation to environmental hazards. For example, IIMS can store and provide information on daily observations on mean sea level. By recording the mean sea level over a period of time (and using historical data), changes in sea level can be monitored. A portion of Manila Bay (Philippines) was determined to be experiencing sea-level rise based on hourly observations of mean sea level undertaken by the National Mapping and Resource Information Authority.

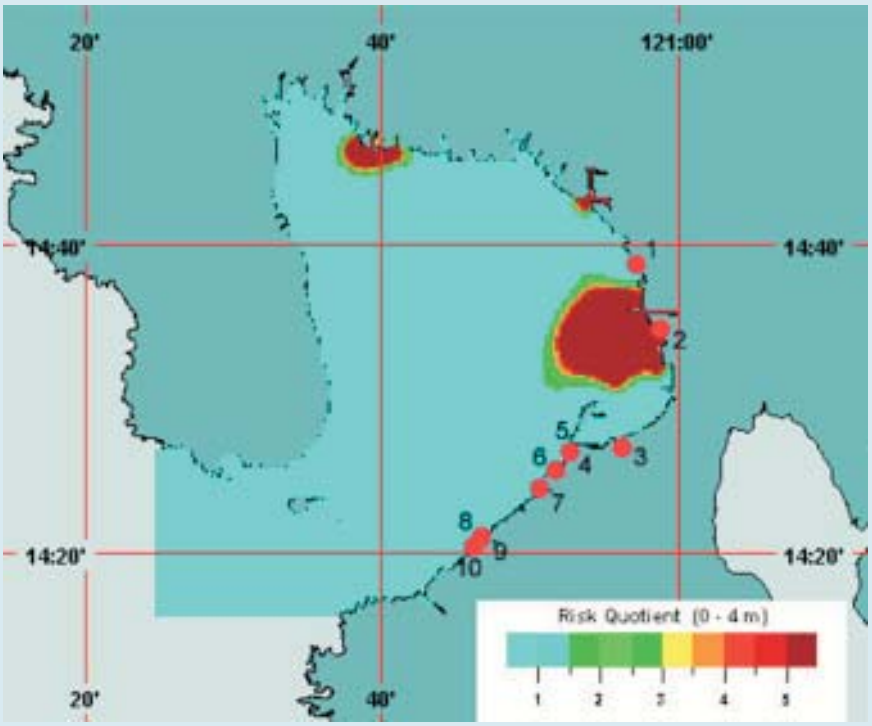
- Managing information generated from environmental monitoring programs and model applications. IIMS serves as repository of data from monitoring programs and model scenarios. IIMS can also present information in useful formats (e.g., tables, graphs, maps, risk quotients or RQs) and facilitate data interpretation and management recommendations. For example, the high coliform levels measured in bathing stations in the southeastern part of Manila Bay were always thought to be due to loading from the Pasig River on the eastern part of the bay. A comparison of RQs generated by IIMS with RQ outputs of a predictive model that was verified using IIMS data shows that the coliform die-off within a specific radius from the river mouth (Figure 1), and that high coliform levels observed south of the river may be coming from discharges along the coastal areas and not from the river. Results point to the need for proper sewage management not only along Pasig River but along the coastal areas as well.

- Linking with GIS and other external software enables broad possibilities for data analysis and presentation and provides necessary information to develop an atlas that can aid in planning and decisionmaking. For example, IIMS and GIS are important inputs in the development of the Manila Bay Atlas. Some identified applications of the Atlas are water quality monitoring, monitoring of coastal erosion and shoreline changes, and natural hazard management by providing necessary information on hazard-prone areas such as those prone to erosion and flooding. Data on population, economic activities and natural resources likely

Figure 1. Use of IIMS to Present Information from Monitoring and Model Scenarios.

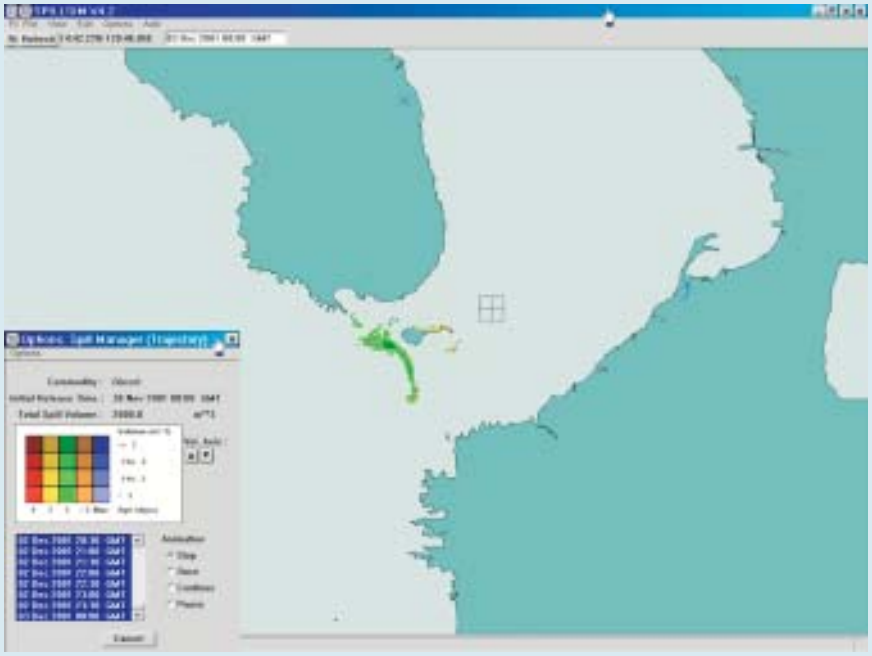
Average annual RQs for fecal coliform at stations along Manila Bay (1996–1998).

Station	Range of Annual RQ
1	534 – 4,000
2	478 – 4,500
3	677 – 1,100
4	97 – 550
5	64 – 80
6	55 – 1,100
7	152 – 450
8	19 – 80
9	5 – 15
10	6 – 85



Fecal coliform predictive model and range of RQs at stations in Manila Bay.

Figure 2. Hypothetical Model Scenario for Manila Bay.



to be affected during calamities can be determined as these can be stored in IIMS. The Atlas will also be used in assessing sites suitable for solid waste management facilities using criteria set by the government. By providing information on appropriate sites, hazards that may be caused by these facilities during operation can be mitigated or lessened. The Atlas will also be used in suitability analysis for mangrove rehabilitation since, based on the ERA of Manila Bay, the few remaining mangrove areas need to be rehabilitated to strengthen coastal defenses.

- The IIMS can serve two purposes in combating oil spills: as database that can provide information in developing an oil spill contingency plan; and as oil spill model that can help assess and improve response strategies in high risk areas, which can be used to improve the oil spill contingency plan. A hypothetical scenario on oil spill was modeled at the mouth of Manila Bay (Figure 2). With the given current and wind situation and the type of oil, the model showed the direction of the spill and what areas would be affected. If there are sensitive resources and habitats in the area, then actions should be taken to combat the oil and protect those resources and habitats.

- Networking to facilitate information-sharing which can be useful in establishing and operating early warning systems. For instance, the Manila Bay Area Information Network, which is being established, will serve as a platform for sharing information among members and stakeholders. By keeping network members and stakeholders informed on monitored conditions in flood-prone areas, erosion-prone areas or areas where fault lines lie, appropriate activities in those areas can be planned such that impacts would be lessened in case of the occurrence of natural hazards.

- Providing information to support hazard management or to reduce risks during disasters. For example, data on population at community levels and economic activities at municipal levels can be provided by IIMS to disaster management teams.

- With slight modifications, IIMS may be customized to provide other information requirements to support hazard management and disaster risk reduction.

platform and mechanism for all concerned stakeholders to work together and share resources to address environmental problems. CS development (Figure 2) involves massive stakeholder consultations, leading to the formulation of a shared vision of the coastal area, identifying stakeholder values and needs with regard to the marine and coastal resources in the area, building consensus on existing and potential threats to those values, and developing corresponding strategies and action programs to realize and/or maintain the shared vision. CS adoption signals political commitment for its implementation, and paves the way for the integration of environmental concerns into the development plan of the respective governments.

As the platform for cross-sectoral partnerships in addressing local environmental problems in the ICM sites, a coastal strategy is a living document which should be refined to accommodate new concerns and priorities in the coastal area, taking into consideration local environmental, social, economic, cultural and political realities.

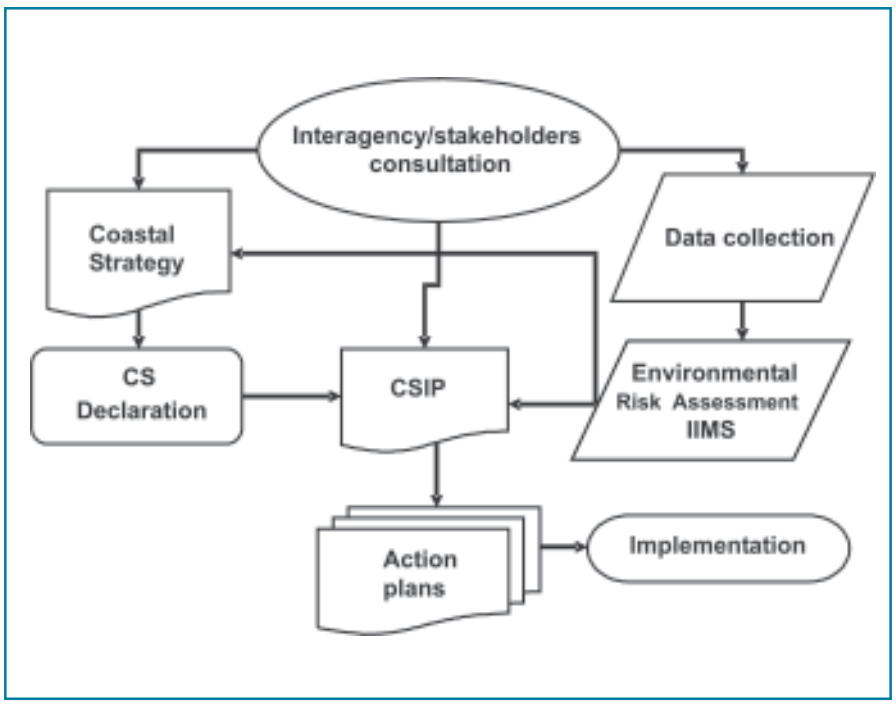
The CS process is the first step in getting people to think about and realize the potential for and consequences of various hazards. Therefore, to incorporate elements of natural hazard management into the coastal strategy, the discussion should extend from man-made hazards to natural hazards as part of the consultation process.

As the platform for cross-sectoral partnerships in addressing local environmental problems in the ICM sites, a coastal strategy is a living document which should be refined to accommodate new concerns and priorities in the coastal area, taking into consideration local environmental, social, economic, cultural and political realities.

Perception of risk is important in developing and implementing strategies on risk reduction, since there may sometimes be disparity between the actual risk and what is recognized by people. Communication between specialists who understand the technical nature of hazards and risks and local people who are the best source of on-site knowledge, information and experience is essential. Considerations in incorporating hazard management into the CS include (adapted from ADRC, 2005):

1. Integration of the following technical information (into a draft hazard map) by hazard specialists:
   a. Various types and characteristics of hazards including latent conditions that may develop into hazards
   b. Basic conditions of hazard area (topographic map, roads, buildings, population, land use, environmental and socioeconomic information)
   c. Estimated damages from disasters and potential damages from latent hazard conditions
   d. Preparedness (shelters, evacuation routes, etc.)
2. Presentation of the information to the people/participants for review and refinement, discussion of elements not reflected in the map, actual experiences, constraints/limitations, expected problems, capacities, local/traditional countermeasures, responsibilities
3. A walk through the key hazard areas, if possible, including the specialists and local people to confirm identified risks
4. Consensus-building on the prioritization of hazards, countermeasures, and responsibilities
5. Formulation of strategies and action programs taking into consideration cost-effectiveness, applicability to local conditions, and capacity for implementation

Figure 2. Development and Implementation of Coastal Strategy.



Incorporation of hazard mitigation into ICM through the CS will enhance its comprehensiveness as a framework in managing and

protecting the coastal area. The review/refinement of the CS should be guided by the global initiatives and commitments on disaster reduction such as the Hyogo Framework of Action (UN, 2005) and Cairo Principles (UNEP, 2005), and national and local laws, policies and plans. The refinement should be carried out through the lens of environmental management as well as risk reduction, and should involve consultations with government agencies and units, academe, private sector, civil society, and communities.

Risk Assessment

Risk assessment (RA) is the essential first step in any serious consideration of risk reduction strategies. Following the identification of priority problems using the environmental profile and CS, application of RA provides a systematic and scientific evaluation of technical information on the hazard and the physical, environmental and socioeconomic factors that influence the degree of impacts from the hazard. Information from the RA will guide the formulation of cost-effective risk reduction measures.

The environmental risk assessments (ERA) undertaken in PEMSEA ICM sites focused on the scientific evaluation of the likely consequences of various factors arising from human activities on ecological and human targets. The ERA, which used primarily available data, involved two complementary assessments: 1) evaluation of the likelihood that adverse effects will occur to the targets based on environmental conditions that currently exist or may exist in the future (prospective RA); and 2) evaluation of changes that may have occurred on the targets and identification of significant causes for any adverse effects observed (retrospective RA). Risk was assessed in relation to the hazard and exposure (or vulnerability) of the target to the hazard.

The ERA has drawn attention to common concerns like human health risks associated with contamination of recreational waters and consumption of contaminated seafood, and ecological risks from pollution and habitat loss and degradation. Where relevant, harmful algal blooms (HABs), oil spills and shoreline changes were also assessed. The risk agents identified include various human activities that pollute, extract as well as physically alter the coastal resources and environment. Results are used as inputs to provide focus to risk management and the application of other ICM tools. RA facilitates the use of scientific information to support better-informed decisionmaking.

Although the ERA was not undertaken in relation to natural hazards, the recommendations from the ERA aims to improve the conditions of the marine and coastal resources and environment, thus reducing vulnerability of the coastal area to natural hazards such as storm events, wave surges and erosion.

Strengthening further the ICM risk assessment process in relation to hazard management requires the incorporation of some characteristics of natural hazard RA (Box 2).

The assessment of risks associated with specific natural, biological (e.g., pest infestation), and technological (e.g., industrial accidents) hazards applies basically the same general concept (Risk = Hazard x Vulnerability) and approaches. Due to the different nature and potential impacts of the hazards, however, methods and requirements for data collection and risk analysis differ from methods previously applied in ICM sites. In assessing seismic hazards, for example (ISDR, 2004), hazard assessment would involve identifying technical features of threats such as the location, intensity, frequency and probability of an earthquake. Ground shaking and ground movement are then the two most important factors, and a statistical earthquake hazard assessment can be made to assess the probability that a particular level of ground motion at a specified site is exceeded during a specified time interval. Meanwhile, for assessing the overall activity and potential danger of a volcano, field observations through mapping of various historical and pre-historic deposits are considered useful (ISDR, 2004). For a more comprehensive ERA that includes natural hazards, additional specialists should therefore be included in the RA

team to cover specific and potential natural hazards.

Vulnerability assessment is an important complement of hazard assessment and involves not only the physical and environmental conditions that make people vulnerable to hazards but also the socioeconomic factors as well. Expertise in using technical and social survey tools in data collection, monitoring and analysis is also required in the RA team.

Coordination and cooperation with agencies specializing in natural hazards should be sought for technical information and support. Use of best-available information, data and capacity would be more cost-effective than spending resources to generate new data.

As RA is the starting point of a cost-effective hazard management program, building or enhancing capacity to undertake risk assessment is a worthy investment with potentially significant returns.

Coastal Strategy Implementation Plan

A Coastal Strategy Implementation Plan (CSIP) translates the strategies and action programs in the CS into action plans and activities that will address the priority issues identified by the government and stakeholders. Priorities for the development of the CSIP are provided by the ERA, which identifies priority environmental areas of concern. The CSIP is a concise and comprehensive plan that presents priorities, targets, budgets, timeframe, and direction for implementation, which is envisioned to catch the attention and support of the government, private sector and other stakeholders.

CSIP development provides an opportunity to identify and strengthen cost-effective environmental measures that maintain or restore healthy and resilient ecosystems so they can provide valuable services such as protection, conservation and rehabilitation of wetlands, mangroves, coral reefs and seagrass beds; promotion of responsible fisheries and environment-friendly aquaculture practices; and development of alternative sources of livelihood to reduce the pressure on natural resources.

Establishment of systems for disaster preparedness, contingency planning, emergency management, and early warning can also be considered in developing the CSIP. An early warning system that gets the right information to the right people at the right time will require combining appropriate technology and traditional/popular medium for communication.

Integrated Environmental Monitoring

An environmental monitoring program is important in order to keep track of environmental conditions in the ICM area as well as to measure the impacts of policy and management interventions. To ensure the usefulness of the monitoring effort as well as its sustainability, cost-effective monitoring programs are being designed in the ICM sites by
a) focusing on the priority issues of concern and potentially-important data gaps identified in the RA;
b) integrating and streamlining the efforts and resources of separate entities involved in environmental monitoring at the site; and
c) establishing mechanisms for information-sharing in order to ensure optimal use of generated information.

continued on page 102

Box 2. Characteristics of Natural Hazard Risk Assessment which Can Be Incorporated into the ICM Risk Assessment Process.

- Enhance ecological risk assessment in relation to coastal function as natural defense system and relate to trends in degree of impacts of hazard events
- Develop hazard maps to show the spatial distribution of identified risks
- Use hazard maps in conjunction with physical and socioeconomic information from the IIMS/GIS to answer the questions:
  - What is vulnerable? Where is it vulnerable? (Physical vulnerability)
  - Who is vulnerable? How have they become vulnerable? (Socioeconomic vulnerability)
- Applying participatory approach in identifying and mapping risks in order to promote awareness of risk, interaction with experts, and acceptance of risk reduction measures

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Managing the Coastal Zone: What Lessons to Draw from the Tsunami?

The Context

The December 26th earthquake and tsunami devastated the lives and livelihoods of millions of people, and caused enormous damage to physical infrastructure, leaving a wake of destruction in the countries along the coast of the Indian Ocean. If counted in sheer numbers, the challenge faced by the affected countries appears nearly insurmountable. However, the people and the governments of the affected countries have demonstrated remarkable resilience and determination. Their efforts to alleviate the suffering of affected communities and to put their countries on the road to recovery have been heartening. There has also been a remarkable outpouring of concern and assistance from the world community. In response to requests from the governments of tsunami-impacted countries, the United Nations system, under the leadership of Secretary-General Kofi Annan and the Undersecretary General for Humanitarian Affairs, Jan Egeland, has swiftly mobilized emergency humanitarian assistance to address housing, healthcare, transport, water and sanitation services.

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UNEP Response to Tsunami

The United Nations Environment Programme (UNEP) has played a vital role in all the efforts of the UN system. In the immediate aftermath of the tsunami, on 28th December, UNEP Executive Director Klaus Toepfer created the Asian Tsunami Disaster Task Force, charging it with the responsibility for assisting governments to assess and respond to the environmental impacts of the tsunami. In response to requests from governments, UNEP immediately deployed experts to Indonesia, Sri Lanka, Thailand and the Maldives, and later to the Seychelles and Yemen. These teams have remained in the region to conduct and facilitate rapid assessments and help coordinate environmental recovery programs in partnership with national authorities, UN colleagues and the international community.

Together with governments and other partners, UNEP addressed a number of priority environmental concerns. UNEP also made an endeavor to extract meaningful lessons from the tsunami experiences to enable governments, donor and international agencies to implement environmentally sound reconstruction programmes in the affected countries. In continuation of this, the Asian Tsunami Disaster Task Force in collaboration with the UNEP Coordination Office of the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (UNEP/GPA) convened a meeting on 17th February 2005 in Cairo, Egypt, to discuss coastal zone rehabilitation and management in the tsunami-affected region. Meeting participants included senior government officials from tsunami-affected countries — Indonesia, Malaysia, Thailand, Myanmar, Bangladesh, India, Maldives, Sri Lanka, Kenya, Seychelles, Tanzania and Yemen; representatives from the UNEP Regional Seas Programmes, international organizations and institutions. Some international organizations and

institutions include the Department for Environment, Food and Rural Affairs–United Kingdom, Department for International Development–United Kingdom, the Food and Agriculture Organization (FAO), UNESCO, World Bank, Islamic Development Bank, League of Arab States, the World Conservation Union (IUCN), World Wide Fund for Nature and UNEP. Attendees from the affected nations and supporting international institutions endorsed 12 key principles consistent with an advance to more sustainable forms of coastal development contributing to the realization of the United Nations Millennium Development Goals (MDGs).

The Cairo Principles, if adopted and applied throughout the affected region, will allow those involved to sequence their actions following a common set of priorities; strengthen collective commitment to rehabilitate and protect coastal communities and increase the efficiency of actions.

Tsunami Reconstruction — The Guiding Principles

The Cairo meeting adopted the 12 guiding principles (herein referred to as the Cairo Principles) for the rehabilitation and management of the coastal zone in the tsunami–affected countries. This article expands on the 12 principles formulated in Cairo by incorporating suggestions on the original draft text made before and

Overall Damage to Ecosystems (Aceh, Sumatra, Indonesia).

Images acquired and processed by CRISP, National University of Singapore, IKONOS image © CRISP 2004, www.crisp.nus.edu.sg/tsunami/tsunami.html; and Ibu Liana and Faizal Parish. 2005. Preliminary Assessment of Tsunami Impact on Ecosystem in Aceh, Ministry of Environment & Global Environment Center. Created by UNEP/DEW A/G RID-Europe, February 2005.

during the Cairo meeting by the World Bank, UNEP, IUCN, FAO, the International Maritime Organization (IMO) and others. It also takes note of texts subsequently released by IUCN, UNEP, the Consortium to Restore Shattered Livelihoods in Tsunami-Devastated Nations (CONSRN) and the WorldFish Center. The Cairo Principles will subsequently be revised and amplified through a round of workshops in the region where participants would share their experiences, identify priority needs and offer specific examples of successes and difficulties during its application in a wide range of settings. After the workshops, the revised and amplified version of the principles will be prepared with short examples and case studies that reflect the realities being encountered by those most directly involved in rehabilitation and restoration efforts. The aim is to create a living document that incorporates and builds upon collective experiences and knowledge. For early 2006, UNEP/GPA proposes to reassemble representatives of the affected nations and supporting international organizations to review progress and lessons learned a year after the adoption of the principles.

The Cairo Principles, if adopted and applied throughout the affected region, will allow those involved to sequence their actions following a common set of priorities; strengthen collective commitment to rehabilitate and protect coastal communities and increase the efficiency of actions. It is recognized that to initiate such processes the necessary technical capacity should be present in each nation.

What Needs To Be Done?

Overarching Principle 1

Reduce the vulnerability of coastal communities to natural hazards by establishing a regional early warning system; and applying construction setbacks, greenbelts and other no-build areas in each nation, founded on a science-based mapped "reference line."

It is not possible to sustain any development in coastal areas if the huge energy and natural dynamics of coastal systems are ignored. Many of the adverse social and economic impacts of the tsunami have occurred because people have been made more vulnerable to natural hazards through poor planning and the ineffective management of coastal development. The technical difficulties and financial costs of opposing the natural dynamics of coastal systems far outweigh the long-term benefits that can be gained by working with the natural processes that create and maintain healthy ecosystems and a flow of social and economic benefits to humankind.

At a time when human populations are becoming increasingly concentrated along coastlines, sea levels are rising and long-established weather patterns are changing, we need to apply a precautionary principle in planning. It is important to acknowledge that hazards created by storms, the reshaping of coastlines by processes of erosion and accretion, instabilities produced by new patterns of land use as well as such relatively rare occurrences as tsunami will together make shorelines increasingly hazard prone.

The above would call for application of integrated coastal management (ICM), including public engagement in local decisionmaking, to undertake rapid assessment for zoning and planning pertaining to overall recovery process.

Principle 2

Promote early resettlement with provision for safe housing; debris clearance; potable water, sanitation and drainage services; and access to sustainable livelihood options.

This entails putting the people first in the rehabilitation process, and would require moving quickly to resettle those displaced by the tsunami in a manner that provides the poor with living conditions and services that are better than what existed before the disaster. Those that have lost property and cannot rebuild because their properties are within the no-build zone must be adequately compensated.

Where practicable, it would be advisable to identify sites beyond the "no-build zone" for permanent housing for those displaced by the tsunami, and for reconstruction of essential infrastructure, such as access to roads, water supply and sanitation, wastewater treatment and solid waste disposal.

Involuntary resettlement needs to be avoided as far as possible and, if unavoidable, to be addressed in accordance with the Guiding Principles on Internal Displacement presented to the UN Commission on Human Rights and the General Assembly. A "no-build zone" applied to a settled coastline may have severe consequences for those deprived of land tenure or rights of residence. Where relocation is judged to be in the best long-term interest of those affected, provision of adequate compensation for land and property has to be guaranteed along with establishment of channels for grievance resolution at the appropriate levels of government.

Where practicable, it would be advisable to identify sites beyond the "no-build zone" for permanent housing for those displaced by the tsunami, and for reconstruction of essential infrastructure, such as access to roads, water supply and sanitation, wastewater treatment and solid waste disposal.

Principle 3

Enhance the ability of the natural system to act as a bioshield to protect people and their livelihoods by conserving, managing and restoring wetlands, mangroves, spawning areas, seagrass beds and coral reefs; and by seeking alternative sustainable sources of building materials, with the aim of keeping coastal sand, coral, mangroves and rock in place.

Natural barriers to flooding and coastal erosion, such as coral reefs, near-shore rock outcrops, sandbars, and sand dunes that reduce, absorb and redirect waves and floodwaters, should be protected from construction activities and uses that compromise their structural integrity. Wetlands, lagoons, river estuaries, and reefs are essential to sustaining fisheries, public health and the many livelihoods that support coastal populations. They contribute to a healthy and aesthetically pleasing environment for a seaside holiday. A portion of the rehabilitation funds should therefore be assigned to protect and restore these habitats.

Reconstruction may require thousands of cubic meters of sand for cement and for fill, and building materials of every description. Traditionally, many of these materials have been taken from the coast itself. Experiences, however, suggest that when sand is mined from beaches, dunes and coastal rivers, mangroves are cut for timber and wetlands are filled as building sites, coastal settlements become more vulnerable to hazards of every description. Extraction of coastal resources should be planned with due care to the long-term sustainability and integrity of the natural system.

Principle 4

Promote design that is cost-effective, appropriate and consistent with best practice and placement of infrastructure away from hazard and resource areas, favoring innovative and soft-engineering solutions to coastal erosion control.

Reconstruction is an unprecedented opportunity to relocate communities away from hazardous and unhealthy areas, rectify badly designed infrastructure and services, and reduce previous inequities in their availability and distribution.

Transportation infrastructure such as roads, railroads and other

facilities should be well inside the setback line and with site-access ways perpendicular to the coast. The natural barriers to flooding and coastal erosion, specifically coral reefs, near-shore rock outcrops, sand bars and sand dunes, should be protected from construction activities and uses that compromise their structural integrity.

Principle 5

Respect traditional public access and uses of the shoreline, and protect religious and cultural sites.

All coastal development initiatives should respect the customary rights of local communities to the coastline and recognize these areas as public domain. All these sites are to be clearly identified and marked with permanent on-site markers to preserve public rights of way to the shore. Particular attention should be given to landing sites for local fishers and associated facilities for cleaning catches and storing fishing gear; these should be restored or relocated to an equivalent or better nearby location. Coastal development should also recognize and respect religious or cultural sites valued by local residents, keep these special coastal features accessible and protect their visual integrity.

Principle 6

Adopt ecosystem-based management measures; promote sustainable fisheries management in over-fished areas, and encourage low impact aquaculture.

The rehabilitation of hundreds of kilometers of shoreline should generate many opportunities for more diversified and more sustainable livelihoods. A primary concern must be the future prospects of communities dependent upon fishing. These communities contain a high proportion of the region's poorest people. A recent statement prepared by WorldFish Center points out that coastal fisheries in Asia were severely depleted and over-fished before the tsunami. Too many boats taking too many fish had in some areas reduced fish stocks to less than 10 percent of their original levels and destroyed or degraded the habitats upon which these potentially renewable resources depended. A trend toward the use of damaging gear and the use of increasingly destructive fishing methods — such as small mesh nets that take juveniles — has made the situation progressively worse. The tsunami has only added to the problem.

While assisting fishers by replacing equipment and rebuilding boats, it is important to ensure that less destructive and more sustainable fishing practices are adopted. Assistance may be given to fishers who do not wish to return to fishing by developing alternative livelihoods. This will contribute to reducing fishing effort and restoring natural resources.

Principle 7

Promote sustainable tourism that respects setback lines and carrying capacity, benefits local communities and applies adequate management practices.

Tourism planning should be responsive to the needs of the local community and ensure community benefits. Local communities should be involved in the tourism planning process and the development of associated recreational activities. This will ensure better distribution of economic benefits generated by tourism activities.

In coastal tourism development, appropriate siting, improved engineering designs and appropriate construction management practices that respect the dynamic nature of the coastal areas and ecosystem function should be applied. Such measures help control the negative impacts that can come with coastal tourism, including the loss of habitat and landscape, degradation of water quality, erosion of beaches and loss of beach access and income by traditional resource users. Such siting and design also minimize risks from storms, hurricanes, tsunamis and erosion and will reduce the need for prohibitively costly restoration and rehabilitation measures. Construction setbacks are one of the most appropriate proactive means of reducing risk of natural hazards. National and local authorities must support the industry through public sector planning, development control and provision of construction standards.

The Process Measures

How things are done is as important, sometimes more important, than what is done. Local knowledge and insights are critically important to successful planning and decisionmaking, and local citizens must be engaged in the rehabilitation and reconstruction process at every stage. It is essential that the application of the construction setback line and the boundaries of bioshields are defined in consultation with the local communities, coastal reach by coastal reach.

Principle 8

Secure commitments from governments and international organizations to abide by these Principles and build on and strengthen existing institutional arrangements where possible.

Rapid or immediate endorsement of these principles is a precondition to ensure their incorporation in planning all reconstruction activities. The adoption of the principles need not add time to the reconstruction process and, if unequivocally endorsed by the highest levels, will reduce uncertainty.

Setting specific measurable goals (e.g., to double the number of people with potable water over pre-tsunami levels) for the reconstruction by each participating nation and its partner organizations will help focus the effort and provide a basis for measuring successful implementation of the principles.

Opportunities created by the intense activity brought by the reconstruction process could be used to strengthen the relationships among these institutions and to address weaknesses in the current coastal management system. Responsibility for coastal planning and decisionmaking — including the necessary enforcement powers — are invariably distributed among a number of governmental agencies at the national and sub-national levels. In some nations, non-governmental organizations (NGOs) also play major roles in coastal management.

The tsunami reconstruction process provides opportunities to strengthen each nation's coastal management system including institution building.

Principle 9

Ensure public participation through capacity building and the effective utilization of all means of communication to achieve outcomes that meet the needs and realities of each situation.

Consultation with local people is crucial to review conditions as they existed before the tsunami to identify potentially significant habitats, rights of way to the shore and significant cultural or religious sites. The provision of detailed before-and-after conditions based on aerial photographs and maps showing the reference line will assist in this process. It is essential that representatives of the poorer segments of the community are present and participate actively and that traditional leadership such as village leaders and religious leaders provide guidance and assist in the mediation of disputes. It is important that decisions be guided by the precise demarcation of the setback line and that the boundaries of bioshields be based on pre-defined and unambiguous criteria and that these be applied in a transparent manner.

Adaptive strategies for applying these principles will be most appropriate. It will be important to learn and adjust as the reconstruction and rehabilitation efforts unfold. Local knowledge combined with technical expertise and guided by national goals is the recipe for success.

Principle 10

Make full use of tools, such as strategic environmental assessment, spatial planning and environmental impact assessment, to identify trade-offs and options for a sustainable future.

Clear goals are to be defined for the desired outcomes of the reconstruction and rehabilitation

continued on page 105...

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The Politics of Recovery: Post-Asian Tsunami Reconstruction in Southern Thailand

Introduction

Unimaginable destruction and suffering was brought by the 26 December 2004 earthquake and tsunami to millions of people around the Indian Ocean. More than a quarter of a million lives were lost and the livelihood of millions of people were affected (UNEP, 2005). Although media coverage focused on the plight of wealthy tourists and on infrastructure, a disproportionate number of the affected people regionally were poor fisherfolks and coastal communities. They are now struggling to survive (Sachs, 2005).

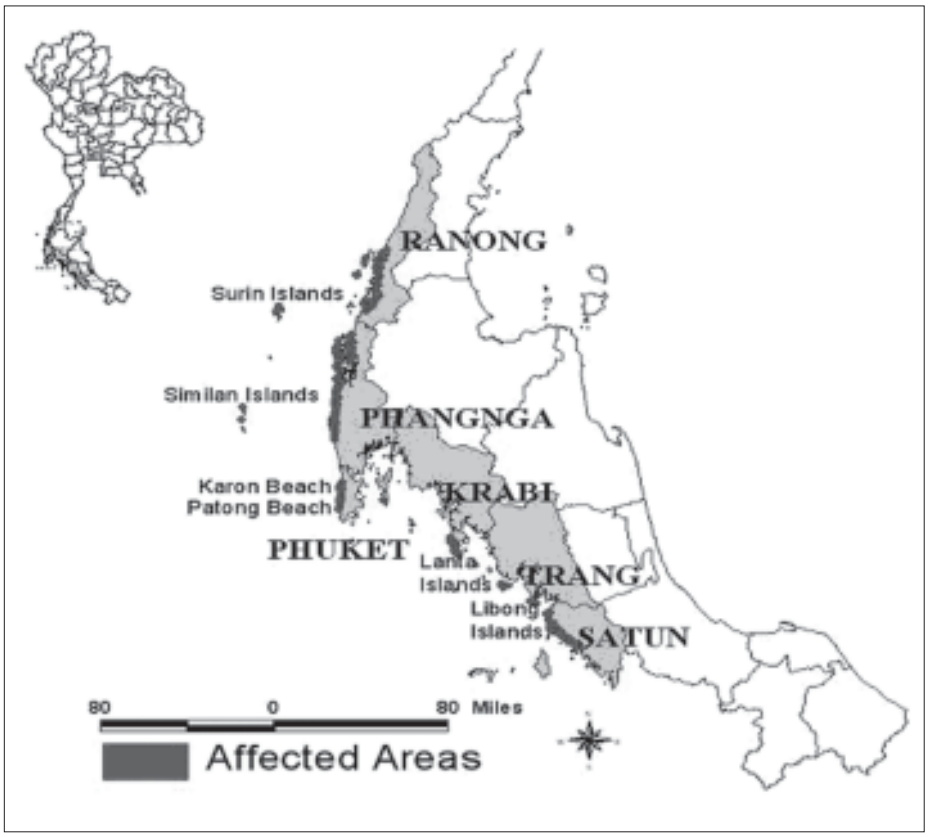

Figure 1. **Map of Tsunami-Affected Areas in Six Southern Provinces of Thailand.**

As local and international relief workers and volunteers continually bring the much needed shelter, food, safe water, and medicine to affected communities, plans for the eventual reconstruction and rehabilitation of the economy and peoples' lives and livelihood start to take shape. However, initial indications are that serious barriers to restoring poor people's lives, livelihood and communities are being erected as part of this process. Firstly, participation by socially vulnerable groups in setting priorities for reconstruction efforts is token. Many of the key decisions,

especially in Thailand, are being made to address issues of tourism and conservation rather than livelihood security of the poor in the fishing sector. In Indonesia the central government has benefited from the disaster to gain stronger control of what remains of the population of Aceh. Secondly, the rhetoric of aid and support is not matched by actual increases in aid but by "raiding" and "re-labeling" other budgets. It is questionable that this really helps with reconstruction in the long run. Thirdly, some of the actions being taken are really more about re-distributing rather than reducing risks.

Post-Asian tsunami recovery programs provide opportunities to reduce vulnerability to future risks from natural disasters and secure livelihoods of poor and socially vulnerable groups. But, this can only be realized if the governance system in which it is carried out promotes a sense of justice and fairness in disaster risk management (Box 1).

Box 1: Vulnerability and Governance.

Vulnerability refers to the degree to which households and communities are likely to experience harm due to exposure to hazards, and the ability (or lack thereof) of the community to cope, recover, or fundamentally adapt (Kasperson and Kasperson, 2001). The vulnerability of households and communities can be decomposed into several components of a "risk chain" including:

- the risk of exposures to hazards;
- the responses to perceptions of these risks; and
- the influence of hazards on future risks (Heitzmann, et al., 2002). Studies often show that households are pushed to a deeper cycle of poverty after disasters, but with appropriate interventions this cycle can be broken.

Issues of governance are central to how the risk chain unfolds. All people are at some risk of exposure to the furies of nature, but the ecological, social and political context of groups who are poor often makes them much more vulnerable. Vulnerability is thus not just a result of physical location (exposure to natural hazards), but also a social product. It arises out of the social, economic and ecological circumstances of everyday living, social relations in which some people obtain better access to resources than others (Adger, 1999). Differences in access to resources including capital, information and decisionmaking are crucial for survival and well-being during reconstruction.

This paper is based on the authors' own field and voluntary work in southern Thailand during the early stages of the reconstruction process. It aims to raise a number of important questions about how politics are shaping the recovery and reconstruction processes. Whose vulnerability to disasters is being reduced in the immediate and longer terms? Who will be left worse-off as result of reconstruction measures or new institutional arrangements, for example, for coastal management? Have the underlying causes that made some groups more socially vulnerable to the disaster being recreated by recovery and rehabilitation programs?

The Disaster

The six southern provinces of Thailand along the Andaman Sea — Ranong, Phang Nga, Phuket, Krabi, Trang and Satun — were impacted severely by the tsunami (Figure 1). The casualties were reported at 5,393 dead, 3,062 missing and 8,457 injured (UNEP, 2005). The economic base of the six provinces — tourism, fisheries and agriculture — were severely damaged. The losses in tourism, fishery and agriculture sector were estimated at US$321 million, US$43 million and US$0.65 million, respectively (UNEP, 2005). Some 315 hotels and resorts and 234 restaurants have been totally or partially destroyed.

It is estimated that the livelihood of around 100,000-120,000 people have been disrupted. More than

Source: ACHR (2005)

Damaged boats in southern Thailand.

10,000 people are displaced and are living at camps and shelter homes. The early survey of nongovernmental organizations (NGOs) indicated that 161 fishing villages of 418 total villages located by the sea in the six provinces have been affected. The impacts range from total destruction of homes, fishing boats and fishing gears to moderate damages of houses and fishing implements (Table 1).

Alternative Perspectives

By early January 2005 several competing discourses about the appropriate course of rehabilitative action had emerged: 1) revitalizing the tourist industry; 2) coastal resource conservation; 3) safety measures; 4) livelihood restoration of affected communities; and 5) sustainable redevelopment. Proponents of these perspectives are shaping the recovery process (Table 2).

Revitalizing the Tourism Industry

Reviving the tourism industry in the south and transforming it with world-class infrastructures has been well articulated by hotel and related tourism interests and officials. The urgency to lure back tourists and restore tourist confidence is understandable considering that the provinces of Phuket, Phang Nga and Krabi generate around 40 percent of the country's gross tourism revenue, and tourism accounted for 12 percent of the country's gross domestic product in 2004. Prime Minister Thaksin underscores the importance of tourism to the region:

Table 1: Tsunami-Affected Villages in Six Southern Provinces of Thailand.

Province	Total Villages by the Sea	Affected Villages	Deaths and Missing Persons	Damaged Houses		Damaged Fishing Tools and Fishing Farms		
				Totally Destroyed	Partially Destroyed	Boats	Fishing Tools	Fishing Cages/Nets
Krabi	83	18	35	414	275	793	8,560	231
Phang Nga	123	46	1,616	2,267	Incomplete data	581	Incomplete data	1,792
Phuket	38	18	7	42	299	132	392	925
Ranong	43	14	146	221	Incomplete data	1,053	199	300
Trang	57	36	34	100	Incomplete data	285	26,118	666
Satun	174	29	8	33	Incomplete data	463	458	11,620
Total	**418**	**161**	**1,846**	**3,077**	Incomplete data	**3,307**	**35,727**	**15,534**

Source: CODI, 2005.

Table 2. Emerging Reconstruction Perspective and Discourses.

Discourse	Proponents	Proposed Recovery Actions
1. Revitalizing the Tourism Industry	Hotels and big businesses; Tourism officials; tourism-related industries	Revive the sector through sector re-development, tourism campaign and incentives that lure back tourists and restore their confidence
2. Safety and Security	Safety and disaster groups	Enforcement of zoning and safety measures
3. Coastal Resource Conservation	Environmentalist and conservation groups	Rehabilitation and restoration of coastal ecosystem and implementation of coastal resource protection measures
4. Livelihood Restoration	Tsunami-affected communities and support groups	Speedy and participatory restoration of affected communities' livelihood and community
5. Sustainable Redevelopment	Funding institutions, international agencies, civil society and media	Link coastal resource conservation, sustainable livelihood and economy, and the need for early warning systems and preparedness

"The livelihoods of hundreds of thousands of people living in the affected areas, from Southeast Asia to South Asia to the eastern coast of Africa, depend on tourism. Their livelihoods cannot return to normal in the absence of tourist. But tourists will simply not return unless they have trust and confidence in their safety." (Cited by Isaacs, 2005).

The recently-prepared Phuket Action Plan aims to restore tourist confidence in the area. The Phuket Action Plan has four phases, namely: 1) providing special assistance for four key world-renowned tourist-sites — Patong, Kamala, Khao Lak beaches and Phi Phi Island; 2) building new infrastructures; 3) marketing campaign; and 4) tourist incentives such as duty free shops (Isaacs, 2005). The Prime Minister will set up 10 billion Baht (about US$252 million) trust fund to help revive the hotel business. This undoubtedly has some important side effects, e.g., the seasonal employment in the tourism sector is an important part of livelihood diversification for some households in coastal communities.

Safety and Security

The concern for safety has also caught the attention of the country. "As terrifying and unpredictable as tsunamis are, good forecasting, early warning and education could save lives" (The Nations, 28 December 2004, Editorial). There seems a consensus of the value of the early warning system in the region as Thailand bids to host the center for the Indian Ocean region. The tsunami aftermath has also underscored the socio-political and cultural context that exacerbates the impact of the December 2004 tsunami — "unplanned and often illegal establishments, pre-tsunami ecosystems were partly ruined, unsustainable and failing environment" (*Bangkok Post*, 24 January 2005, Editorial). Likewise, the aftermath reveals that several coastal communities lack education, training and preparation. Indigenous groups such as the Moken (sea gypsies), on the other hand, escaped the tsunami by heeding ancestral signs and the wisdom of the sea (Sukrung, 2005). In disaster risk management there is a renewed interest in integrating indigenous knowledge with modern technology for community early warning preparation.

The establishment of an early warning system, enforcement of protection zoning and safety

Indigenous groups such as the Moken (sea gypsies), on the other hand, escaped the tsunami by heeding their ancestral signs and the wisdom of the sea (Sukrung, 2005). In disaster risk management there is a renewed interest in integrating indigenous knowledge with modern technology for community early warning preparation.

measures, disaster training and education and the immediate restoration of the coastal environment have been proposed by safety and security groups. Safety regulation measures such as zoning are explored. In Patong Beach in Phuket, beach zoning is developed to prevent construction and tourist facilities (e.g., umbrella) on the shoreline for a safety reason. "Under the new zoning plan, clear access ways must be made to the beach. New construction that encroach on public areas must stop now," says Phuket Governor Udomsak Uswarangkura, as cited in Katharangsiporn (2005). In Krabi, people are asked to relocate away from the coast, which is part of the national park, to the uplands. The villagers are wondering whether the beach would be leased for tourism development later on.

Coastal Resource Conservation

Echoing the safety and security groups are the voices and insights of the environmentalist groups. The aftermath of the tsunami indicated that a healthy coastal ecosystem protected people and property (UNEP, 2005). Reports from the initial environmental assessment demonstrates that the destructive force of the tsunami is greatly dissipated as it passes through intact, healthy coastal zones containing coral, seagrass, mangroves and sand dunes (World Rainforest Movement Bulletin, 2005; UNEP, 2005). These coastal natural resources acted as the first line of protection. They are the first line of defense from tsunamis. In Phuket, the sand dunes minimized the tsunami impact in Kata-Karon areas (Chinvarakorn, 2005). In Phang Nga, mangrove forests and seagrass significantly mitigated the effects of the tsunami (UNEP, 2005).

The rehabilitation of lost and degraded ecosystems has been called for, not only for security measures, but also for the livelihoods of coastal communities. A new zoning plan for natural park land is being considered (Bunyamanee, 2005). Likewise, coastal resource management policies need to be enforced. However, as illustrated in past zoning policies in Thailand and elsewhere, it may actually mean less livelihood security among fisherfolks as access to the sea is reduced.

Livelihood Restoration

The restoration of the livelihood of 161 affected coastal communities (Table 1) has been the rallying cry of the tsunami-affected communities and their support groups. The primary sources of livelihood include 1) fishing and fishing-related endeavors; and 2) services to tourism industry. The restoration of people's livelihood necessitates the repair of their fishing boats and implements and the restoration of their villages. Access to the sea and tourism havens is critical in the restoration of their livelihood. Many of the tsunami-affected households also rely in tourism industry-related occupations such as diving instructors, boat generators, masseurs, sex workers, among others. Likewise, access to financial and material support is also crucial. Government compensation and financing has been slow and the coverage is not enough. Many fishers at the camps are becoming restless and eager to start fishing as echoed by Taweesak Wansabu, a fishers group leader in Bo Jed Luk village in Satun Province, Southern Thailand:

> "A survival bag can sustain us for a day or two. Supplies have dried up now that more than a month has passed. But we don't need any more bags. We need our jobs back." (Cited by Achakulwisut, 2005).

The uneasiness of fishers is also shared by small vendors and small shop owners serving the tourists. They should be allowed to continue to offer their goods and services rather than be replaced with a more regimented, strip-mall planning approach in tourism reconstruction which is advocated by some big businesspeople and hotel owners (Katharangsiporn, 2005).

Sustainable Redevelopment

An emerging overarching framework for the reconstruction has been proposed by NGOs, funding agencies, international agencies and the media. The United Nations Development Programme (UNDP) calls this reconstruction framework "sustainable redevelopment." Sustainable redevelopment links the environment, sustainable livelihood and economy and the need for early warning and disaster preparedness systems. As a framework for reconstruction, it addresses the concerns for the revitalization of the economy, the restoration of the ecology and livelihood of the people and security of the region. For instance, the UNDP Tsunami Impacts Relief and Community Livelihood Restoration Project links coastal conservation and livelihood restoration. Likewise, aside from the call for a little re-ordering in the rebuilding process, the 24 January 2005 *Bangkok Post* editorial argues for a recovery path that addresses the issues of economy, safety and security, coastal resources integrity and peoples' participation.

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However, the call for redevelopment in the reconstruction is easier said than done. The lack of agreement over how to rebuild the six tsunami-hit provinces among different actors explains the several disputes and conflicts in the reconstruction process. What will be the priority? How will funds and manpower be allocated? How will the plans be implemented? Who will be the main agency and actors in the recovery? The lack of platform to discuss the goals and vision of reconstruction as well as the lack of leadership to undertake the negotiated rebuilding process contributes to the conflict (*Bangkok Post*, 24 January 2005, Editorial).

Negotiating Reconstruction

Emerging Issues

A resettlement plan and livelihoods recovery has been drawn out by government officials. However, the needs of the affected communities are not well-articulated. With the facilitation of the Community Organization Development Institute (CODI) and the NGOs coalition, 900 tsunami-affected communities met in Phang Nga on 26 January 2005 to discuss their conditions, problems and issues. The emerging problems can be classified into four categories: 1) resettlement and livelihood restoration; 2) resource rehabilitation; 3) security and safety; and 4) participation (Table 3).

Resettlement Disputes

Resettlement is a critical issue for livelihood restoration. It determines access to sources of livelihood — the sea and the tourism industry. The Asian Coalition for Housing Rights (ACHR) documented the complicated land tenure situation and land status in several coastal

communities. Most of these lands are *de facto* public lands administered by different government ministries and departments (e.g., national parks). Some of the lands where given on concession to the private sector (e.g., tin mining companies, tourism), and some of these concessions were sold to a new generation of speculators and entrepreneurs. Though without land titles, several coastal communities have been occupying their villages for several generations.

For example, the residents of Ban Thoong Wa in Takua Pa, Phang Nga, were prevented from going back to their old village by the Office of Social Development and Social Welfare on the grounds that the land has been identified as the site for the provincial hospital. The *Bangkok Post* reported that around 100 Moken families from Ban Muang marched back to their tsunami-wrecked village. They encircled their land in Bang Niang with a rope in a symbolic ceremony to mark their land ownership (Wongruang, 2005). The land, however, will be used to build a new hospital according to Phang Nga governor Anuwat Maytheewibulwut.

The land negotiation involving the Ban Thoong Wa Moken community, the National Land Department, the local administrative authority and the provincial governor resulted to a practical scheme of land sharing. The community will get 16 rai (2.56 hectares) of the land to rebuild their village, while the provincial government gets 10 rai (1.6 hectares). The land sharing scheme is a practical alternative to a contentious long process of resolving overlapping land claims (ACHR, 2005).

However, as indicated by CODI, there are several land dispute cases between affected coastal communities and private entrepreneurs or between communities and conservation groups which have not been resolved yet. And it may take several months, if not years, before these disputes would be resolved.

Support for Livelihood Restoration

Many fishing communities have already returned to their ravaged villages without waiting for more comprehensive support from the government. They realized that getting their livelihood back quickly is critical. But for others the wait for material and financial support with

Table 3. Emerging Issues, Problems and Conflicts.

Discourse	Proponent	Proposed Actions
1. Resettlement Areas	70 percent of the people want to go back to their coastal communities but were prevented by other groups who have property rights to their villages	Land negotiations
2. Livelihood Restoration	Financial and material support for repair	Establish community shipyard and community revolving funds
3. Coastal Resource Rehabilitation	Damaged coral and coastal environment	Propose to the government to make artificial coral reefs to become fish nurseries and mangrove reforestation.
4. Water Supply	Critical water supply (quality and sources)	Government assistance
5. Early Warning System	Villagers are not confident with the government information system.	Set up an early warning system
6. Peoples' Participation	Clear mechanisms for integrating people's voice	Bring the community-government dialogue to the ground

Source: CODI, 2005.

which to repair their boats and fishing gear is a tough struggle. Many fisherfolks complained that they had only just received compensation for the damages to their boats, and this was often insufficient to cover the cost of the repair (Achakulwisut, 2005). Our own survey in January suggests that media, some NGOs and the state focused on sites with visually astonishing damage rather than livelihood needs.

A coalition of NGOs, civic groups, community organizations is helping the southern fishing villages articulate a rehabilitation plan for their shattered communities and damaged livelihoods. Given the limited support from the government, some fishing communities are establishing what they call "community-shipyards" with the support of the private sector (the Siam Cement Group) and NGOs (Save Andaman Network) (Achakulwisut, 2005). There are eight dry docks in the provinces of Trang, Satun, Krabi and Phang Nga, and it is estimated that several vessels would be ready for work within two months. Moreover, these communities are establishing community revolving funds and community kitchens, among others (Achakulwisut, 2005). Microcredit and the revolving fund scheme are effective options for recovering fisherfolk livelihoods. Many fishing communities are familiar with microcredit or community banking and the revolving fund system. However, not all communities are reached by NGOs. Neither do NGOs have the organizational capacity to service all affected communities.

Sustainable Redevelopment

Majority of the tsunami communities have been living insecurely in very poor and inadequately serviced conditions before the disaster (ACHR, 2005). These vulnerable conditions have been the result of forces that shape the region's economy and ecology. For instance, the degradation of coastal resources of Takua Pa, Phang Nga, has been the result of centuries of exploitation — tin mining, mangroves logging and aquaculture and tourism activities. And with the tourism boom, desolate tin mines and mangrove stubbles were transformed into prime resort property with prices exceeding 10 million Baht per rai (about US$250,000 per 0.16 hectare) (Warunpitikul and Tangwisutijit, 2005).

The extent of coastal resources degradation undermines the long-term livelihood viability of the community, their security and the economy of the region. This is the basis for a sustainable redevelopment approach that links the environment, sustainable livelihood and economy and the need for early warning and disaster preparedness systems. In principle there may be consensus among the different stakeholders, but the ways and means to achieve a sustainable redevelopment in the region remain contentious.

One issue for example is the tension between coastal resource management and people's livelihood as embodied in many natural resource management conflicts. The framework underpinning most resource management assumes a resource-people divide. To protect the resource people are evicted although there are schemes such as buffer zoning and community resource management that integrate both the livelihood objectives and the protection of the resource. Instead of penalizing poor people, what might be needed in the long run is the strengthening of institutions and programs that address both people's livelihood and coastal resource recovery. Likewise poorer villagers and settlements close to seashores may be also evicted for security reasons. Establishing reliable early warning systems using indigenous and recent technologies and communication systems as well as appropriate training and education might increase security without necessarily displacing coastal communities.

Hearing the People's Voice

At the outset of recovery there are no clear mechanisms for integrating the people's voice in the decision regarding: 1) relocation and resettlement areas; 2) strategies for livelihood's recovery and rehabilitation of the community; and 3) regional redevelopment. Negotiating for resettlement sites is a contentious process considering the overlapping and conflicting

bases of ownership. According to the Coalition Network for Andaman Coastal Community Support, more than 30 villages in the six tsunami-hit provinces are now facing eviction (Ekachai, 2005). Though the National Human Rights Commission provides assistance in checking the legality of claims, there seems to be no clear mechanism to address this issue in a manner that protects the most vulnerable sector before and after tsunamis.

The path to redevelopment that the post-tsunami recovery brings is a highly contentious one. It is therefore important that all voices, especially the poor be heard. Whether these efforts will be successful in securing livelihoods against serious future challenges is uncertain as the vision, the goals and process of reconstruction are contested and negotiated. We believe that it is crucial for the voices of affected people, in particular socially marginalized groups, in the reconstruction process both because it is the right thing to do and because it means interventions are more likely to be effective and supported by people who ultimately will have to carry them out and live with the consequences. But rarely have we heard of small-scale fisherfolks, Burmese immigrant workers, or women and men working for the tourism sex industry.

Recovery plans that explore with a sense of social justice and goodwill the diverse needs, interests and capacities of those with the least resources from which to rebuild a livelihood should be applauded. Plans which use a crisis as a cover to re-allocate access to critical coastal areas to the wealthy should be exposed for what they are: the best way to reproduce the conditions for the next disaster.

Conclusion

Disasters provide an opportunity for the recovery efforts to avoid reconstructing the pre-disaster risks and address the underlying causes of vulnerability, especially among the poor. This has not happened so far in southern Thailand. Vulnerable poor fisherfolks and coastal communities have been largely marginalized from major decisionmaking processes about post-tsunami recovery. We see four key areas where actions are urgently needed.

Firstly, platforms are needed to encourage broader participation in decisionmaking about post-disaster programs. This is especially important as many new allocations, infrastructure, zoning options are being considered and for which the electorate has had no real chance to express their views by other means. It is easy to rush things post-disaster so as to give the appearance of getting things done, but this is often at the expense of listening and thus meeting real needs. In southern Thailand, it has been a scramble. Though *ad hoc* as of this writing, the "land sharing scheme" strategy has been proven to be a practical negotiated solution and, thus avoids the long and time-consuming litigious way of resolving conflicting property rights claims (ACHR, 2005). The post-tsunami coastal master plan promises to provide arenas for local participation. In collaboration with Chulalongkorn University, CODI has offered to assist in the process of getting communities and various local groups involved in developing the master plan (ACHR, 2005). The first test for the participatory coastal planning process was on Koh Lanta Island. A policy in which villages adopt NGOs, instead of NGOs adopting villages, has been practiced in Tamil Nadu, India. The affected communities lobbied with the government for a policy in which every NGO that wants to work with a particular village has to get the endorsement of the villagers.

Secondly, the focus of the reconstruction program should be more firmly on securing the livelihoods of poor and socially vulnerable groups rather than just upon assisting businesses recover, something they are capable of doing well themselves given just modest incentives like "time to pay back loans." There is a need for alternative economies in traditional fishing communities as the younger generation may not be inclined to do fishing (ACHR, 2005). For example, entrepreneurial options of traditional fishing villages may be expanded through "home-stay" programs and eco-tourism. Fishing communities might also be a major agency in the protection of sensitive coastal

environmental areas or the primary force in the regeneration of damaged coastal ecosystems.

Thirdly, greater emphasis on community-based disaster risk management is needed. The tsunami illustrated again and again the importance of non-state actors in places where state capacities are very limited. Rather than bemoaning their lack of state capacity, government agencies should see their roles in training, capacity building and coordination. Prepared communities have a lot to offer in reducing risks and effective responses when major challenges strike.

Fourthly, analyses are needed about the underlying causes of disaster that go beyond immediate and obvious practice, like "they were sleeping on the sand" or "houses were on the beach." If zoning principles and regulations exist why are they so easily circumvented or manipulated by tourist entrepreneurs? Can fishing villages be built in ways in which good access to coastal resources is maintained while vulnerability is reduced and the environmental protection functions of mangroves and other coastal vegetation is maintained?

The post-Asian tsunami reconstruction provides a window of opportunity to address the underlying causes of vulnerability of coastal communities at risks. It is an opportunity to re-think development frameworks and pursue redevelopment strategies that link the environment, sustainable livelihood, the economy and the need for early warning and disaster preparedness systems. The outcomes of reconstructions are a negotiated one, and it is important that social spaces for dialogue and negotiations are created. Without hearing the voices of the people, especially the survivors, any recovery effort may not truly and meaningfully address their true needs and well-being. Allowing the survivors to speak and participate affirms our trust on their ability to navigate their own future and create more secure, safe and sustainable realities.

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Ensuring 'Green Reconstruction' in Post-Tsunami Rehabilitation Efforts in Indonesia

Introduction

"Green Reconstruction aims to improve the quality of life for communities and affected individuals whilst minimizing the negative impacts of reconstruction on the environment and maintaining the biological diversity and productivity of natural systems."

A diesel power station barge has been transported inland by the tsunami. To minimize the ecological footprint of reconstruction, governments should consider 'cleaner' energy production options.

Post-tsunami reconstruction efforts face the challenge of meeting immediate humanitarian need, whilst balancing longer term natural disaster mitigation and planning for development and poverty alleviation. Across the Indian Ocean, where the greatest loss of life occurred, literally tens of thousands of families are left without homes, boats or fishing gears. Healthy ecosystems underpin healthy and safe communities and durable prosperous economies. Those impacted by the tsunami will be looking to healthy marine ecosystems as a source of livelihood and food security, and as a potential first line of defense against future natural disasters. With such a strong connection between the role of a well-

managed environment and the well-being of many of the most vulnerable individuals in the post-tsunami recovery process (women, children and those dependent on subsistence activities), it is important that the principles of sustainable development, integrated coastal zone management and ecosystem-based management of fisheries underpin actions and choices.

To be of benefit to donors and practitioners, reconstruction advice needs to provide a means of discriminating among available options and provide guidance on approaches to ensure that the end result of reconstruction is enduring and supported by local stakeholders. With the generous outpouring of funds and assistance from aid agencies and humanitarian organizations, the decisionmakers in the donor and aid sectors and within government agencies responsible for reconstruction are faced with a potentially bewilderingly large array of options for how to rebuild. The goal of this paper is to provide guidance to those involved in reconstruction efforts on those aspects that link most closely to natural resources. By highlighting these areas, the aim is to minimize any negative environmental impacts of reconstruction and promote positive choices that optimize environmental goods and services, development and livelihood opportunities. The resulting 'Green Reconstruction' aims at long-term mainstreaming of environment in development and effective participation of local communities in resource governance.

With such a strong connection between the role of a well-managed environment and the well-being of many of the most vulnerable individuals in the post-tsunami recovery process (women, children and those dependent on subsistence activities), it is important that the principles of sustainable development, integrated coastal zone management and ecosystem-based management of fisheries underpin actions and choices.

Green Reconstruction Principles

Within the context of national recovery and restoration strategies, the following five goals are proposed, representing a modified version of the goals proposed by the Indonesian Government and the donor community to Indonesia (BAPPENAS, 2005):

- To restore people's lives and fulfil their needs;
- To restore the economy and provide work opportunities, markets and incentives;
- To rebuild communities and give them social stability;
- To restore the system of local governance, that represents people's aspirations; and
- To re-establish the province as politically stable and economically vibrant and one which is resilient and protected against new disasters.

In addition World Wide Fund for Nature (WWF) promotes the following additional goals:

- To minimize negative externalities of reconstruction on livelihoods and the natural environment;
- To ensure rehabilitation, reconstruction and future development of Aceh follows a sustainable path;
- To ensure long-term improved quality of life; and
- To ensure long-term human harmony with nature through

Coral reefs are themselves effective natural breakwaters; during reconstruction and creation of defenses against future impacts, efforts should focus on strengthening natural defenses and should seek 'soft' solutions rather than 'hard' engineering structures.

increased consideration of environmental issues in development practice.

In the context of successful implementation of any post-tsunami reconstruction activity, whether it is in the form of setting policy or carrying out activities on the ground, four principles are considered to be critical to success and long-term sustainability. These are described below with a goal and set of supporting actions for each.

I. Mainstreaming Environment: Environmental concerns should be integrated in all aspects of reconstruction activities and strategies including through aiming to improve the quality of life for communities and affected individuals whilst minimizing the negative impacts of reconstruction on the environment and maintaining the biological diversity and productivity of the natural systems.

II. Building Strong Legitimate Local Institutions: Recovery from the socioeconomic, cultural and livelihood impacts of the tsunami will be strengthened by building strong local institutions such as the Panglima Laot, and making them self-reliant in carrying out sustainable development programs to enhance their well-being and ensure environment sustainability.

III. Spatial Plan: The overall spatial plan ensures that reconstruction efforts have minimum negative environmental impact and promote positive choices during the reconstruction process that optimize environmental goods and services as well as development and livelihood opportunities.

IV. Building Good Governance: The governance of the reconstruction process, including planning implementation and evaluation, should be fully participatory, transparent and accountable, and include the effective participation of local communities.

Putting Green Reconstruction into Practice

The preceding sections focused on a set of overarching principles to be adopted in all aspects of reconstruction, in order to ensure sustainability and supportive, enduring local institutions. When it comes to the reconstruction of infrastructure, rehabilitation of damaged ecosystems or rebuilding of livelihoods linked to natural resources, then more targeted advice on Green Reconstruction can be given. This takes the form of strategies, actions and indicators for aspects of reconstruction implementation, based on experience and current models of best practice. Three examples are highlighted below to illustrate the practical application of such advice in the area of use of timber in reconstruction, rehabilitation of coral reef ecosystems and rebuilding coastal and subsistence fisheries.

Example 1: Construction Materials

An assessment of the volume of logs required to provide temporary barracks accommodation, low-cost permanent housing, reconstruction and repair of office buildings, schools, hospitals and houses of worship, during the Phases of

Emergency Response and subsequent Reconstruction of Nanggroe Aceh Darussalam ranges from around 4 million to a maximum of 8 million cubic meters. A survey of some potential domestic timber sources (stolen, found, seized and donated timber, as well as those from timber plantations, community-owned forests and crop plantations) shows that these are very limited and inadequate to meet the anticipated demand.

The use of imported, sustainably-produced timber is recommended in order to avoid the opportunistic practices that could occur, should traders of illegal timber use the "attractive" opportunities sure to be provided by the great reconstruction need. This imported timber could be supplied free as in-kind assistance by donor-states or by global corporations involved in the trade of such timber. The Indonesian Government should expedite the import process for such timber by ensuring there are no bureaucratic barriers that would delay imported timber reaching its intended destinations and by providing special facilities to ensure a transparent, legal route. The Government is advised to use local and international NGOs within existing forestry networks to assist in lobbying and in the necessary technical preparations, e.g., directing the flow of donated timber.

General goals, strategies and indicators for construction materials are illustrated further in Box 1.

Box 1. General Goals, Best Practice Actions and Indicators for Construction Materials.

GOAL: Reconstruction is sensitive to local traditions and cultures, supports local businesses, builds local capacity and minimizes impact on local natural resources through using recycled or sustainably-sourced materials wherever possible.

RECONSTRUCTION STRATEGY

- Assess damage to infrastructure (houses, hospitals, schools, roads, bridges, airports, ports, etc) and determine most appropriate reconstruction method.
- Assess quantity and type of materials required for reconstruction.
- Assess quantity of required materials available from recycled (e.g., from debris) or other sustainable sources in affected country.
- If there is insufficient material available from recycled or other sustainable sources in-country, assess feasibility of supplying needs by importing from sustainable sources.
- In particular, avoid exacerbating existing pressures on local natural resources (e.g., avoid timber supply from stressed forest systems, avoid aggregate supply from stressed coastal or river systems, etc.).
- Use materials suited to local conditions (e.g., durable in local climate).
- As far as possible, do not create new (or expand existing) processing industries beyond the long-term capacity of the relevant natural resource to supply them.

INDICATORS OF SUCCESS

- Local natural resources are used in reconstruction in a sustainable manner.
- Natural resources are imported from sustainable sources to fill any shortfall in local availability.
- Replanting programs initiated where specialty woods are required such as for boat-building components.

Example 2: Rehabilitation of Coral Reefs

Based on preliminary damage assessments by the Government of Indonesia and international agencies, a significant percentage of mangroves, up to 30 percent of reefs, and up to 20 percent of seagrass beds may have been damaged in Aceh. The damage to coral reefs is likely to range from relatively minor physical damage such as breakage of coral, to more substantial damage where corals have been smothered by sediment or blanketed by debris. If the picture that emerges is similar to Thailand, then areas of significant damage will be extremely localized, exposed shallow fringing reefs will have suffered most, and coral with delicate and intricate structures (such as gorgonian fans) will be most susceptible to impact. Aceh was the landmass nearest the quake's epicenter and there may

The majority of the fishing boats that were damaged or destroyed by the tsunami were made of wood. Reconstruction efforts should focus on supporting local industries through the repair of damaged boats, rebuilding new boats and strengthening management to ensure sustainability.

have been permanent physical changes to the coastline in many areas and this may have long-term effects on the distribution of corals and reefs.

The ecological effects are an overall loss of live coral cover and a loss of habitat for the creatures that live in and around the reef. Reefs are crowded natural environments where every last inch of 'living space' is occupied. The sheltered spaces in and around branching coral provide a safe haven from predators for numerous small fish and invertebrates and so a loss of branching types of corals means a loss of these associated communities.

Another type of impact of tsunamis on reefs is the smothering of living coral by mud that is deposited as the floodwaters recede and by debris being caught on the reefs. Coral polyps are delicate creatures preferring warm, clear water and high sediment levels trigger a stress reaction and can eventually kill the living tissue. The impact and recovery here will depend on local oceanographic conditions which will determine whether the mud is washed away before the corals die and how quickly recruitment can take place if there has been a coral die-off.

Coral reefs are, in general, highly resilient and if other threats such as high nutrients and fishing using destructive methods such as dynamite and cyanide can be minimized, then the natural processes of recruitment will lead to new corals quickly settling on damaged and dead portions of the reef. Depending on the degree of damage to reefs and mangroves, recovery may take from a few months to up to 20 years or longer in severe cases. Regardless of the extent of damage, it is now even more important to remove other threats to coral reef health, such as destructive fishing, to provide the best possible conditions for recovery.

To ensure optimal conditions for the natural recovery of coral reefs in Aceh, efforts should focus on removing all pre-existing threats to coral reef health and integrity, especially illegal and destructive fishing practices, such as fishing using homemade bombs and cyanide. Of equal concern is that all coastal and nearshore rehabilitation, reconstruction, and reclamation activities be carefully screened to prevent introducing new impacts to recovering reef systems through the disturbance of current regimes, sedimentation or, in the worst case, physical removal or burial under breakwaters or other engineering structures. Coral reefs are themselves effective natural breakwaters; during reconstruction and creation of defenses against future impacts, efforts should

focus on strengthening natural defenses and should seek 'soft' solutions rather than 'hard' engineering structures.

Box 2 presents strategies and indicators for the rehabilitation of coral reefs and seagrass beds.

Example 3: Rebuilding Coastal and Subsistence Fisheries

Before the tsunami, an estimated 100,000 people were involved in fishing in Aceh, with 58,000 being employed fulltime. Most members of the fishing community were artisanal fishers, which explains the large numbers of canoes (15,000) compared to the small-scale nearshore crafts (5,600). In the disaster, an estimated 65 percent of boats and gear were lost, and 15-20 percent of fisherfolk lives were lost. Especially in coastal villages along the west coast, fishing is primarily beach-based, carried out by families or groups of individuals.

Those who were engaged in subsistence fisheries before the tsunami, and who have lost boats, gear or materials for processing catch, are considered a high priority for rebuilding livelihoods. Given the importance of fisheries as a source of livelihood, as a source of regional economy and as a source of tradition and culture for local communities, rebuilding the fisheries sector is seen as a priority from a variety of perspectives.

It is recommended that rebuilding of the artisanal subsistence fisheries be done not by introducing new fleets and new technologies but by providing sustainably-sourced materials to rebuild boats and crafts similar to those lost (More recommendations in Box 3). During the process of rebuilding the lives and livelihoods of fishing communities, care should be taken not to introduce over-capacity, to only equip fishers with non-destructive gears, and to safeguard sites critical for future recruitment and replenishment of the fish populations and ecosystems. Technical support, training and expertise should be provided to establish an overall

Box 2. General Goals, Best Practice Actions and Indicators for the Rehabilitation of Coral Reefs and Seagrass Beds

GOAL: To have tsunami-damaged coral reefs and seagrass beds fully recovered and coral reef and seagrass health optimized to contribute to fisheries, coastal defence, tourism potential and to be resilient against future impacts such as climate change.

RECONSTRUCTION STRATEGY

- Prioritize the removal of any external threats to the reef system, including bomb and cyanide fishing, and seek to minimize land-based threats such as pollution and destructive fishing, in order to maximize recovery and if active rehabilitation is deemed necessary, choose a methodology appropriate to the type and scale of damage.
- Initiate a broad education and outreach program targeting communities and policymakers to highlight the need to urgently remove external threats, especially those linked to illegal activities, to help ensure rapid recovery.
- Sites of importance for ecological processes such as those providing new recruits to fish populations and those identified as having long-term resilience, prioritized for high levels of protection as insurance against future natural impacts.
- Engage full range of stakeholder and institutions and ensure full environmental impact assessments are carried out on any proposed structure that would have direct or indirect impacts on reefs and seagrasses.

INDICATORS OF SUCCESS

- Percentage recovery of reef and seagrass damaged by tsunami and area of reef and seagrass under high form of protection.
- Health of coral reef and seagrass ecosystems as measured by trophic structure, population size frequency and trends on abundance of indicator species.
- Reduction of illegal activities impacting coral reef and seagrass ecosystems.
- No further damage to coral reefs and seagrass beds from reconstruction activities.

The option of careful rebuilding for a sustainable subsistence fishery, with access to markets and incentives for best practice, is considered far preferable to the other more technological options. It avoids creating increased capacity over the situation prior to the tsunami and therefore lessens the risks of exacerbating the pressure on coastal fisheries.

Damaged school in Banda Aceh. Where natural materials are used in the rebuilding of housing and other infrastructure, such as schools and hospitals, these should be supplied from sustainable sources.

ecosystem-based framework within which subsistence, coastal and offshore fisheries could be managed.

The option of careful rebuilding for a sustainable subsistence fishery, with access to markets and incentives for best practice, is considered far preferable to the other more technological options. It avoids creating increased capacity over the situation prior to the tsunami and therefore lessens the risks of exacerbating the pressure on coastal fisheries. For example, The European Union should not transfer EU boats due to be scrapped to tsunami-hit areas, as the boats are not suitable for local fishing communities and that the EU should support domestic boat-building industries instead. As part of the EU response to help tsunami-hit countries, the European Commission has proposed to transfer European decommissioned fishing boats (under 12 m and between 5-20 years old) to the countries devastated by the tsunami. European fishing boats are very different from Indonesian coastal vessels and this would lead to serious changes in local fishing practices. For example, in the tsunami-affected region most fishers operate individually in small boats, not in crews. Therefore the use of European vessels would require different systems of working with owners and workers.

In the wake of the Indian Ocean tsunami the rulebook on foreign debt has been rewritten, and it is now time to rewrite the rulebook on development. Strategic leadership by the Indonesian Government and donors should frame a green reconstruction process that sets ambitious integrated environmental and

Box 3. Rebuilding Marine Fisheries

GOAL: A fisheries sector is re-established that is sustainably managed, operates according to best practices within a precautionary framework, is equipped with appropriate gears, and supported by efficient post-harvesting technology and infrastructure.

RECONSTRUCTION STRATEGY

- Develop an overall sustainable fisheries reconstruction plan, focusing on creating an overarching sustainable fisheries management framework, sustaining target fish populations, conserving sites critical for replenishment, rebuilding boats, gears, supporting infrastructure and markets.
- Focus on the reconstruction of sustainably managed small-scale fisheries involving those impacted by the tsunami as a priority, including strengthening local institutions involved in small-scale fisheries and strengthening small-scale fisheries governance.
- Where possible, promote community-led reconstruction efforts, invest in local industries and local capacity for rebuilding boats and infrastructure (under the guidance of capacity limits), promote the use of recycled or sustainable sourced materials and re-equip with appropriate gears according to a sustainable fisheries management plan.
- Take care not to allow the introduction of inappropriate or unfamiliar technologies and critically evaluate donor or national government-driven initiatives to provide substantially different boats or gears.
- Ensure effective surveillance, enforcement and compliance mechanisms are in place to prevent over-exploitation of fish populations and other targeted components of the ecosystems, and to prevent other activities from having significantly damaging impacts on the health of the ecosystems.
- Provide incentives and access to markets for products passing a certification standard to encourage best practice, and if appropriate, develop infrastructure and trade networks and seek markets to support such ventures.
- Invest in reconstruction of strong local formal and informal institutions and human capacity for management, including monitoring and enforcement. This should be coupled with efforts to rebuild infrastructure.
- Ensure that commercial and large-scale fisheries do not deplete fish populations or impact ecosystems that will have negative consequences for small-scale fisheries.

INDICATORS OF SUCCESS

- Reduction in use of unsustainable and destructive fishing gears and reduction in illegal fishing activities.
- Marine trophic structure of target ecosystems, size-frequency distribution of indicator species, abundance and population structure of target species, and catch per unit effort.
- Maintenance of traditional fishing grounds, traditional access rights and traditional mechanisms for sustaining healthy fish populations, including integration of traditional fisheries knowledge and management into management frameworks and effective participation of local institutions representing fisher communities in the governance process.
- Average income of small-scale fishing households, access to markets for best practice fisheries products, and numbers of fisher households engaged in enterprise schemes.
- Percentage of fisheries production sourced from sustainably-managed fish populations, access to markets for best practice fisheries products and percentage of fisheries products conforming to best practice standards.
- Fisheries management plan supported by local stakeholders and developed under an ecosystem-based management framework with clear catch limits under a precautionary framework.

development targets. Compared to the slow working political processes, the reconstruction effort sets a unique stage for demonstrating the practical advantages of bringing environment and development goals together.

In five years' time, this period can be marked as an historical moment in the practice of sustainable development. Human harmony with nature is a commonly cited aspiration; the green reconstruction of coastal communities around the Indian Ocean is our chance to make this a reality. ■

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Life-Saving Belts: Post-Tsunami Reassessment of Mangrove Ecosystem Values and Management in Thailand

Introduction

The tsunami that struck Thailand's six southern provinces (namely Phuket, Phang Nga, Krabi, Ranong, Trang and Satun) along the Andaman coastline on 26 December 2004 killed at least 5,300 people, affected about 490 fishing villages along the Andaman coast, and left tens of thousands homeless. Following the disaster, Thailand has planned new steps to cope with the often-unpredictable tsunami by establishing monitoring and warning systems, as well as to take necessary actions to manage the disaster. While the tsunami destroyed or seriously damaged the villagers' lives and properties, early evidence suggested that mangroves and other coastal forests might help reduce the devastation caused by the waves.

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"The conversion of landforms by humans often goes unnoticed. Moreover, humans tend to remain satisfied with an environment even as it degrades around them. As time passes, natural landscapes become even more susceptible to conversion, human memory of natural landform characteristics fade, documentation of those characteristics becomes scarcer, and people accept current conditions as a natural system. The landscape may remain valuable to humans, but the interactions of processes and the resultant landforms that characterized the natural system are modified, and the intrinsic value of the physical landscape is gradually lost."

— Dr. Karl Nordstrom (1990)

More recent analysis has urged concerned authorities and decisionmakers to replant mangroves for the protection of coastal areas from unsustainable development, as well as to revitalize the concept of integrated coastal management (ICM) that was introduced and strongly promoted in the 1980s.

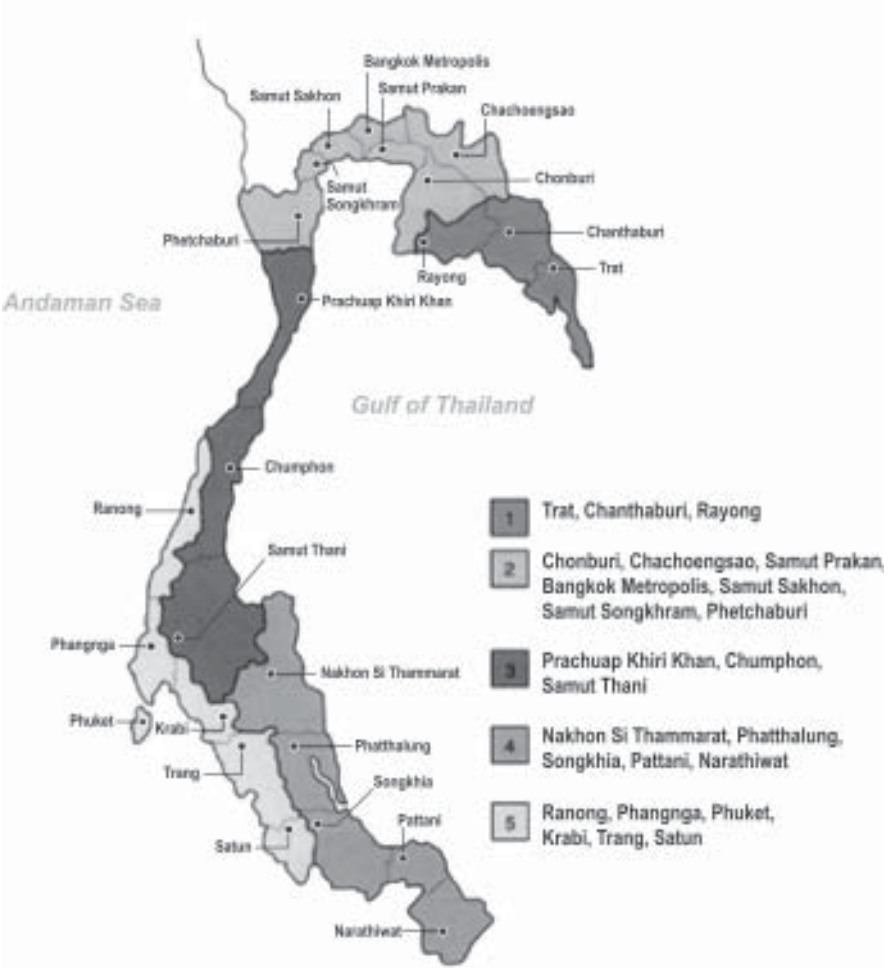
The coastal zones of Thailand's southern region include coastal lowlands, beaches, rocky shores and cliffs, dunes, estuaries (including coastal forests, salt marshes, mangroves, seagrass beds, sandflats and mudflats, and coral reefs) and islands. These coastal ecosystems offer diverse environmental and economic values such as food production, recreation and habitat for plants and animals. The natural character of the coastal environment that include land

forms, plants and animals, as well as physical and biological processes and values, help protect the coast's natural qualities, which directly and indirectly support national economic development and often are the major sources of income in coastal communities. Mangrove areas, for example, are home to thousands of families. The coastal people, particularly those along the Andaman coast, have long cherished mangroves as a source of food, medicine and fuel and as areas for recreational activities. In most instances, sustainability is dependent upon functioning natural processes that support the region's natural character. Increasing modifications of the coastal ecosystems by human activities, including industrial, commercial, residential and agricultural development, have altered the functional integrity of the ecosystem, which can seriously reduce the level of goods and services that they normally generate.

In most instances, sustainability is dependent upon functioning natural processes that support the region's natural character. Increasing modifications of the coastal ecosystems by human activities, including industrial, commercial, residential and agricultural development, have altered the functional integrity of the ecosystem, which can seriously reduce the level of goods and services that they normally generate.

The Existence of Natural Character: An Intrinsic Value of Mangroves

Mangroves are among the most productive terrestrial ecosystems. They thrive in sheltered bays where rivers have deposited nutrient-rich sediment, forming part of many different habitats that make up the estuarine ecosystems. Mangroves are important feeding grounds for many species of coastal animals and



Along the shoreline in Ranong Province, where Kasetsart University's Coastal Resource Research Station is located, many villagers were saved from the tsunami because the mangroves are thriving and dense in this area (Aksornkoae and Hawanon, 2005).

are rich in food and non-food products for man. Mangrove trees can withstand severe environmental stress including alternating mixes of freshwater and saltwater, prolonged submersion or exposure with every tide, and mud that has no oxygen and has a high sulfur content. Mangroves trap silt and build up thick, shifting sediments where they grow, stabilizing land elevation by sediment accretion which helps protect coastlines from erosion, storm damage, and wave action. Mangroves play a pivotal role in moderating monsoonal tidal floods and in coastal protection, as widely reported in the Asian region and elsewhere.

An early observation in south Indian villages after the December 2004 tsunami suggested that mangroves, as well as coastal trees and shrubs, minimized disastrous wave energy and reduced the number of casualties (Christian Science Monitor, 2005). The damages were relatively extensive where mangroves and other natural coastal barriers were transformed, as reported from southern Thailand (Worldchanging, 2005b). Along the shoreline in Ranong Province, where Kasetsart University's Coastal Resource Research Station is located, many villagers were saved from the tsunami because the mangroves are thriving and dense in this area (Aksornkoae and Hawanon, 2005). The report also mentioned that only houses and schools built behind the mangrove forests in Phang Nga Province were not destroyed or damaged.

A thick area of mangroves helped reduce the devastation caused by the wave in Kuraburi, Phang Nga Province, Thailand.

While scientists are updating specific information to analyze how mangrove areas can reduce the loss of life and damage caused by recent tsunamis in the Indian Ocean, evidences have been reported focusing on the shoreline protective values of mangrove ecosystems (Chong, 2005; IUCN, 2005; UNEP, 2005a; 2005b). In many cases, the results show that mangroves have a special role in stabilizing tropical coastal zones and demonstrate the usefulness of mangrove reforestation for coastal protection. A study on indirect values of mangroves in southern Thailand was a unique attempt to calculate additional external benefits of mangroves to local communities in terms of coastline protection for shrimp farms (Sathirathai and Barbier, 2001).

Mangroves Are Disappearing in Southern Thailand

In southern Thailand, mangroves cover an area of around 2,093 km^2, which account for 85 percent of the country's total mangrove area (RFD, 2003). According to Food and Agriculture Organization (FAO) data, Thailand lost about 15 percent of its mangrove area in the period of 1980–2000, which was due largely to high population pressure and conversion of mangroves for pond culture, mining and infrastructure development.

While shrimp farms account for about 64 percent of mangrove area conversion throughout the country, changes in mangrove area in the six tsunami-affected provinces have been due mainly to the growth of the tin mining industry (e.g., Ranong, Phang Nga and Phuket), construction of fishing port facilities (e.g., Krabi, Phang Nga and Satun), and urban/community development (e.g., Ranong, Krabi, Phuket). In Phang Nga Province, for example, large areas of coastal vegetation including mangroves were removed to prevent obstacles to machinery during mining. Following the collapse of Thailand's tin mining industry in the late 1980s, these mines were abandoned, leaving large holes filled with rainwater that contain large amounts of tailings left behind by alluvial mining. These are unable to support any life form and have left the areas barren. While land damaged by mining can be restored, the restoration work may be costly and time consuming. There are only few cases in Ranong and Phang Nga Provinces where the rehabilitation of mangroves in post-tin mining areas was successfully implemented (Aksornkoae, et al., 2004).

In Ranong Province, Thailand, a mangrove species, the *Avicennia alba* were uprooted by the December 2004 tsunami.

The tsunami damaged the mangroves at Baan Nam Khem, Phang Nga Province, Thailand.

In recent years, the rapid growth of urban and community development has been the most controversial issue in coastal areas

A study on indirect values of mangroves in southern Thailand was a unique attempt to calculate additional external benefits of mangroves to local communities in terms of coastline protection for shrimp farms (Sathirathai and Barbier, 2001).

of Thailand's Andaman coast. Information on the status of mangrove areas and deforestation trends in fast-developing areas of Krabi, Phang Nga and Phuket is scarce. However, many case studies have described how population and economic growth in coastal areas has led to the conversion of mangrove areas for coastal construction and tourism (MAP, 2005; Worldchanging, 2005b).

Thailand Policy on Mangroves and Coastal Management

Early attempts to manage the coastal areas focused on resolving coastal land-use conflicts, particularly the conversion of mangrove areas for aquaculture and urban development. In 1979, the first Cabinet resolution on the recommendations of the National Mangrove Resources Committee on the protection and conservation of mangrove resources was passed, followed by the resolution on Measure for Mangrove Area Exploitation in 1980 regulating the use of mangrove areas for development projects. Since then, a number of Cabinet resolutions on mangroves have been adopted aiming to resolve conflicts in different circumstances. However, it was noted that, while the intention was to control major developments in mangrove areas, there was no clear guideline for implementation (Aksornkoae, et al., 1999). Lack of guidance on how to integrate the work among different agencies led to policy failure.

Attempts were made by the government to rehabilitate degraded mangroves. In June 1991, the Cabinet approved the replanting of mangroves in all coastal provinces. Four mangrove seedling centers were established in Trat, Phang Nga, Nakhon Si Thammarat and Satun. A plan was developed to increase the effectiveness of the 34 mangrove management units in the country and to set up another six units in Phetchaburi, Rayong, Chumpon, Surat Thani, Nakhon Si Thammarat and Pattani. In April 1993, with Cabinet approval, two research and conservation centers were set up in Phuket and Nakhon Si Thammarat.

Following the government reform in 2002, mangrove conservation, rehabilitation and management has been mainly under the Department of Marine and Coastal Resources. The agency enforces a number of legislation related to coastal and marine resources and is responsible for the sustainable management of all coastal resources including mangroves. Recognizing the need to bring policy and legislation in line with the integrated, holistic approach to coastal management, the Department of Marine and Coastal Resources has initiated the process of formulating a national marine and coastal policy that takes into consideration key principles of sustainable development, precautionary action and polluter pays. As outlined in the Department's mission, policies for integrated coastal zone management and sustainable development will be directed toward the protection of remaining mangroves, minimizing environmental impacts on coastal areas, the promotion of eco-tourism and the development of seawater irrigation system for coastal aquaculture. Current policy and legislation also require that the local administrative organizations have a major role in protecting and conserving coastal resources in their territories.

A number of initiatives to strengthen the government's

capacity on coastal management were also launched during the 1990s, introducing an integrated, holistic approach. Project activities were piloted in many coastal provinces, gradually building up the ICM capacity of government officials at the national and local levels. The government's policy on crosscutting issues and planning in coastal areas has been carried over to local authorities, taking into account the needs of all stakeholders. To date, many local authorities in Thailand are well aware of the potential for coastal development through the ICM approach. There has also been significant advance in the adoption of projects/activities for ICM in Thailand. A successful example is the improvement of Koh Loy for recreation and commercial activities by the Sriracha municipality in Chonburi Province, which is one of PEMSEA's demonstration sites. Another recent effort to promote integrated management of mangrove plantations for development of coastal resources was carried out through a series of knowledge-based research in Pak Phanang Bay, Nakhon Si Thammarat Province (Aksornkoae, et al., 2004). Based on a multidisciplinary research approach, a holistic model of sustainable management of mangrove plantations was proposed and is expected to be implemented by concerned agencies.

Recognizing the need to bring policy and legislation in line with the integrated, holistic approach to coastal management, the Department of Marine and Coastal Resources has initiated the process of formulating a national marine and coastal policy that takes into consideration key principles of sustainable development, precautionary action and polluter pays.

Replanting mangroves for coastal protection by fishers in Nakhon Si Thammarat Province, Thailand.

The Life-Saving Belt Concept and ICM

Parallel to the government's new coastal development thinking and ICM initiatives, a life-saving belt concept should be developed and adopted to protect coastal hazard-prone areas and to contain or manage urban growth. Research and recent experience have suggested that building and living too close to the shoreline and removing coastal vegetation and dunes create potential hazards for people and property in the area.

Specifically, coastal management in the hazard-prone areas, and indeed throughout the country, must move beyond dealing with coastal management issues on a case-by-case basis to an approach that proactively focuses on larger-scale issues at both the coastline and within the associated watershed.

Both ICM anecdotes and empirical studies have repeatedly recommended that the integrated management system should be applied to incorporate risk factors in new and currently formulated coastal development projects. Specifically, coastal management in the hazard-prone areas, and indeed throughout the country, must move beyond dealing with coastal management issues on a case-by-case basis to an approach that proactively focuses on larger-scale issues at both the coastline and within the associated watershed.

The life-saving belt concept would utilize mangroves to zone development at the coastal areas, maximizing natural character as well as protective and amenity values.

Rehabilitation of mangroves in abandoned shrimp ponds in Nakhon Si Thammarat Province, Thailand.

The idea is to allow a fair share of growth in the coastal areas, while preserving the core values that most people share. This may not necessarily involve large-scale public purchase of coastal land[1], but instead, depend primarily on public regulatory methods and economic incentives to prevent undue conversion of the mangroves.

While maintaining that the development and implementation of the life-saving belt concept can succeed in protecting the direct and indirect values of Thailand's coasts, particularly in hazard-prone areas, it is only feasible if specific principles and strategies are developed and adopted. This includes solid support from the local community, strict implementation and enforcement of relevant legal measures, sound ICM planning and practices, community education, participation and information programs, and identification of assured sources and methods of financing. In order to receive the support of people in coastal areas, life-saving belts must also provide significant and tangible social and economic benefits to the citizens.

[1] It has been suggested that, in order for the mangroves to effectively provide protection against the actions of waves, the width of the forest should not be less than 100 m from coastal shores (Aksornkoae and Hawanon, 2005). The extent to which the mangrove belts contribute to protecting coastal areas against tidal waves also depends on other factors such as wave height and velocity and coastline topography and orientation.

Conclusion

The failure to adequately regulate coastal development and the rush to transform coastal areas into economic zones without considering their natural character are major factors contributing to human loss and damage to property from the December 2004 tsunami. While there is no guarantee that replanting mangroves will prevent another tsunami tragedy, coastal communities need many more life-saving belts to help filter the energy of strong winds and tidal waves. Until recently, mangrove forests have been recognized mainly for their direct-use values. This erroneous understanding has made it easier to exploit mangrove areas as cheap sources of food and as wastelands, undervaluing shoreline protection services that mangroves provide.

In Thailand's coastal areas affected by the tsunami, as well as in other hazard-prone coastal areas, there are opportunities to adopt the life-saving belt concept to effectively address coastal hazard issues and to demonstrate the protective value of mangrove ecosystems. Meanwhile, stricter national and local governmental regulations and enforcement are crucial to ensure the protection of mangroves. For sustainable management and protection of coastal resources and areas, including the nearby mangroves, the improvement of coastal resource information system and awareness as well as the involvement of local communities in coastal planning and implementation are essential. ■

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The Disasters That Did Not Happen

"Building a culture of prevention is not easy. While the costs of prevention have to be paid in the present, the benefits lie in distant future. Moreover, the benefits are not tangible; they are the disasters that did not happen."

– Kofi Annan

The Hyogo Framework for Action 2000–2015: Building Resilience of Nations and Communities to Disasters is predicated on the fact that risk from disasters has become commonplace that greatly erodes development gains. This awareness is coupled with the appreciation that disasters are not only isolated extreme events managed by warning systems, humanitarian relief and rescue operations and structural reconstruction. Disasters can also result from slow-onset, series of successive man-made decisions and actions (or inactions) that increases peoples' vulnerability to disasters.

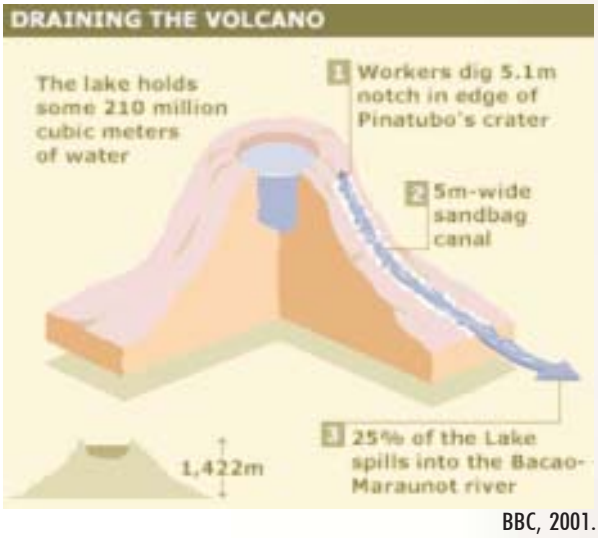
It is clear that vulnerability must be central to risk reduction strategies. The actions to reduce vulnerability must be tied at identifying and strengthening the individual, institutional and

In Memoriam

"It turned out to be his last mission to save lives," a Philippine daily bannered, in deference to Dr. Raymundo Punongbayan and four other Filipino scientists who perished last April in a helicopter crash while conducting an aerial survey on two eastern Luzon provinces. The new data will form the basis for a flashflood and earthquake hazard map of the vulnerable communities. Widely-known internationally, Dr. Punongbayan was best recognized as the scientist from a then poorly funded and poorly equipped institution, who led thousands of people from Central Luzon to escape the foreboding disaster of the June 1991 Mt. Pinatubo eruption (Orejas, 2005). It was the world's worst volcanic eruption of the 20th century; spewed volcanic materials reached as far as Russia and North America and caused subsequent widespread lahar around the volcano's vicinity. Only about 300 perished although a million were displaced while several towns were buried in lahar; hundreds of millions of dollars were lost from destroyed properties and infrastructures (Newhall and Punongbayan, 1996). Highlighted from reports is the significant impact when Dr. Punongbayan heeded the concern of an indigenous tribal group — the Aetas — who became restless when their beloved mountain started showing steams and frequent earthquakes. Lessons abound on successful forecasting of eruptions and lahar flows; of warnings coupled with intensive educational campaigns and of international partnerships and coordination.

Dr. Raymundo Punongbayan

Ten years after the eruption, the same volcano, this time having formed a crater lake from its blown-off top, has dangerously accumulated enough water that could breach the crater walls. The impacts could inundate and possibly kill 40,000 people downslope the small coastal town of Botolan, Zambales. A 5-m deep drainage channel was dug from the side of Mt. Pinatubo to spill off a quarter of the lake's water; a major effort heralded as the first of such operations done anywhere in the world (BBC, 2001). No one died and no property was damaged as result of this operation. Dr. Punongbayan was ecstatic when he said "It's a good success story — something we can be proud of." ■



BBC, 2001.

Diagram from BBC (available at news.bbc.co.uk/2/hi/asia-pacific/1530182.stm)

societal capacities and coping mechanisms. This is at the heart of acting proactively — of instituting mitigations during lull periods when disasters are not wreaking havoc. This is the time of building the culture of safety and prevention. As always the case with rhetoric, this is easier said than done.

Here are running accounts from case studies that embody some of the significant components of disaster risk reduction. They form but a small part of a wider body of experience in East Asia. They are examples of best practices and also form probably the best argument for supporting specific activities that are recommended in the Hyogo Framework and why mainstreaming risk reduction to development policies can lead to sustainable development. ■

2-way radios

IFRC, 2002

Cyclone shelter in Chittagong, Bangladesh.

NDM-Partnership, 2004

Emergency Day Care Centers in Vietnam

People-Centric Early Warning Systems

Early warning saves lives. That's the very obvious lesson from the 2004 tsunami event. But it has to be people-centric because an overly expensive technology is of no use when warnings are not heeded by soon-to-be affected communities. A warning has to be sent fast and accurately, and received and responded to appropriately. As in the case of the instructive early warning system established in a coastal community in Indonesia (Bildan, 2003).

Mirit, in the southern coast of Kebumen, central Java, Indonesia, is prone to prolonged riverine flooding from heavy monsoon rains because a number of their villages are located below sea level. The years 1992, 1999 and 2000 saw damages to their irrigation network, roads, houses, a school and health center. A community-based early warning system was installed with the help of their upland villages and Oxfam GB. The latter provided two 2-way radios while the community matched the contribution. The villages upstream were tasked to provide information on rainfall level and duration via the radios. During a monsoon in 2001, and with torrential rains threatening, the process of hazard detection and dissemination was set into motion. The quick warning from upland villages and quick response from the lowland villages, while coordinating their efforts with government officials, meant evacuation of villagers before flooding occurred. Lives were saved and losses were significantly lessened.

In conjunction with early warning systems, the construction of physical structures where people can easily go to during evacuation is imperative. In Bangladesh, several cyclone shelters have lessened deaths during emergencies (IFRC, 2002). In 1970, storm surges from a major cyclone reaching a wind velocity of 62 m/s caused deaths to 500,000 people and left millions homeless. But in 1997 and during a cyclone with wind velocity of 64 m/s, about one million people were evacuated to several cyclone shelters. Only about 190 died.

In Vietnam, more than 900 emergency day care centers have opened to shelter 20,000 children being affected by seasonal floods. In the past, 72 percent of deaths from water-related emergencies were children, left to fend for themselves when their parents have to look for food or work (NDM-Partnership, 2004). These centers open as soon as flood reaches a critical mark and are instrumental to decreasing the drowning to as much as 62 percent. ■

Life-Saving Belts

Recently, UNEP (2005) released interim results of environmental assessments done in Indonesia, Maldives, Seychelles, Somalia, Sri Lanka, Thailand and Yemen. Immediate findings validate the claims that coastal habitats including coral reefs, mangroves, vegetated sand dunes and other coastal vegetation buffeted the effects of the tsunami. For example, Naluvedapathy Tamil Nadu, India, is protected by a kilometer-thick forest composed of *Casuarina*, coconut and other tree varieties. The village lies adjacent to areas worst-affected by the tsunami. The trees saved them because as early as 2002, they planted 80,244 saplings in the hope of entering into the Guinness Book of World Records (Raman, 2005).

IFRC (2002) highlighted that since 1994, Vietnam Red Cross (VNRC) has been planting and protecting mangrove forests in northern Vietnam. Quite a peculiar undertaking for a humanitarian organization at that time, VNRC is fully cognizant of the importance of the activity in saving lives and properties as Vietnam is often ravaged by typhoons. About 12,000 ha have so far been planted with different mangrove species. They now protect 110 km of the 3,000-km sea-dyke system that snakes down Vietnam's coastline. During the 2001 Typhoon Wukong, three northern provinces took a beating, but no death was reported. And the dykes have been protected by the mangroves. In the past, waves from storm surges destroy the dykes causing deaths and flooding. As an additional benefit, the communities generate income from selling crabs and shrimps as well as supplemental food from the now abundant mangrove fauna. ■

People collecting sea products for their livelihood.

Sea dykes are protected by mangroves.

Land-Use Planning

Naga City, in the Philippines, experiences flooding from river swelling and coastal storm surges. As one of the ten demonstration sites under the Asian Urban Disaster Mitigation Program (AUMD), the local government became cognizant of the link between hazard mitigation and land-use planning to address multiple hazards. They put in place strategies that included (UN-ISDR, 2004):

Hazard mapping and risk assessment – A hazard map was developed using data from the weather forecasting office vis-à-vis community-based surveys. All information was translated to the geographical information system (GIS) platform, significantly refining areas which could easily be flooded and which specific households, in times of emergencies, need to be evacuated immediately.

Relocating centers of economic activities – Centers of economic activities and settlements received further focus after the most vulnerable areas were delineated. The goal is to shift activities away from the flood-prone central business district to less risky areas. New growth areas were developed in accordance with their five-year development plan, land-use regulations and economic incentives. By doing so, economic activities will not stop, even during calamities, lessening economic loss and ensuring that regular community activities can resume earlier. Included are the creation of new markets, new roads and additional social service facilities away from the urban center.

To address problems on informal settlers, the Naga *Kaantabay sa Kauswagan* (Partners in Progress Programme) relocated, to date, more than 12,500 households to safer areas with basic social service facilities.

Safer building construction – Local building ordinances were refined based on the existing national building code. The new ordinances, appropriately suited for Naga, expedited enforcements and prosecution of violators. In turn, this has dramatically improved compliance.

continued on page 106

Harakunarak, A.

Management-Based Research

Research is fundamental to risk reduction strategies. Recent research agendas have become multidisciplinary, which look not only at comprehensive knowledge about hazards per se, but also on how communities interact and find solutions given knowledge of multi-hazards affecting them. A research project in La Union, Philippines, about coastal erosion articulated both the natural processes and human actions that aggravated the hazard (Siringan, et al., 2005). Several local government actions have since been instituted as a response to the data and information generated by the research.

Coastal erosion.

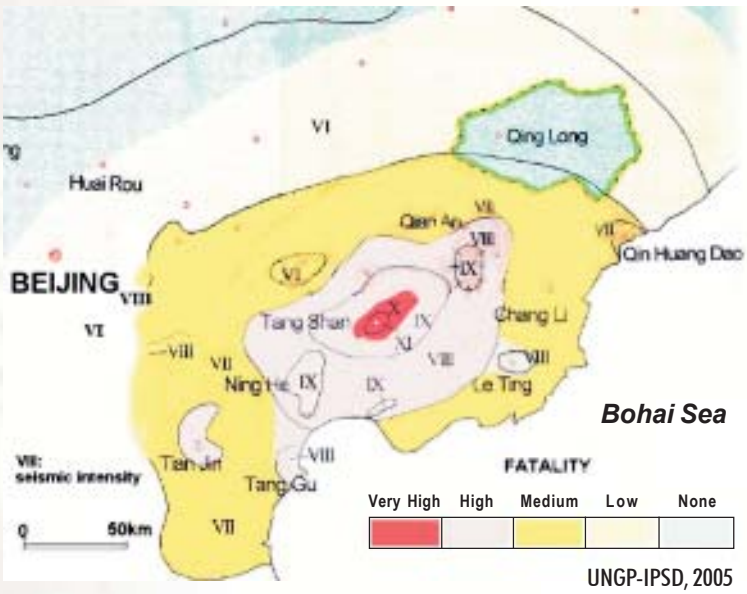
The research on coastal erosion in the province of La Union was funded by City of San Fernando, the Province of La Union, the Poro Point Development Authority and the World Bank – ProVention Applied Research Grants in Disaster Risk Management. Worth noting is that the initial seed grant came from a private individual whose scientific inclinations and love for the community started the project.

continued on page 106

Partnerships

Tangshan, west of Bohai Sea in China, experienced the Great Tangshan Earthquake (GTE) in July 1976. The earthquake, registering a 7.8 magnitude, flattened physical structures and killed 240,000 people. The effect reached as far as away as Beijing, 200-km west of Tangshan. In Qinglong County, 115 km from Tangshan, amazingly no one died although about 180,000 of their buildings collapsed. Their unbelievable story is made up of accounts consisting of exemplary government action and community spirit borne out of information from their national scientists (UNGP-IPSD, 2005; Delica-Willison, 2005). The partnership of the triad is instrumental to preventing loss of lives.

Two years before the Great Tangshan Earthquake, the warning from the State Seismological Bureau (SSB) alerted officials in North China – Bohai region of an impending earthquake of magnitude 6 or greater. For Qinglong, this meant becoming prepared for the incoming devastation. A county disaster management program was designed. Initially it called for distributing 70,000 books and 14,000 posters and slideshows from the SSB to educate the public. By mid-1976 practically everybody knew about earthquakes and the steps they needed to follow in the event of one happening. County, commune and village-level observation stations were also set-up to monitor changes in color, clarity, temperature and levels of water wells. Manned by community volunteers, they were also in-charge of monitoring unusual animal behaviors, geoelectricity and geomagnetism. Days before the GTE, and with fresh alerts from SSB, public administrators took more drastic measures like school classes and businesses being held outdoors; earthquake warning through telephone and public broadcasts, frequent monitoring at the observation stations (by this time water from wells became murky and strange animal behaviors were observed like nocturnal weasels and rats moving about in broad daylight, unmindful of humans) and setting up of temporary earthquake tents as transient shelters. When the earthquake struck, everybody was safely ensconced in their earthquake tents outside of their homes and buildings. ■



The Great Tangshan Earthquake Death Toll.

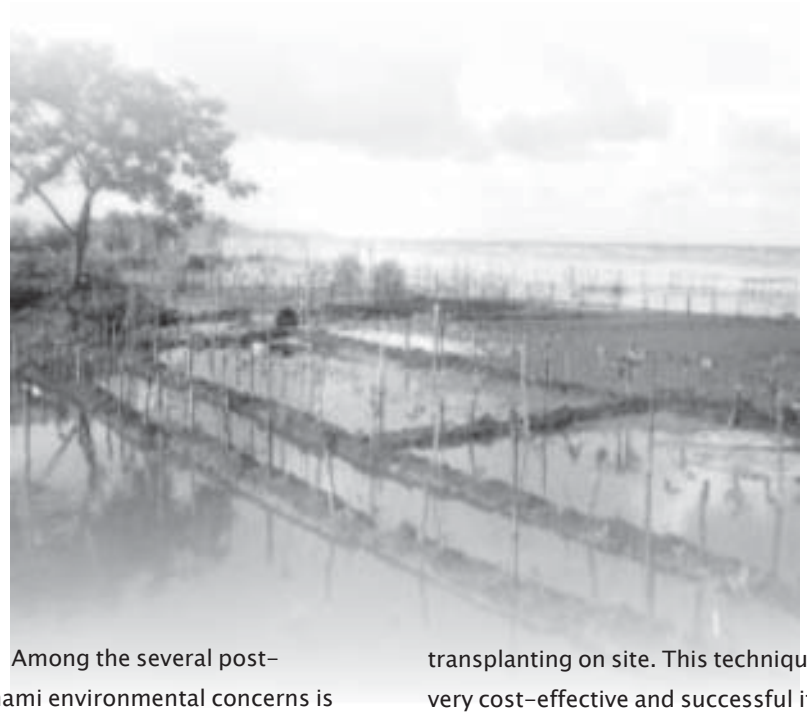
Prof. Dr. Noraini Mohd. Tamin
Universiti Kebangsaan Malaysia
Selangor, Malaysia

President
International Erosion Control Association, Malaysian Chapter

Ecological Restoration: Engineering Mangrove Rehabilitation in Erosion-Prone Coastlines

Introduction

The tsunami of 26 December 2004 has killed more than 250,000 people in countries around the Indian Ocean, caused massive destruction of infrastructure, buildings and crops, and brought about huge losses in properties, habitats and livelihoods. We may never know the total value of some of these losses. For example, the loss of coastal vegetation and the subsequent exposure of coastal habitats to erosion and degradation, and their rehabilitation are difficult to quantify in monetary terms.



Among the several post-tsunami environmental concerns is the massive coastal area stripped of vegetative cover and subjected to impounding wave action and erosion. This issue has serious implications on mangrove planting activities, if we are to rely solely on conventional techniques as practiced by state forestry departments in all tsunami-hit countries. The common method is to collect viviparous propagules (seeds) from selected mother trees, select healthy stock and either push them directly into the ground or into nursery polyethylene bags for growth up to one meter before enrichment transplanting on site. This technique is very cost-effective and successful if the planting site is located in protected estuaries or bays. Most foresters know that mangroves do not grow well on erosion-prone coastlines.

Another post-tsunami concern is the proposal by the Indian Government to build about 1,000 km of concrete seawall as protective barrier along the east coast of the Indian Sub-Continent. This issue was highlighted during a Special Tsunami Session, in conjunction with the Asian Wetlands International Symposium, on 9 February 2005, at Bhubaneswar, Orissa, India.

The author served as Consultant Ecologist for the main contractor, Datar Raya Sdn Bhd. She and her students at the Master of Science and Bachelor of Science levels at Universiti Kebangsaan Malaysia, Bangi, were thus given the opportunity to conduct studies related to mangrove establishment and monitoring from 1999 until 2004.

Environmental experts from government and non-governmental organizations (NGOs), engineers, eco-engineers and planners have voiced their concerns that such concrete structures will not sustain marine flora and fauna and can ultimately lead to depleting incomes for coastal fishers. Instead they have proposed the replanting of coastal vegetation, as effective and sustainable coastal barriers. At the end of the Symposium, representatives of the Indian Government were impressed by various data and slides presented, and have decided to review the above proposal, and probably limit their construction only to severely eroding coastlines.

In exposed and erosion-prone sites, mangrove propagules are easily washed away by strong tidal waves, and thus cannot become established on muddy or sandy substrates. A more technically challenging approach is needed for vegetation establishment, under such circumstances. An innovative technique incorporating ecological engineering has to be adopted for successful vegetation establishment, including mangroves.

Paradigm Shift

The bitter experience from the recent Asian tsunami should compel relevant authorities to review past perceptions and practices on coastal zone management. We should open up our minds to new issues and innovative technologies in coastal habitat rehabilitation. There is a need to involve relevant experts (particularly restoration ecologists) in the rehabilitation processes, including the inputs of non-foresters and local communities in planting mangroves and other coastal vegetation as effective coastal barriers.

In the long term, local authorities should accord due respect to coastal zone reserves and accordingly locate future coastal villages, towns, resorts and coastal highways further away from the high seawater level.

Asian Tsunami Coastal Greenbelt Initiative

Findings and recommendations from the Asian Wetlands International 2005 Symposium are now being fine-tuned for the Asian Tsunami/Coastal Greenbelt Initiative. This effort involves technical and financial inputs from environmental NGOs (e.g., Global Environmental Centre, Wetlands International, Mangrove Action Project, IUCN), intergovernmental organizations (e.g., UNEP, FAO, IFAD, ASEAN Secretariat), government forestry departments, coastal communities, coastal wetland restoration ecologists and experts, research institutes and humanitarian and donor groups. The main objectives of this initiative are to complement existing activities and provide an open-ended framework to bring together key stakeholders to collaborate in supporting the protection and rehabilitation of coastal forests in the region. It is heartening to know that this initiative supports the use of ecological-engineering technologies in rehabilitation works and the involvement of local communities in the planting of coastal vegetation.

Soft or Hard Engineering Coastal Erosion Control Measures

In exposed and erosion-prone sites, mangrove propagules are easily washed away by strong tidal

Post-tsunami coastal habitat restoration and rehabilitation is a highly technical process that requires professional inputs from engineers, ecologists, scientists, planners, architects, contractors and ordinary workers/staff. This is how ecological engineering works, because it is multidisciplinary.

waves, and thus cannot become established on muddy or sandy substrates. A more technically challenging approach is needed for vegetation establishment, under such circumstances. An innovative technique incorporating ecological engineering has to be adopted for successful vegetation establishment, including mangroves.

Ecological engineering is the use of living or dead plant materials in combination with inert materials like cement or steel, for ground stability. Processed plant materials that are used in engineering processes, are known as geo-materials. These are usually produced according to known specifications and have specific strength, durability and shelf life. These materials can be sourced locally, are non-polluting and biodegradable. It has been practiced by farmers using traditional knowledge since the 12th century in China, for example, in the use of brush fascines for erosion and flood control measures.

Hard engineering structures such as concrete seawall and rock revetments should be the best option at severely eroding coastal sites, and where there are clear threats to human lives. Nevertheless, after the tsunami, it has been shown that even such structures were broken to pieces by very strong tidal waves. Therefore existing concrete seawalls and rock revetments should be vegetated and strengthened through eco-engineering for long-term protection.

The acceptance of mangrove ecological engineering for coastal habitat rehabilitation by state forestry officials and all levels of the government is vital for successful establishment of protective greenbelt along erosion-prone sites. Post-tsunami coastal habitat restoration and rehabilitation is a highly technical process that requires professional inputs from engineers, ecologists, scientists, planners, architects, contractors and ordinary workers/staff. This is how ecological engineering works, because it is multidisciplinary.

Pilot Mangrove Eco-Engineering in Malaysia

Mangrove eco-engineering is new in Malaysia, and probably throughout Southeast Asia. This method of coastal vegetation establishment is cost-effective, sustainable and economically viable in the long term. Mangrove eco-engineering should be further explored and probably improvised to suit local conditions, in the course of restoring and rehabilitating coastal zones that were destroyed by the recent tsunami.

In 1999, the National Hydraulics Research Institute of Malaysia (NAHRIM) conducted a pilot mangrove planting project using eco-engineering techniques, for coastal protection and enhancement.

Though the tsunami hit the study site, damages to areas surrounding the site were minimal, because the mangroves had grown 3-m high and were dense enough to act as protective coastal barriers. This study became extremely important because data was monitored before and after the tsunami. (See sidebar for a summary of some important findings of the study).

Pilot Mangrove Eco-Engineering in Malaysia

Project Site

The project site was to the south of the Sala River mouth, near Kuala Sala, (in the northeastern state of Kedah, in Peninsular Malaysia) and along a kilometer of erosion-prone coastline. The area supports two abandoned prawn ponds each measuring 20 m x 20 m and 2 m deep, and two other damaged ponds already exposed to the sea and thus resembled coastal swamps. The coastline here was severely eroding and threatened nearby paddy fields with saltwater intrusions if no remedial measures were undertaken.

Methodology

There are five major components in the methodology: (i) the determination of physical properties on site (including tidal flows, soil and seawater physical and chemical properties, fauna and flora); (ii) installation of wave breakers (fascines and mud bags) to initiate soil stabilization on site; (iii) setting up of brackish water mangrove nursery to produce vegetated coir logs (coir logs with mangrove seedlings grown one meter high); (iv) installation of vegetated coir logs on recently stabilized site; and (v) monitoring.

Soil stabilization and nursery management were concurrent activities during the first year of the project work schedule. Two control sites were simultaneously monitored, one where mangrove propagules were planted using conventional (directly pushed into the ground) planting technique, and the other, where no mangrove was planted. No measure (fascine or mud bag installation) was taken to control waves at the control sites.

Wave Breakers and Sediment Traps

At the initial stage, brush fascines were cost-effective geo-materials that can function as wave breakers and sediment traps. These were bundles of tree trunks and branches — each measuring 30 cm in diameter and 3 m long — tightly bound by nylon strings and stacked 3-5 bundles high. The fascines were installed on mudflats on site (using poles and nylon strings) about 50 m from the high seawater level (Photo 1). Local fishers were trained to produce and install brush fascines on site, as an income-generating activity.

Photo 1. Brush fascine as wave breaker.

Photo 2. Mud bags as wave breaker.

Another effective, but costlier, wave breaker and sediment trap is the commercially produced mud bag made of non-woven geo-textile. For this project, 30 mud bags were used, each measuring 10 m x 2 m. The bags were one-third filled with the local beach material (mud) using a pump, sealed and then installed 5 m apart along the coastline, and about 90 m from the high water level mark (Photo 2). The mud bags can dissipate wave energy and allow water but not sediment to pass through. These bags were very effective in retaining sediments from tidal backflows. In the long term, mud-laden bags that have settled on the seafloor acted as artificial reefs and prevented the scouring of the seafloor at high tide.

Mangrove Nursery Management

The success of producing vegetated coir logs depends on the location of the brackish water nursery (Photo 3). The site should receive daily influxes of seawater and freshwater to enable mangrove propagules to grow into 1-m tall seedlings. Initially, each propagule was prepared as 'mangrove plug' when it was wrapped in loose coir and tied with a biodegradable jute string. The mangrove plug was then inserted into holes made in the coir log, a meter apart. Each 3-m long coir log carried three mangrove plugs. Several mangrove species (*Rhizophora apiculata, Rhizophora mucronata, Sonneratia alba, Avicennia alba, Bruguiera cylindrica, Nypa fruticans, Xylocarpus molluccensis*) were used as test species. Local fishers were also engaged in various income-generating activities related to mangrove nursery construction and management.

Photo 3. Vegetated coir logs in nursery.

Photo 4. Vegetated coir logs installed on site.

Mangrove Transplanting

In 2000, after a year in the wetlands nursery, vegetated coir logs were transported by crane to the planting site and installed using poles and nylon strings. The roots of the meter-tall mangrove seedlings were already well-established within the coir substrate. These seedlings would stand better chances of surviving the harsh environment, predators and pests on site. The large coir logs (30 cm in diameter) were laid out in grids and acted as secondary wave breakers and sediment traps (Photo 4).

Project Monitoring

The growth of mangrove seedlings was monitored for the next four years until December 2004. The accumulation of beach materials within the project site was monitored, as well as the number and species of plant recruits that were established on site. The types of mangrove predators and pests were also noted. Plant cover and density on site were assessed over the monitoring period, as a measure of successful vegetation establishment.

Pre-Tsunami Plant Performance

The incoming waves near the project site were strong, with crests ranging from 0.6 m to 1 m in height. Initially the project site was devoid of vegetation and only supported mud skippers and crabs. It took about a year for the wave breakers to be effective in depositing beach materials on site (Figure 1), and another year to fill up the disused prawn ponds (Photo 5) with sediments. By 2003, the abandoned prawn ponds were about 90 percent covered with *Eragrostis sp.* (salt tolerant grass) and planted mangrove test species (*R. apiculata* showed the best performance).

Mangrove recruits established on site were *A. officinalis* (migrant pioneer), *Ceriops tagal* and *R. apiculata, X. molluccensis* and *N. fruticans*. Others were mangrove associates (for example *Excoecaria agallocha, Aegeratum conyzoides, Vitex pubescens, Acanthus bracteatus, Eupatorium odaratum, Ipomoea pes caprae, Eragrostis sp., Paspalum sp. and Cyperus sp.*), that were established on drier ground on site. Between 2001 and 2004, a total of 12 species of migrant plants and 10 species of migrant wildlife were observed on site (Photo 6). In contrast, no vegetation was established on the control sites where mangrove propagules were planted using conventional planting techniques. The coastline here became severely eroded.

It was also observed that as the ground became drier and more stable, other mangrove associates (for example *Hibiscus tileaceus, Morinda citrifolia and Solanum torvum)* were established on site. Major seedling predators were goats and mud crabs, while other less serious pests were leaf-eating beetles, insects and ants.

The newly established mangrove vegetation was more than 3-m tall, with an average density of one per square meter, average growth rate (height) of a meter per year and already covering 95 percent of the study site, when the tsunami hit the area on 26th December 2004 (Photo 7 and Photo 8).

Post-Tsunami Mangrove Performance

After the tsunami, about 30 percent of the 3-m tall mangroves seaward of the study site were destroyed (Photo 8). However the mangroves had dissipated strong wave energy and protected nearshore structures including six units of port-cabins that function as site office, laboratory and dormitory. Nearby paddy fields were also saved from saltwater intrusion, as the seawater only rose 0.5 m from the high water level.

Unfortunately an area to the north of the river mouth, about half a kilometer away from the project site, was badly damaged by the tsunami. A bridge was torn in half while a nearby concrete seawall was broken to pieces. The shoreline was severely eroded. However, no lives were lost here.

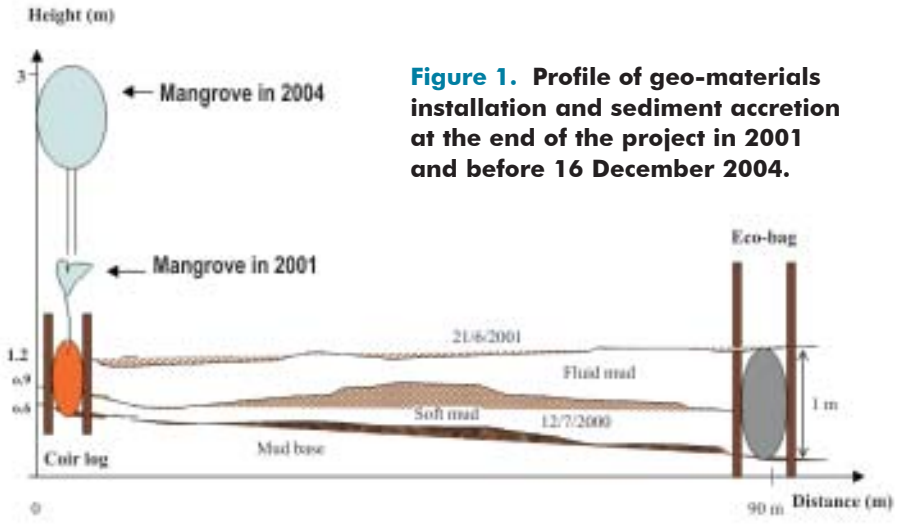


Figure 1. Profile of geo-materials installation and sediment accretion at the end of the project in 2001 and before 16 December 2004.

Photo 5. Project site in 1999.

Photo 6. Project site in 2004.

Photo 7. Mangroves planted before the tsunami in 2004.

Photo 8. Same mangroves destroyed after the tsunami on 26 December 2004.

Conclusion

Mangrove and coastal vegetation establishment on erosion-prone coastlines using ecological engineering approach is a technically challenging effort that requires regular professional advice from specialist consultants. It requires hard work from consultants, project managers, contractors and local communities on the ground. An important success factor is the full understanding of tidal dynamics, ecological succession, and the establishment of pioneer and seral plant communities, because coastal vegetation establishment is site-specific. The physical and chemical soil composition may change with time and there is a need to identify suitable plant species for different soil conditions on site.

Results from the Malaysian study has shown that 3-m tall mangrove stands were effective in dissipating strong tidal surges brought about by the December 2004 tsunami. Recent reports from other tsunami-hit countries, e.g., Indonesia, India, Sri Lanka and Thailand, also showed that mangroves were effective coastal protective barriers against tsunami. Therefore, these countries should initiate large-scale planting of coastal vegetation immediately.

Furthermore, in tsunami-hit countries, where many coastal local communities are struggling to rebuild their lives, efforts must be intensified to involve them in the planting of coastal vegetation, including mangroves. Replanted mangroves can entice the return of fish and prawns for breeding purposes, and thus help jump-start the return of sustainable livelihoods and resources for coastal fishers.

Finally, managers of large tsunami funds should consider the establishment of coastal greenbelts, in addition to cash or material donations to tsunami-hit countries. They should work closely with relevant experts to ensure that the planting of coastal vegetation be implemented under the supervision of experienced experts in collaboration with local governments and communities. ■

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Community-Based Disaster Risk Management: Local Level Solutions to Disaster Risks

Introduction

It is a recognized fact that disasters have a tremendous negative impact on efforts at all levels on poverty reduction and sustainable development programmes. Disasters continue to be a major threat to the survival, dignity, livelihood and security of people and communities, most specially the poor. This point has been proven once again by the December 26, 2004 earthquake in Sumatra, which triggered a tsunami that killed thousands, damaged the environment and destroyed people's livelihood in several countries in Asia and Africa. The cycle of damage, dislocation, loss of life and recovery/rehabilitation places a severe strain on the resources of the countries. Repeated disasters severely hamper efforts for economic development and cause a continuing cycle of poverty. Reducing risks to hazards is therefore a necessary and an important step towards preserving economic gains and maintaining the level of development a society has attained.

Emergency Operations Center and Networking of *Buklod Tao* in Bgy. Banaba, San Mateo, Rizal, Philippines.

Though the primary responsibility of protecting people and property from hazards rest with the national and local governments; usually it is the individuals, households and communities that are in the forefront of either escaping from or fighting against disasters. Though the national programs for disaster preparedness and mitigation are essential, not all disaster preparedness activities to save lives and to protect livelihoods can be achieved at the national level. This underscores the need for managing disaster risks at the community level.

Community-based organizations, individuals and nongovernmental organizations (NGOs) working in disaster areas have been lobbying and advocating for community involvement in risk reduction to governments and UN agencies, specifically during the International Decade for Natural Disaster Reduction or IDNDR (1989-1999), a UN-initiated strategy to reduce disasters worldwide. Finally, the urgency of addressing disaster risks at the local level has become one of the main concerns of the World Conference on Disaster Reduction held in Kobe, Japan last 18-22 January (ISDR, 2005). This

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conference is another UN initiative to continue the gains of the IDNDR. Delegates from governments and civil society concurred that strengthening communities' capacities to reduce disaster risks is particularly needed. It was accepted that appropriate disaster reduction measures at the local level enable the communities and individuals to reduce significantly their vulnerability to hazards.

This article will highlight the value of disaster prevention, mitigation, preparedness and response at the community or local level. This will present examples on how some communities have managed risks by developing their internal capacity and collaborating with external resource to strengthen themselves. Good practice from community-based disaster risk reduction activities can be replicated in equally hazard-prone coastal localities.

Though the primary responsibility of protecting people and property from hazards rest with the national and local governments; usually it is the individuals, households and communities that are in the forefront of either escaping from or fighting against disasters. Though the national programs for disaster preparedness and mitigation are essential, not all disaster preparedness activities to save lives and to protect livelihoods can be achieved at the national level. This underscores the need for managing disaster risks at the community level.

Hazardous Region

Asian countries are prone to a number of natural events, which either demonstrate their effects on a cyclical basis such as meteorological hazards, or on an entirely unpredictable basis such as geophysical hazards. Examples of meteorological hazards which occur within a relatively predictable timetable include typhoons and tropical storms, extreme climatic events such as excessive rainfall leading to flooding or drought; damaging wind effects, storm surges and coastal area flooding. Examples of geophysical hazards that visit the region include volcanic eruption and earthquakes that could lead to tsunamis and landslides, which may also be triggered by excessive rainfall. By and large, while the timetable of occurrence of some of these hazards is predictable, the force of their impacts is not.

A combination of human-made and natural hazards like environmental degradation, urban and forest fires, pest infestation, health and sanitation-related problems and food insecurity are also a common source of disasters in the region. On top of these natural phenomena, some countries in the region are also beset with human-sourced hazards such as political and violent conflicts. Most poor communities in Asia are located in seismic, coastal, mountain slopes and urban centers that are vulnerable to natural and technological hazards.

Community-Based Disaster Risk Management (CBDRM)

Despite people's many vulnerabilities, it is their natural tendency to protect themselves from the harm and danger posed by various types of hazards, be they natural or human-sourced or a combination of both. If only there were ways to go back in history and rebuild communities away from hazardous areas and plan the use of land better, then there would be a big chance of ensuring public safety and a healthy socioeconomic life. But since it

Therefore it is paramount that the capacity of the community be built so that they are able to assess the risk, identify risk reduction measures and plan and implement these measures. These include activities that will prevent disasters, mitigate hazards and prepare the community to respond to crises and emergencies.

is impossible to go back, the choice is for those communities located in areas with many risks to strengthen themselves and undertake risk reduction measures that they themselves can implement.

To appreciate the meaning of CBDRM, it is best to understand the concept of risk and its relation to disaster. Simply put, risk is the probability that a very negative consequence may happen if hazard strikes a community with many vulnerabilities and with less or no capacity. In this equation, the following are the factors of risks: if capacity (skills, resources, readiness) is insufficient, if vulnerabilities (weaknesses) are too great and if the scale of hazard (both natural and human sourced) is too big, then the risk is too high. Emergencies resulting from these hazards cannot be managed locally; the communities cannot cope because the extent of destruction is beyond the communities' capacity and readiness. Then a disaster situation occurs. This concept of risk is compatible with the definition of disaster — a serious disruption of the functioning of a community causing widespread human, material or environmental losses, which exceed the ability of the affected community to cope using its own resources.

Stakeholders participate in cleaning up an oil spill in their community.

Therefore it is paramount that the capacity of the community be built so that they are able to assess the risk, identify risk reduction measures and plan and implement these measures. These include activities that will prevent disasters, mitigate hazards and prepare the community to respond to crises and emergencies. This process is called community risk management or community-based disaster risk management.

When emergencies occur and the community is well prepared, then it can manage the emergencies well. This is the reason why it is important to have a community preparedness plan. However, when the impact of the hazard is so great that the emergencies resulting from it are beyond the capacity of the community, then the community requires external assistance. This is what is called disaster management.

Community risk management is the single most important tool available for us today in reducing the increasing cost related to natural hazards. While people killed by hazards may be decreasing, the number of people affected and the economic costs are increasing exponentially

based on a 30-year record compiled by the International Federation of Red Cross (IFRC, 2003).

Ideal Characteristics of CBDRM:

- The local people are the prime movers in reducing disaster risks in their community. CBDRM promotes genuine participation. It means that people are given opportunities to gain knowledge and awareness of their risks. It actively enables people to make choices and build their own disaster-resistant future through a process of assessment, analysis and action.

- Development-oriented. While managing everyday risks, CBDRM does not lose sight of its long-term platform of addressing the root causes of vulnerabilities. It is also about increasing the community's capacities, their resources and coping strategies. The long-term goal is two-fold: community empowerment and sustainable development, wherein risk management is an important part. Risk management is a precursor to sustainable development. Short and medium-term goals are to minimize human, property and environmental losses, limit social and economic disruption and to enjoy the benefits of a secured and safe environment.

- Gender- and culture-sensitive. CBDRM recognizes that men and women have different needs, different activities, different perceptions of risk and different priorities. Community culture, tradition and customs are recognized and respected.

Public awareness and capacity building are some of the activities of *Buklod Tao* targetted towards disaster mitigation.

- Accountable. CBDRM workers and promoters believe that they are accountable to the people first and foremost.

- Living in communities as safe as possible from hazards is considered a basic human right. Standards (for shelter, water and sanitation, health, etc.) have been developed and considered as basic human rights in order to live decently. These standards are a component of a healthy and robust society, essential to make the community feel safer.

- Inclusive. While it is recognized that community participation and empowerment is the fundamental principle in community risk management, involvement and all-out support from local and national governments is essential for a successful CBDRM. The role of civil society (church, business and academe) is also a factor for success. A directive approach from the top (government) is also necessary to enforce laws and regulations, for example, in the area of environmental protection.

CBDRM Strategies:

- Organizing the community around disaster risk reduction. An organization or a committee that will carry out the CBDRM process is important. The CBDRM process includes risk assessment, planning, community-managed risk

Community risk management is the single most important tool available for us today in reducing the increasing cost related to natural hazards.

Bringing disaster preparedness to neighboring communities.

reduction programmes and monitoring and evaluation. Public awareness and capacity building are important aspects of community organizing. Organizing is essential in sustainability.

- Social Mobilization. CBDRM brings together the multitude of community stakeholders for disaster risk reduction to expand its resource base. The local community level links up with intermediate and national, even up to the international level, to address the complexity of disaster risks. Networking and building partnerships at all levels is crucial in social mobilization. Advocacy, lobbying and campaigning for favorable policy formulation and legislation on CBDRM are important activities for mobilizing various sectors.

- Analysis-Action-Reflection. Before implementing the plan a thorough analysis of the situation is undertaken. During and after implementation, people reflect on what went wrong and what went well in the process. Lessons drawn from practice are always considered to improve performance. Lessons learned continue to build into the theory of CBDRM. Complementary to this approach is documenting CBDRM stories.

- Utilizing participatory methodologies. CBDRM utilizes participatory tools such as participatory risk assessment, participatory identification of risk reduction measures, participatory planning, community-managed risk reduction programmes and participatory monitoring and evaluation.

CBDRM Practice

Currently there are many organizations implementing CBDRM in various developing countries like the Philippines, Vietnam, Laos, Cambodia, India, Nepal, Sri Lanka and Bangladesh. However, the practice is not widespread yet. The following are two examples of community-based disaster risk management: one in Cambodia and one in the Philippines. Lessons from these two cases can be applied in other areas, particularly those frequented by floods.

NGO Initiative on CBDRM in Cambodia

Due to its location, Cambodia is susceptible to flooding from two major watersheds, the Mekong River and Tonle Sap. To address the situation, the Cambodian Red Cross with the support of NGOs working in Cambodia such as the International Federation of Red Cross and Red Crescent Societies and PACT jointly implemented the Cambodian Community-Based Flood Mitigation and Preparedness Program (CBFMP). This project was also supported by the Asian Disaster Preparedness Center (ADPC).

The Cambodian Red Cross started the project by organizing and mobilizing volunteers. These volunteers, who were chosen from flood-prone communities, were trained on disaster preparedness. They in turn conducted community meetings and explained the need for flood preparedness to the community. This approach to manage the flood risk challenged the communities to act concertedly in building safer communities. The program has initially covered 5,496 households in 23 most hazard-prone villages in 3 flood-prone districts within 3 provinces. The project was implemented through a core of community volunteers who were trained in participatory risk assessment and facilitation of identification and implementation of community-level disaster risk management activities addressed to flooding. The people identified and implemented community-level solutions, such as water-control structures including repairing dams and dikes; cleaning irrigation ditches, culverts, and water gates; raising of road levels; and. constructing small bridges. The raised road project in Bang Sang Lech Village in Kampong Cham District reduced the speed of flood onset to the houses further inland, provided elevated ground for the safety of the villagers and their livestock and provided road access.

The program, while addressing the flood risk, also dealt with livelihood options, increased the community's awareness about flood, employed participatory methodologies and made volunteers and local people understand community dynamics.

Their experience of the flood in 2001 prompted the community members to plan the construction of higher wells to prevent water contamination during such events and the building of safe areas for families. The people in each village are proud of what has been attained and acknowledge the ownership of the project's outcomes. They also realized that the benefits are not limited in times of disaster. For example, the raising of roads and the construction of bridges provided a reliable transportation route and increased accessibility, allowing children to travel to school and allowing traders to transport their agricultural produce to local markets. New, enlarged or rebuilt culverts increased the community's control over the water flow, enabling them to increase their rice crop yield, and, for some communities, even harvest a second crop. The community-based effort also enhanced community cohesion. "As we completed our project, our community become closer. This is something, I have not seen for a long time," shared Mr. Peng Eourn, a 63-year old villager (ADPC, 2002).

Environmental People's Organization Takes on CBDRM

In 1996, residents of Doña Pepeng Subdivision and informal settlers of North and South Libis, Barangay Banaba, San Mateo, in the province of Rizal in the Philippines, organized themselves formally into *Buklod Tao* (United People). The coming together into one people's organization (PO) was triggered by an environmental issue that wrought havoc to the village residents' lives and livelihood. A construction company built a high wall that served as a dam aimed to protect the company from flooding, at the expense of the people living downstream. A storm hit and flooded the area that caused damage to properties and almost drowned some children when they were trapped by the flood waters. The initial step of the PO was to lobby and file a case against the company. The result was a

Never underestimate local capacity. No matter how poor a community is, it can still generate resources through networking and provision of labor and local materials. Sustainability of efforts requires the cooperation of all stakeholders.

Cambodian Red Cross facilitating community planning.

restraining order or a "Cease and Desist Order" against the company's operations. This success story prompted the PO to learn more on how they can protect themselves.

As the community is located very near the Marikina River, it is prone to flooding (when the river rises due to excessive rain), river erosion and health-related problems. It is also located near a major earthquake fault. Aware of these hazards, representatives of Buklod Tao attended a seminar conducted by an NGO focusing on disaster risk management. After a one-day Disaster Management and Preparedness Seminar in June 1997, Buklod Tao formed a Disaster Response Committee (DRC) composed of 33 members and formulated a Counter Disaster Plan to protect the community from damages due to regular flooding. Three disaster management teams were organized and a counter disaster plan containing emergency rescue and evacuation was put together.

Two months after the seminar, a typhoon hit the community. Although several houses were swept away by the waters, no one was killed and many people were able to save their belongings. Since then, when typhoons hit the area, everyone is brought to safety because of flood-level monitoring, early warning, evacuation, rescue operations and relief assistance activities of the DRC. These activities are all part of the village counter disaster plan.

Buklod Tao generated resources locally: it secured life jackets from the Barangay Council; and secured funds amounting to Php 30,000 (about US$600) from outside sources to purchase essential equipment for effective disaster response such as flashlights, ropes, megaphones, first aid kits and materials to build three rescue boats. Buklod Tao was able to construct three fiberglass boats using local expertise and labor. Practice or rescue drills along the river were undertaken using the fiberglass boats.

News about Buklod Tao's activities have circulated among the neighboring communities. As Buklod Tao carries on its disaster risk management activities at the home front, it continues to cater to requests for assistance from other equally vulnerable communities, as resource persons and as mentors. Buklod Tao has become a model for other villages

in community-based disaster risk management. For example, a one-day Disaster Management Orientation followed by a two-day Disaster Preparedness Training in January 2002 in Bgy. Banaba Extension resulted to the formation of a DRC. Buklod also helped this DRC by passing on its old but still serviceable preparedness logistics. To date, Buklod Tao has assisted in the formation of Disaster Management Committees in rural communities in Antipolo City, some 40 km from Manila and in the neighboring villages.

Buklod Tao also has a very active partnership with various dioceses and the Center for Disaster Preparedness (CDP), an NGO assisting communities in counter disaster planning. Their partnership led to a series of activities promoting CBDRM, not only locally but also internationally (Interview with Mr. Noli Abinales, Buklod Tao Leader, February 2005)

These communities have the potential to become disaster-resistant communities, if given more support in addressing the major risks. This requires the support of the higher levels of governance.

Conclusion

Whatever the scale of hazards, big or small, it is the local community that either suffers the brunt of or survives from hazards' devastating effects. The population at the local community is the one affected and, as such, it also becomes the first/initial responders who manage the emergencies at the household and at the community levels. By managing emergencies well, it prevents the escalation of these emergencies into disasters. But more than this, local communities take measures to manage risks long before the hazards strike. In this light, disaster risk management is most appropriate and relevant at the community level.

Cambodian Red Cross facilitating hazard assessment.

Never underestimate local capacity. No matter how poor a community is, it can still generate resources through networking and provision of labor and local materials. Sustainability of efforts requires the cooperation of all stakeholders. There is a need to focus on linking solutions with the needs and priorities of community members. Disaster risk management should be promoted to all members of the community. ■

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Mitigating the Impact of Harmful Algal Blooms in the Philippines

Introduction

Harmful algal bloom (HAB) is a term used to describe events associated with the rapid increase in algal numbers or bloom that cause harmful effects to the environment, living organisms and humans. It refers to blooms of toxic and non-toxic algae that discolor the water, as well as blooms that are not sufficiently dense to change the color of the water but which are dangerous due to the algal toxins they contain or the physical damage they cause to other biota. Blooms are caused by environmental conditions like a change in water temperature, and/or high nutrient content. Some blooms cause mass mortality of fish or fish kills, while some produce potent toxins that are of public health significance. They cause poisoning syndromes such as paralytic shellfish poisoning (PSP), amnesic shellfish poisoning (ASP), diarrhetic shellfish poisoning (DSP), neurotoxic shellfish poisoning (NSP), and ciguatera poisoning.

A shellfish farm.

Hence, the occurrence of harmful algae is of primary concern in the Philippines because of the great dependence of the burgeoning human population on marine resources especially fish and shellfish as source of cheap protein and source of income.

This paper presents the current status of harmful algal occurrence in the Philippines, and the approaches to address growing threats and problems associated with harmful algae.

Background

The fisheries sector is important to the national economy. Fish production reached 3.619 million MT valued at Php119.9 billion (about US$2.2 billion). The aquaculture fisheries subsector accounted for 40.2 percent (1,454.5 MT) of the total production, commercial fisheries contribution was 30.7 percent (1,109.6 MT), and municipal fisheries was 29.1 percent (1,055.1 MT). Aquaculture

includes production from activities such as brackish water and freshwater fishponds, freshwater and marine fish pens, freshwater and marine fish cages, culture of oysters, mussels and seaweeds. Fisheries contribution to Gross Value Added in the Agriculture, Fishery and Forestry Group, calculated at Php95,487 million (about US$1.7 million; 14.5 percent) at current prices and Php44, 857 million (about US$800,000; 20.9 percent) at constant prices, is considered the second largest share next to agricultural crops.

Fish ranks as the most important staple food next to rice. Of the total fish use, approximately 86 percent is for food use, 11 percent for exported production and 3 percent for non-food use. Estimated fish consumption per person per year is at 26.80 kg per 2001 population of 77,925,894). The Philippines is characterized as having one of the highest per capita consumption of fish in the world.

Shellfish poisoning syndrome, particularly PSP, has been and continues to be considered as one of the marine resource management issues in the country. PSP is disastrous in coastal communities where people are primarily dependent on shellfish for food and income. This phenomenon has occurred in the country for more than three decades now.

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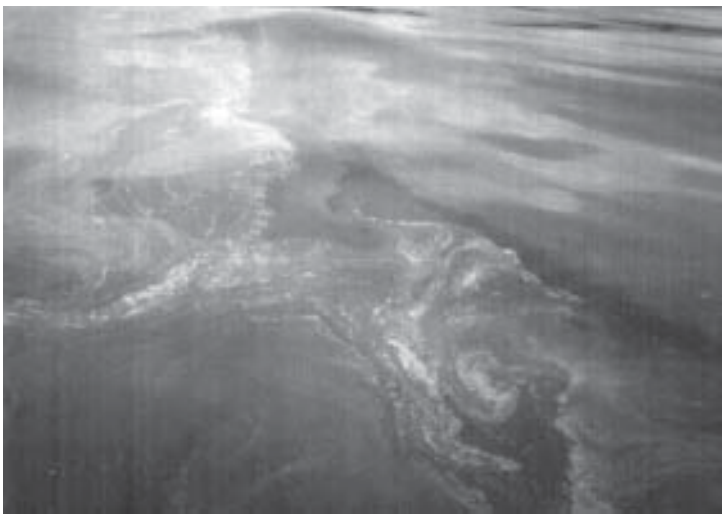


Harmful algal blooms discoloration.

***Ceratium furca* bloom.**

The impact on humans caused by HABs in the Philippines extends beyond human illness — that is economic losses and social displacement are also incurred. The economic losses associated with HABs are not easily assessed due to the broad range of sectors in society that are affected.

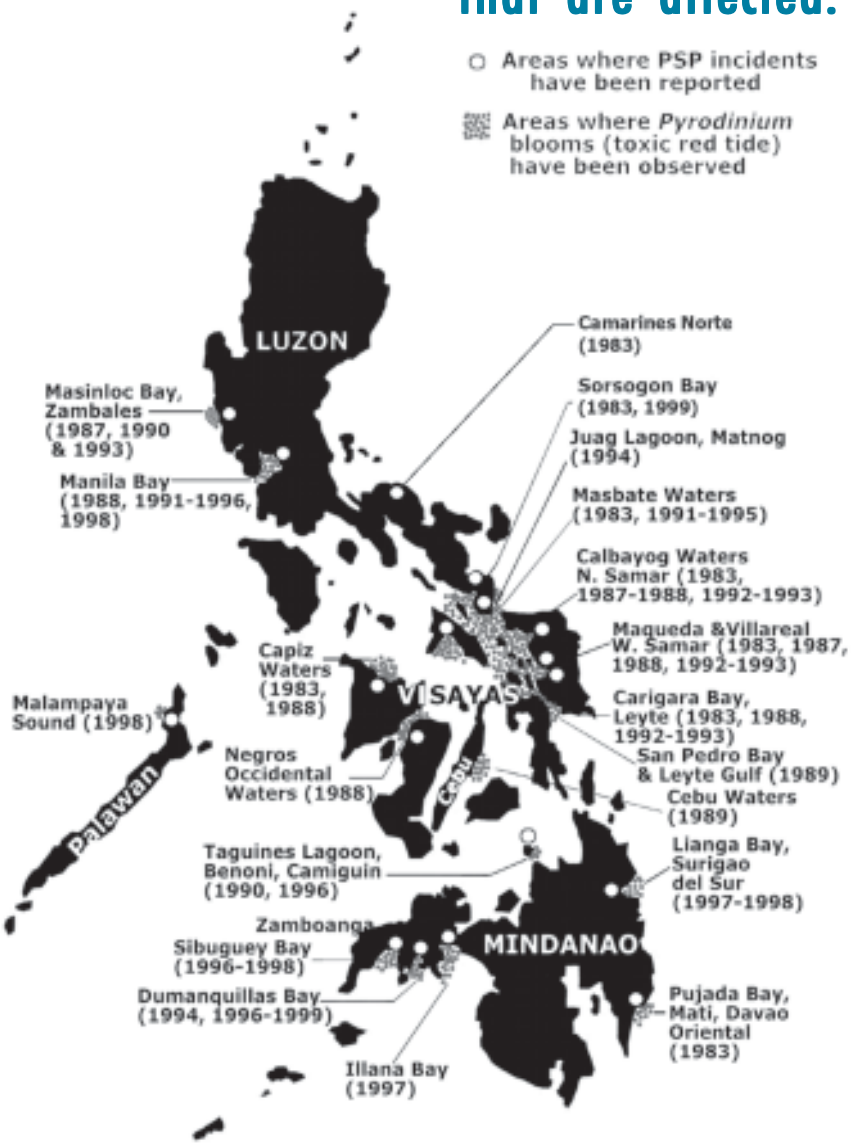


Figure 1. Geographical Distribution of *Pyrodinium bahamense* var. *compressum*.

The HAB Problem

Occurrence of *Pyrodinium bahamense* var. *compressum* bloom was first recorded in Philippine coastal waters in 1983. Since then, the annual recurrence of *Pyrodinium* was observed. Apparently the phenomenon expanded both in time and space. It has occurred in 20 localities in the country (Figure 1). Moreover, records showed that shellfish-poisoning episodes due to *Pyrodinium* has increased in severity over time. Over a span of 21 years a total of 2,159 PSP cases with 123 deaths were attributed to the recurrence of toxic *Pyrodinium* (Figure 2).

However, towards the start of the new millennium, there was a marked decrease of PSP episodes (Figure 3) and emergence of HABs causing fish kills. Fish kills due to *Prorocentrum minimum* occurred from January 31 to February 4, 2002 with an estimated production loss of 2,000 MT of cultured milkfish valued at US$17,857.14 (BFAR, 2002). Since the first reported fish kill incident in 2002, frequent mass mortality of cultured and reef fishes have been observed and reported (Figure 4).

Socioeconomic Implication

The impact on humans caused by HABs in the Philippines extends beyond human illness — that is economic losses and social displacement are also incurred. The economic losses associated with HABs are not easily assessed due to the broad range of sectors in society that are affected. Furthermore, data on losses

Figure 2. PSP Cases Recorded from 1983-2004.

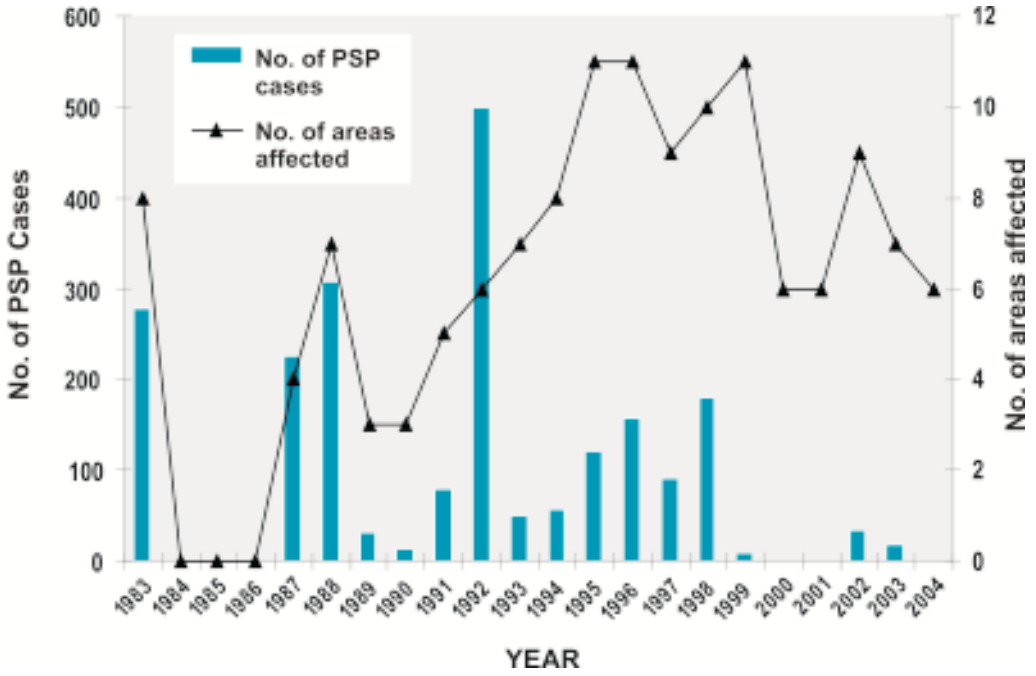
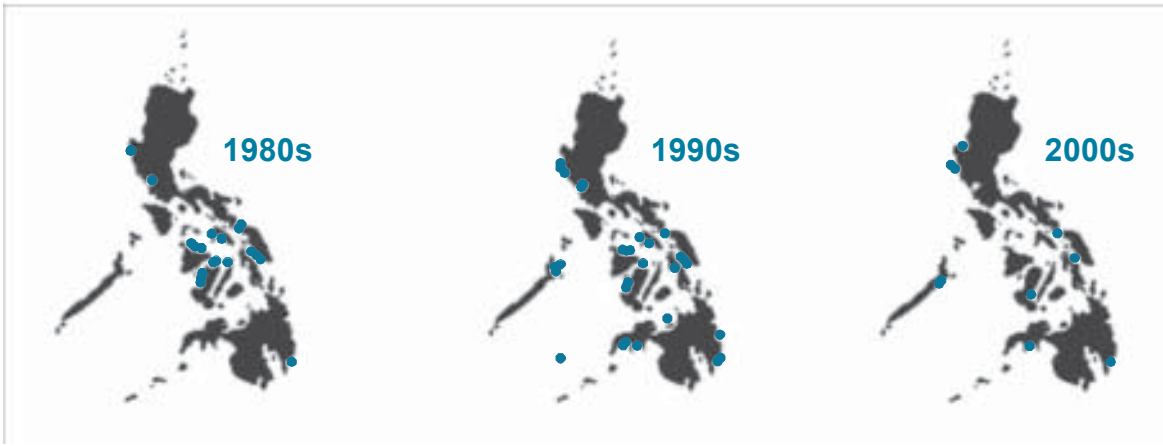


Figure 3. A Comparative Diagram of PSP Episodes Over Time.



in the seafood industry are often not released to the public and in many cases these losses are not quantified.

Nevertheless, the occurrence of HABs has been responsible for the economic losses in the fisheries sector of the country particularly the shellfish industry. The 1983 outbreak in central Philippines resulted to losses of Php2.2 million (US$40,000), and there was a dramatic decline in demand for fishery products in 1988 particularly in Manila Bay. It caused extensive economic damage since prices of all seafood dropped to almost 40 percent of the normal price. Subsequently, shellfish bans during outbreaks was considered a problem in relation to international trade. During the 1988, 1992 and 1993 outbreaks, Japan and Singapore banned shrimp imports from the Philippines. Shellfish closures resulted to unemployment for both fishers and secondary industries such as processing, middlemen and suppliers. In the 1992 outbreak in Manila Bay around 38,500 municipal fishers were displaced from their livelihood for almost four months.

When HABs contaminate coastal resources, the livelihoods, social

Figure 4. HAB Occurrence Associated with Fish Kills in the Philippines.

structure of local residents and food security of artisanal fishers are threatened contributing to possible collapse of the local fishing communities.

Mitigation of HAB Effects

Management strategies and options for mitigation or impact prevention and control of HABs are necessary to protect public health, ecosystem health and fisheries resources.

Strategies for mitigation are actions undertaken to reduce the losses of resources and economic values, and minimize human health risks that occur as a result of HABs. These include better monitoring and surveillance to reduce the risk of ingestion or exposure to toxins, improved forecasting to allow more time to protect resources and avoid risks, restoration of affected resources and a variety of alternative actions to minimize effects which might occur.

The Bureau of Fisheries and Aquatic Resources (BFAR) through the Marine Biotoxins Monitoring Unit (MBMU) of the Fisheries Resource Management Division undertake systematic monitoring and surveillance to predict or detect occurrence of toxic causative organisms responsible for PSP (Box 1). MBMU undertake phytoplankton and PSP toxicity monitoring through both water and shellfish meat samples. Samples are collected fortnightly from areas with histories of *Pyrodinium* blooms. Plankton samples are collected by vertical haul with 20 µm mesh plankton net from near the bottom to the sea surface. The samples are brought to the central laboratory in Metro Manila for qualitative and quantitative analyses. Plankton counts are the basis for the numerical estimates of the plankton population, taking into

consideration the mouth diameter of the net, sampling depth and volume of plankton sample. Determination of shellfish toxicity is by mouse bioassay. Harvesting closures are initiated when PSP toxins is 40 µg STX eq/100g of shellfish tissue are detected. Closures of shellfish areas to harvesting are primarily based on the results of the monitoring of phycotoxin levels in shellfish rather than on the cell density of causative phytoplankton in seawater.

Phytoplankton monitoring is carried out by BFAR central and regional offices as well as some provincial laboratories operated by the local government units (LGUs). Monitoring and analysis for PSP toxins are carried out only in the BFAR central office laboratory and LGU laboratories in the province of Leyte and Bacolod. Preserved water

Box 1. Phytoplankton Toxicity Monitoring through Water and Shellfish Sampling.

Microscopic analysis

Plankton samples collection

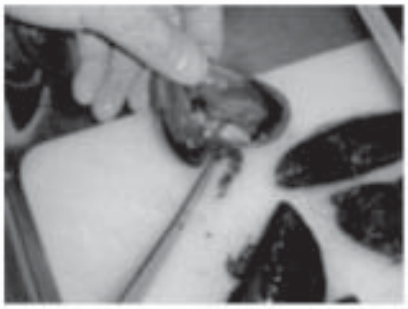
Shellfish farm

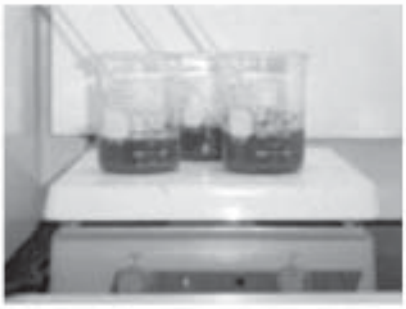
Green mussels

Shellfish samples collection

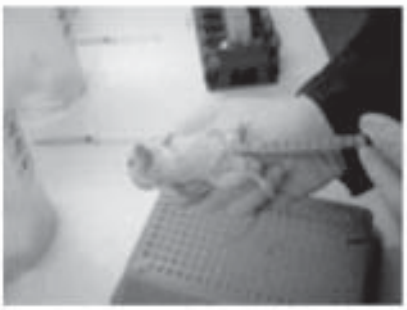
A decentralized management regime is being looked at as probably the more effective way of addressing PSP as well as other phycotoxin problems in the country since the local people and resource users will be empowered to manage their own resources. Immediate response will hopefully be assured since the local people and fishers are physically close to the area where PSP or any other phycotoxin occurs, thus confusion and non-coordination during PSP episodes will be avoided since immediate decisions can be made.

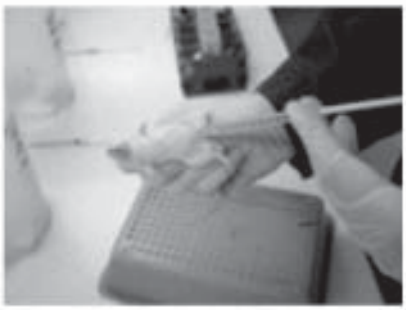
Box 2. PSP Toxin Analysis.





Extraction of toxin from shellfish meat





Determination of toxin level by mouse bioassay

samples and/or frozen shellfish meat from the regions and provinces without capability to do analysis are brought to the central laboratory. BFAR regional offices especially those with recurrent PSP episodes submit reports of plankton sampling activities to the central office at least once a month. (Box 2).

The BFAR notifies the National Red Tide Task Force (NRTTF) that in turn recommends to the Secretaries of the Departments of Agriculture (DA) and Health (DOH) to impose shellfish ban in PSP-affected areas; and lift said ban when HABs have dissipated from said areas. The NRTTF is a multi-sectoral task force which is composed of several national government agencies namely the DOH, Department of Science and Technology (DOST), DA-BFAR, Department of Environment and Natural Resources-Environmental Management Bureau (DENR-EMB), Department of Interior and Local Governments (DILG), Philippine Information Agency (PIA), Philippine Coast Guard (PCG), and a representative from the shellfish industry as an observer. The NRTTF was created to quickly respond in a coordinated manner to PSP poisoning to uphold public health and safety from shellfish poisoning, and recommend management policies to the Interagency Committee on Environmental Health (IACEH). Member agencies have their own specific roles and responsibilities which are:

a. DA-BFAR undertakes PSP monitoring;

b. DOH diagnoses, treats PSP, and investigates problems related to the medical aspects of PSP, and provides funds for NRTTF activities;

c. DENR provides water quality data in areas they monitor;

d. PCG assists in monitoring activities through provision of floating assets;

e. DOST coordinates, provides funds and technical support to research activities;

f. DILG supports implementation of shellfish ban;

g. LGU conducts regular PSP-monitoring locally; and

h. PIA conducts information dissemination.

The highly centralized and top-down approach of management of PSP has its downside considering the presence of other phycotoxins, the archipelagic nature of the country, remoteness of the regional offices to the central authority, and logistical constraints. A decentralized management regime is being looked at as probably the more effective way of addressing PSP as well as other phycotoxin problems in the country since the local people and resource users will be empowered to manage their own resources. Immediate response will hopefully be assured since the local people and fishers are physically close to the area where PSP or any other phycotoxin occurs, thus confusion and non-coordination during PSP episodes will be avoided since immediate decisions can be made.

Control of HABs

Techniques/methods to control HABs, such as absorption by clay particles, ozonization, removal by chemicals and macromolecular flocculants, are not yet applied in the Philippines since these HAB-control methods are still limited in scope and remain largely untested in major blooms. It is still premature to conclude whether control methods are feasible, applicable and advisable due to lack of knowledge on the side effects of such methods. Moreover, research studies are needed to validate these methods.

The costs of monitoring potentially toxic areas, and inspection and analysis of marine products can be limiting factors to an efficient and effective HAB-control system. Regular shellfish monitoring programs are expensive. The fees that are generated from BFAR laboratory services go back to National Treasury and thereby cannot be utilized for the operation and maintenance of the agency's monitoring program. On the other hand, partnerships with the aquaculture sector in monitoring activities, i.e., collecting of shellfish and water samples, can ease up the burden on the part of the national agency. Presently, the fishing industry, particularly the aquaculture sector, is very dependent on the national government in terms of industry development. However, a few LGUs have offered relief in terms of operating and maintaining local HAB-testing laboratories to assist the marine authority in its monitoring activities. ■

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Contingency Planning — The Key to Response Preparedness

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Introduction

Oil spill contingency planning and response can be traced to the Torrey Canyon incident off the coast of England, back in 1967. Since the publication of the first National Contingency Plan circa 1968, a series of corresponding international conventions and national legislations aimed at reducing and limiting the massive environmental damage have already been held.

Through decades of relentless drive and cooperation among the stakeholders since the 1970s there has been a significant reduction in the number of large oil spills from tankers. This decline in spills can be attributed to the successful implementation of international conventions and proactive preventive actions of the International Maritime Organization (IMO) and the oil and shipping industry.

Operational visits to the regional tier 2 center should be conducted to establish working relationships.

The oil and shipping industry, working through organizations such as the International Petroleum Industry Environmental Conservation Association (IPIECA), the International Association of Oil and Gas Producers (OGP), the Oil Companies International Marine Forum (OCIMF), The International Tanker Owners Pollution Federation (ITOPF) and the International Association of Independent Tanker Owners (INTERTANKO) and the United Nations Environment Programme (UNEP) and IMO, designed and broadcast numerous means to prevent spills, enhance preparedness and response, improve the ability to recover spilt oil and mitigate effects from spills. However, oil spills will not be eliminated totally and we must be prepared for it.

Background

Great strides have been taken around the world through close cooperation among the stakeholders. Implementations of such initiatives are not homogenous throughout the world. Understandably, there are competing interests and finite resources available that many countries need to address.

* The opinions and views expressed in this paper are solely those of the author and do not necessarily represent the views of any other party.

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Operating under the framework of the Oil Pollution Preparedness, Response and Cooperation (OPRC) Convention, countries and the industry are working hand in hand in realizing the objectives of mitigating the impact of an oil spill incident to a coastal community. It is through this concern and to reaffirm social responsibility and environmental protection that the oil companies are working together to enhance their own capabilities in dealing with an oil spill incident.

Emergency preparedness is an established risk reduction strategy for mitigating the potential disastrous effects of an oil spill. However, every attempt must be made to achieve this without incurring too exorbitant costs which essentially will be passed down to the public. Hence, the oil companies have set aside funds to establish a few tier 3 response centers (see endnote) strategically across the world.

The Global Alliance is an example of an industry-funded cooperative. The alliance consists of two tier 3 response centers which was merged in 2001 between Oil Spill Response Ltd (OSRL) and East Asia Response Pte Ltd (EARL). EARL in particular has undertaken activities to continually enhance its contingency mechanisms, emergency preparedness and monitoring for its operating area. EARL is contributing positively as a center of excellence for oil spill preparedness and response in Asia-Pacific to the benefit of the governments and the industry alike.

Emergency preparedness is an established risk reduction strategy for mitigating the potential disastrous effects of an oil spill. However, every attempt must be made to achieve this without incurring too exorbitant costs which essentially will be passed down to the public. Hence, the oil companies have set aside funds to establish a few tier 3 response centers strategically across the world.

Contingency Mechanisms

While emphasizing on the importance of contingency planning, the crucial key to a successful mitigation strategy comes from developing customized operational strategies and deployment of all suitable resources identified by the contingency plan. EARL constantly turns challenges into opportunities to ensure that it remains at the forefront of oil spill preparedness in the Asia-Pacific region.

A few of the initiatives undertaken over the past few years incorporating the latest challenges and lessons learnt around the world are as follows:

1. Singapore Boom Plan

The Singapore Boom Plan was developed for pre-identified sensitive sites around Singapore to deal with an oil spill affecting these areas. This plan was proactively developed by EARL and shared with the local government agency as part of cooperation and information sharing.

2. Equipment

To complement the contingency plan, sufficient and suitable equipment are available. Hence, EARL has close to US$10 million worth of equipment stockpile that could be mobilized on short notice to respond to any oil spill in the region. Stockpiles are continually being improved and renewed with the latest technology in oil spill response, hence ensuring cutting edge oil spill equipment technology.

3. Viscous Oil Strategy

From the perspective of a response organization, responding to an oil spill involving viscous oil presents the most operational challenge. EARL has effectively positioned itself from incorporating

Hence, waste management is always a main link to any oil spill response, since there is a limit to storage capabilities of recovered waste both liquid and solid. This is where logistical support in handling the segregated waste is crucial to facilitate recovery and clean operations.

The Coverage of The Global Alliance

On 1st January 2000, OSRL and East Asia Response Pte Ltd (EARL) announced an alliance that allows members to access the resources of both organizations.

many valuable lessons from real response around the world. A full-fledged exercise was conducted to test if strategies adopted were indeed effective and within EARL's operational capabilities.

4. Waste Management

Many links contribute to a successful oil spill response. While waste reduction is included in response strategies, inevitably substantial waste is generated. Hence, waste management is always a main link to any oil spill response, since there is a limit to storage capabilities of recovered waste both liquid and solid. This is where logistical support in handling the segregated waste is crucial to facilitate recovery and clean operations.

Emergency Preparedness

Being a tier 3 oil spill response center covering the Asia-Pacific region, EARL's emphasis is always on emergency preparedness. Its tremendous pool of professional responders collectively adds up to 200 years of oil spill response experience. EARL constantly improves in the area of emergency preparedness with the following measures:

1. Oil Spill Exercises

"Practice makes perfect" holds true especially in oil spill response. This is a main contributor in the area of emergency preparedness. Regular exercises are conducted and participated by EARL together with industry and government agencies. These exercises help update and innovate EARL's appropriate response strategies and will result in greater cohesiveness with all relevant players during a real response.

2. Logistics Requirements

EARL always develops an interface plan with members in the region to ensure that the response chain is not broken and avoid any bottlenecks in a response. Familiarization Workshops are conducted with members to build an understanding and establish respective roles and responsibilities during an oil spill response. This enables members to facilitate any visa and immigration clearance for EARL's responders. Also, to arrange for the appropriate local logistics required to effectively deploy the resource.

3. Proactive Activation

Appropriate lead-time is required to respond to an activation call out. Though, operationally, lead-time

cannot be totally eliminated, EARL actively cuts this down by working closely with members and government agencies to inform EARL of any unsubstantiated incidents that may result in activation. EARL will, covering its own cost, mobilize the corresponding resource commensurate with the incident.

4. Ramping up the Response

There is every possibility in over-responding to an incident during the initial response phase of an activation. EARL factors and reacts to an incident based on worst-case scenarios during the initial phase of a response. The rationale is that it is very easy to scale down the response once spill magnitude is established. However, as a response organization, under-responding to such an incident would be unacceptable.

5. External Resources

EARL maintains a pool of pre-identified external resources which serve to increase operational flexibility in responding to a spill. This is achieved through the conduct of regular training to a group of personnel of a participating shipping company on a monthly basis, resulting in an additional pool of deployable and trained manpower during a spill. EARL also has identified a range of response vessels suitable for the deployment of various oil spill response equipment as part of its strategies.

Delivering IMO Oil Spill training courses, such as those in partnership with PEMSEA and the regional government, increases operational flexibility in responding to oil spills.

6. Operational Readiness

Operational readiness is an intrinsic part of emergency preparedness. This is where EARL's resources are invested in. This translates into a regimented approach in following religiously a planned maintenance program for its oil spill response equipment. As airborne capability is a main part of being a tier 3 response center, EARL emphasizes the importance of having the L-382 ready and available.

7. Regional Responsiveness

In 2003 EARL took its 'new' philosophy into the region. Familiarization Workshops cum operational visits were completed with members in India, Indonesia and China. Completed were seven Familiarization Workshops that explained the Service Level Agreement (SLA), lead times required to reach locations, logistical arrangements required, what EARL and the members must do to ensure an effective response, and everyone's preparedness. Contingency plans were reviewed, when available, to identify potential roadblocks for further action. More work in this area will be done in the future.

Monitoring

EARL will do everything within its operational capabilities to ensure the most effective use and deployment of all resources under its disposal. However, to assume that EARL will undertake every spill incident by itself is a great overstatement. Hence, EARL is constantly seeking out opportunities with industry and governments to leverage on each other's capabilities and strengths in mitigating the potential impacts of an oil spill.

In the spirit of the OPRC Convention, it also encourages

ADDS Pack conducting low-level spraying exercise.

cooperation among stakeholders. There are many contributing factors to a successful implementation of building up local, regional and international capabilities in dealing with an oil spill. The catalyst to this paradigm shift in developing the right approach in oil spill contingency planning and response represents the ownership of a potential hazard associated to the utilization of petroleum by all stakeholders.

While the setup specifically deals with tier 3 response incidents, EARL is often approached for advice in tier 1 – type spills. Also, members are given advice, through EARL's Training and Consultancy Department, in developing tier 1 capabilities as required by most OPRC Convention countries. Hence, EARL is involved in capacity building among local population in the operating countries.

EARL is also involved with regional tier 2 centers, which complement each other in providing coverage in respective countries. Understanding the unique operational arrangements will help in determining what EARL is expected to do. While EARL has a superior equipment stockpile, however the local tier 2 center brings with it valuable local knowledge in the event of a spill. Hence, investment in developing a meaningful professional relationship facilitates cooperation better.

Exercises Conducted to Validate the Singapore Boom Plan.

Dispersant spray system on work boat on landing craft.

Skid tanks and booms loaded.

The Helibucket assembled by external manpower.

Skid tank installed on an EARL boat.

Over the years, EARL has been very actively engaged in the area of advocacy for oil spill response and preparedness within its region of coverage. This is inline with the objectives of a global initiative that the International Petroleum Industry Environmental Conservation Association (IPIECA) spearheads. Every opportunity in raising the awareness level for oil spill response among stakeholders in the region has been taken. This resulted in establishing good rapport regionally that will give EARL a good platform in carrying out the necessary oil spill response activities.

EARL enjoys a close and fruitful working relationship in the area of capacity building, partnering with organizations such as the Global Environment Facility/United Nations Development/International Maritime Organization Regional Programme on Partnerships in Environmental Management for the Seas of East Asia (PEMSEA). A fine example of PEMSEA and EARL cooperation in capacity building is an ongoing project to facilitate and play an advisory role working alongside the project task team of Cambodia to assist in the development and implementation of the National Contingency Plan.

Conclusion

Contingency planning is a vital key to emergency preparedness and management. By developing a sound contingency plan, operational capabilities with available resources and, more importantly, being able to mobilize it in good time are essentially defined. It provides objectivity and clarity in the event of an emergency; no country or organization in this world is spared from some kind of emergency or another. More importantly, being able to identify available regional and international assistance and having a chance to work out issues that may arise provide a realistic picture of the strengths and weaknesses before any incident.

Investing resources in response preparedness is definitely important and worth committing to. The benefits of increasing the ability in emergency management has positive spill over affects in utilizing the contingency mechanism to adapt to any form of emergency both natural or man-made. Stakeholders must therefore ensure that the identified processes remain relevant and that it undergoes regular reviews to maintain a high level of efficiency. ■

Exercise in deploying booms in Karimun.

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Notes

The Tier response is an operational concept that provides a convenient categorization of response levels and a practical basis for planning. Tier 1 is concerned with preparedness and response to a small spill within the capabilities of an individual facility or harbor authority. The Upper limit of tier 1 is often cited as 700 tons. The tier 2 response to a spill requires the coordination of more than one source of equipment and personnel. Assistance can come from a number of entities within a port area or from sources outside the immediate geographic area. Tier 2 describes a wide range of spill sizes and potential scenarios. Tier 3 is concerned with major spills requiring the mobilization of all available national resources, and will likely involve mobilization of regional and international systems. It is this tier of response where positive advance customs arrangements are critical to facilitate a successful effort (IMO, 1995).

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Sri Lanka and the Post-Tsunami Coastal Conservation Debate

Introduction

When rapid or reactive political promises and decisions are made during the initial disaster aftermath, the consequences are unlikely to bode well for ensuring best practice in natural resource management, environmental protection, long-term recovery and reconstruction efforts. Three months after the Indian Ocean tsunami disaster, this appears to be the case for the coastal areas of Sri Lanka. With many of the coastal regions' natural defenses degraded, hundreds of thousands of people still displaced, tens of thousands of homes damaged or destroyed and much of the country's fishing industry in ruins, the Government's immediate post-tsunami pledge to prohibit coastal construction, at the same time promising to restore livelihoods and rebuild affected fishing communities in areas of safety, has been widely criticized as both a knee-jerk reaction and a top-down approach which is inherently ethnically biased, anti-poor and fails to consider local level needs or realities.

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Damaged boats in Batticaloa District on the east coast of Sri Lanka have resulted in livelihood loss for fishers and their families.

Sri Lanka's Coastal Strategy

Sri Lanka's post-disaster coastal conservation strategy is largely predicated on the decision voiced by President Chandrika Bandaranaike Kumaratunga in her first address to the nation a few days after the tsunami struck, to re-institute strict enforcement of coastal protection legislation that had been routinely flouted for decades. This pre-existing legislation in the form of the Coast Conservation Act (1981) originally resulted from environmental concerns over the effects of a growing coastal population, natural and man-made coastal erosion and a heightened emergency preparedness and awareness following Sri Lanka's previous worst natural disaster, a cyclone in 1978 which claimed some 1,000 lives. The Act aimed to arrest the degradation rate of valuable yet vulnerable coastal habitats such as naturally protective corals, sand dunes and mangrove forests. It also aimed to protect coastal communities in areas

where unpredictable tidal patterns resulted in the perennial hazard of flooding and where cyclones posed a potential risk. It regulated private ownership, prohibited construction within 100 m of the mean high tide mark, and restricted other coastal construction to those projects approved by the Coast Conservation Department.

However, the 24 years following the enactment of this legislation through to the recent tsunami witnessed a proliferation of coastal construction and the consequent erosion of coastal resources despite the development of a comprehensive national coastal zone management plan during the interim. Construction has primarily comprised of illegal encroachment on state lands by the poor and marginalized, the growth of unregulated shrimp farming, the militarization of significant coastal areas as a result of the protracted conflict since 1983 in the north and east, and an expansion of the tourist industry mainly along the southeast, southern and western coasts. Where approval has been granted for hotel construction, this has invariably been followed by the rapid development of a tacitly condoned informal tourist-service sector around beachfront tourist sites.

The main reasons for the widespread disregard or circumvention of the Coast Conservation Act were a lack of capacity and political will to implement coastal policies, successive changes in the Government, political and administrative corruption at both national and local levels, the need to stimulate the economy by encouraging inward investment through tourism, and shifting national priorities following two violent insurgencies and years of civil war between the Sri Lankan Government and the secessionist Tamil movement, the Liberation Tigers of Tamil Eelam (LTTE).

Although Sri Lanka's post-tsunami response has now embraced the provisions of the Coast Conservation Act, it is incorporated as part of a wider recovery and reconstruction strategy. This strategy is headed by a new administrative body, the "Task Force for Rebuilding the Nation" (TAFREN), which is mandated to "rebuild damaged and destroyed houses and relocate people living in unsafe areas."

Although Sri Lanka's post-tsunami response has now embraced the provisions of the Coast Conservation Act, it is incorporated as part of a wider recovery and reconstruction strategy. This strategy is headed by a new administrative body, the "Task Force for Rebuilding the Nation" (TAFREN), which is mandated to "rebuild damaged and destroyed houses and relocate people living in unsafe areas." TAFREN's plan has four key components: 1) resurrection of 100-m exclusion zone with possible extension of up to 300 m in some areas; 2) urgent relocation of displaced people currently living in temporary welfare centers to temporary shelters; 3) provision of suitable accommodation in designated 'safe' inland resettlement sites for people displaced from residences lying within the coastal no-build zone; and 4) allocation of resettlement sites from state land. Where no state land is available the Government will make compulsory purchases.

This article assesses the social, economic and environmental implications of this strategy for the

Linking human security and environmental conservation, the exclusion zone also provides a space for the regeneration of those natural defenses which had been degraded during the coastal population growth and mismanagement of the past 20 years.

coastal region by examining both the arguments supporting and opposing the construction ban that has generated so much recent controversy.

The Proponents' Argument

The strategy put forward by TAFREN and the Government is based primarily on security and economic needs. First is the need for protection and emergency preparedness. Relocating displaced families and new construction to designated areas some 100–300 m inland would, they argue, reduce the coastal community's vulnerability to potential future hazards such as a recurrent tsunami (initially viewed as a remote possibility but subsequently regarded as a significant risk following further earthquakes in March 2005 off the coast of Sumatra), cyclones and flooding. There is also belief that the devastation caused by the tsunami created an opportunity to improve upon pre-tsunami housing by building safer, more modern and sustainable residences for affected communities. For the poorest communities, relocation could entail being provided with better quality residences than their shanty-type dwellings built along many parts of the coast and which were destroyed by the tsunami.

The tourism industry was also badly affected, with approximately half of the hotels located in the disaster zones damaged.

Linking human security and environmental conservation, the exclusion zone also provides a space for the regeneration of those natural defenses which had been degraded during the coastal population growth and mismanagement of the past 20 years. Coastal zone management could then be planned and targeted towards sustainable conservation and resource utilization rather than continuing the pattern of *ad hoc*, and often inappropriate development, extraction and exploitation that had prevailed in the pre-tsunami period.

Second are economic considerations. Prior to the tsunami the fishing industry had accounted for some 2.5 percent of GNP. Of the 31,000 people killed during the tsunami in Sri Lanka, 27,000 were from the fishing community (ADB, et al., 2005). As much as 80 percent of the fishing fleet was destroyed and most of the country's major fishing harbors were damaged resulting in a loss of livelihoods for some 170,000 fishers

and their families. Tourism, which accounts for between 2 to 4 percent of GDP was also badly affected with approximately half of the hotels located in the disaster zones damaged and many others unable to function due to the disruption of local services (ADB, et al., 2005). The implementation of coastal management policies would provide the opportunity to control, regularize and modernize both the tourism and fishing industries with the introduction of designated zoning.

The Opponents' Argument

The Government/TAFREN's proposals have been criticized on various levels by numerous parties including fishing community groups, local and international non-governmental organizations (NGOs) and human rights advocates. This section summarizes six key areas of commonly expressed concerns drawn from a Sri Lankan newspaper and local academic articles, reports of international and local NGOs and interviews with commentators and practitioners on the ground:
1) participation and consultation;
2) livelihoods and community; 3) pro-poor development; 4) corruption;
5) land rights; and 6) peace implications.

Participation and Consultation: The reconstruction process has so far failed to adequately account for the opinions and perspectives of local stakeholders. Without their input in the design and implementation of coastal conservation policies, the Government's strategy is unlikely to be sustainable over the long term.

Livelihoods: Fishing communities are concerned that proposals to relocate coastal villages to designated safe inland areas will profoundly disrupt their livelihoods' sense of community. Already displaced, they are concerned about access to their boats and nets, the financial implications of fishing regularization and the social consequences of changes to their traditional way of life.

Pro-Poor Development: There are concerns that the coastal exclusion zone is a thinly veiled excuse to gentrify the nation's beaches for foreigners and the tourism industry by transferring shanty-type dwellings and informal structures to the hinterland. There is a fear that beyond removal there is a lack of consideration for the needs of this sector. Unless reconstruction purposefully addresses the issues of sustainable livelihoods, access to employment, education and housing, the already marginalized communities will be further disadvantaged.

Corruption: With aid and investment amounting to billions of dollars there are concerns regarding how transparency and accountability will be ensured in the reconstruction process. Some question whether the coastal-exclusion zones have more to do with large corporate interests than human security and environmental protection needs. While public-private partnerships can be vital to effective and efficient reconstruction, there is some suspicion over the high level of representation in TAFREN by Sri Lankan conglomerates with significant tourism and construction industry interests.

Land Rights: The tsunami resulted in the displacement of approximately half a million people. Many of these have lost their title deeds and other documentation such as identity cards, savings passbooks, birth and marriage certificates. Critics point out that policies preventing people from returning to their homes complicate the process of establishing ownership, which is a prerequisite for claiming compensation. For many of the displaced, their properties were inextricably linked to their livelihoods, either as workplaces or as tangible assets and collateral for loans. Many of the displaced can no longer obtain the credit needed to finance their livelihoods. The more marginalized communities encroaching or squatting on state lands and have no property claims are unlikely to receive any compensation.

Peace Implications: The extent of the exclusion zone is one of the most ambiguous and contentious elements of the Government's coastal policy. A buffer zone of up to 300 m has been advocated for parts of the east coast while 100 m is

For the poorest communities, relocation could entail being provided with better quality residences than their shanty-type dwellings built along many parts of the coast and which were destroyed by the tsunami.

recommended for most of the southern and western coastlines. Although the Government argues that this reflects the enhanced vulnerabilities of certain areas, others point out that, with the east being home to large numbers of the minority Tamil and Muslim communities, the policy resonates of ethnic discrimination. In a post-conflict, as well as, post-disaster context the tainting of reconstruction policies as biased have the potential to undermine an already fragile peace process.

Another major peace-related implication is how pre-existing conflict induced internally in displaced communities will be accommodated. Many analysts are concerned that with the focus on the tsunami-affected population, those previously affected by the conflict will be overlooked. Such an omission would inevitably exacerbate tensions and the potential for conflict.

Conclusion

The current controversy surrounding the Government of Sri Lanka's coastal conservation policy clearly demonstrates the long-term folly of failing to adequately implement a technically competent and comprehensive strategy. Had the provisions established under the Coast Conservation Act been systematically adhered to over the past two decades countless lives may have been saved. However, in current post-disaster context, a rigid after-the-fact insistence on compliance of this Act is neither helpful nor appropriate. Although there are many aspects of the Act, including the 100-m exclusion zone that may be essential to both coastal conservation and human security, Sri Lanka's shoreline is a very different place to the one which originally informed this strategy. The challenge now is to develop a new strategy that takes into account the different dynamics and stakeholders of the coastal region. This strategy needs to balance environmental protection, human security and economic development in such a way that is both just and equitable for all those involved in the disaster. It needs to promote peace and improve the conditions and livelihoods for poor and conflict-affected communities alike. Central to achieving these goals are participation, consultation, transparency and accountability. ■

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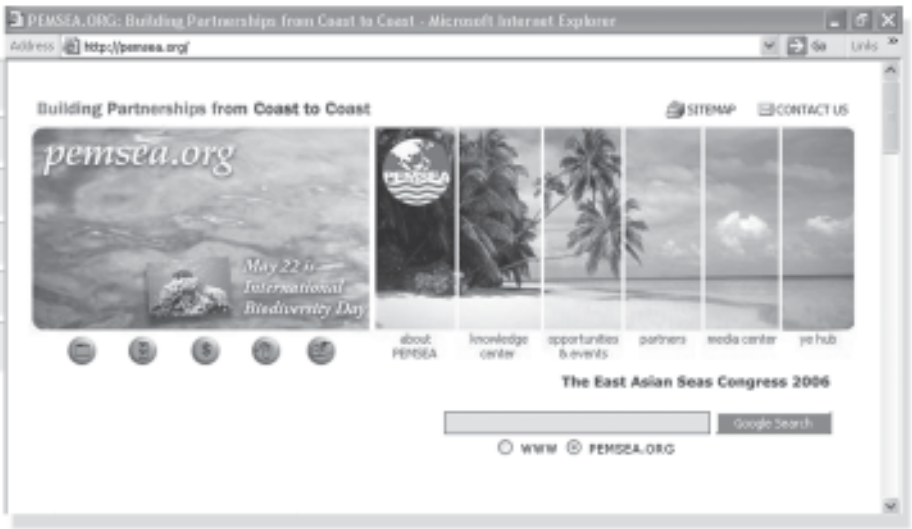

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Ian M. Johnstone-Bryden
Managing Editor
Broadly Boats

Risk Management vs. Scientific Fashion

Introduction

The amazing advances in communications and information technology, during the last 60 years, has brought beneficial changes, but has introduced new risks. As we become saturated with information, our attention span shortens, making us vulnerable to deliberate, or accidental, manipulation. For hundreds of years academia has depended on funding that is triggered by academic debate, through presentation of provoking new theses. Before the explosion in information, this necessary debate was conducted within a closed community that understood the limitations and qualifications. Today, a researcher presents a revolutionary new concept and, in a matter of days, the concept has been broadcast around the world, interpreted by the news media in ways that the researcher never originally intended.

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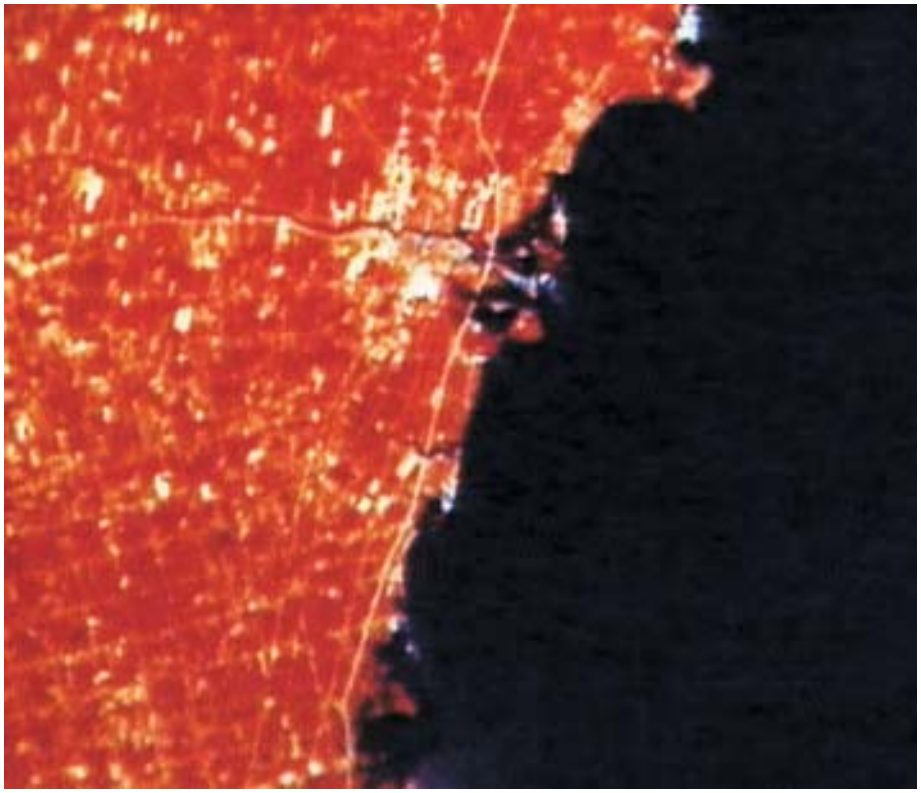

Scientific fashion claims that our profligate use of resources is carrying us towards disaster. This infrared satellite photograph of heat generated by a major population center creates an illusion of human power.

This can have some serious implications. When Fred Cohen presented a paper on self-replicating code, he used the standard academic approach to provoking debate, coining the term computer virus — never anticipating that he would father a destructive industry of malicious code writers and a costly industry of anti-virus programmers. When scientists first discovered the ozone hole above the Antarctic they wanted funds to study the phenomena, needing to provoke debate, never anticipating the way the global warming industry has developed. What is healthy and necessary debate, within the closed community of academic specialists, becomes a costly, destructive debate in a wider community that does not have the time to study all claims and proofs. The great risk is that a new fashion is begun, that takes on a life of its own, consuming vast amounts of resource, while more pressing issues are left unattended and unheard. As

damaging would be the backlash that sets in when some of the wilder claims of the latest scientific fashion fail to result in tangible result.

Risk management follows a different path to that of scientific fashion. Derived from the methodologies developed by German insurance companies more than a hundred years ago, risk management is now applied to many aspects of human activity. The concept is based on the analysis of historic data, to produce mathematical trends, on which can be based the assessment of risk probability and impact. Holistic risk management has developed over a period of 30 years and is still relatively rare. Where it has been employed faithfully, it has produced extremely good results. Unfortunately, it has become an abused term, with many organizations talking about risk management, when they really mean risk avoidance. Potentially, risk management provides the counter balance to scientific fashion. The enemy of risk management is the human instinct to bury bad news and to develop a blame culture. Governments are particularly guilty in this respect, many spending more time on massaging statistics, to produce a politically acceptable result, than they do on learning from mistakes.

In Medieval Europe, terrible plagues swept westwards and people searched for something, or someone, to blame. The scientists of that time decided to blame air pollution for the spread of plague, specifically smoke produced by charcoal burning. We now know better but, at the time, it was very comforting to have someone else to blame. We may be following a very similar path today in the way in which we are approaching issues of climate change. Scientists report the results of their research, attempting to draw conclusions. The subject becomes increasingly fashionable, more scientists concentrate on the subject. Any team presenting a case for research funding supporting the current fashionable theories is more likely to be funded. Any team offering an unfashionable view may have difficulty in finding funds for their research. They will be savaged by their

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Buildings and infrastructure create an illusion of permanence and human omnipotence.

colleagues, who fear them as heretic revolutionaries. The Internet speeds the process towards an extreme, because it is very easy to cut and paste information from massive online information resources. Governments find this a beneficial source of data to be manipulated, supporting their particular political views, some even going to war on the basis of this misuse of information. What started as a provoking thesis soon becomes an established fact, supported and moulded by news media and governments. The global population sees the headline data, which may be distorted and have ill-formed conclusions, and they either blindly accept the latest fashion or cynically dismiss it as lies that politicians tell.

We are now firmly in the grip of the global warming fashion. The majority scientific position is that global temperatures are rising, but some scientists claim that all temperatures are rising, some that the average temperature is rising, and others claim that there are rising temperatures in parts of the globe while some temperatures are falling. There may be considerable debate between research teams about the real meaning and implications for the future. However it has become fashionable to blame all weather conditions on global warming, and blaming this on pollution.

Computer models are developed, predicting future trends, but a computer model is only as good as the programmer's pre-conceived notions. That can mean that the model has dangerous bias. The model depends on the same base as risk management. It has to have initial data, which may be a dangerously small sample. Over time, accuracy should improve, with increasing base data. For example, 30 years ago, one university research team predicted a coming ice age. Their model suggested expanding polar ice caps and falling sea levels. The same university more recently embraced global warming, predicting shrinking ice caps and rising sea levels. They are now attempting to merge their original thesis with the global warming thesis to produce a concept of differential temperature change.

Given fashionable scientific theory that global warming is taking place, but considerable variation in detailed views of how quickly, or how high, temperatures are going to rise, identifying a cause is even more difficult. Global warming has been cheerfully blamed entirely on pollution from chlorofluorocarbon (CFC) release and the consumption of fossil fuels, particularly from

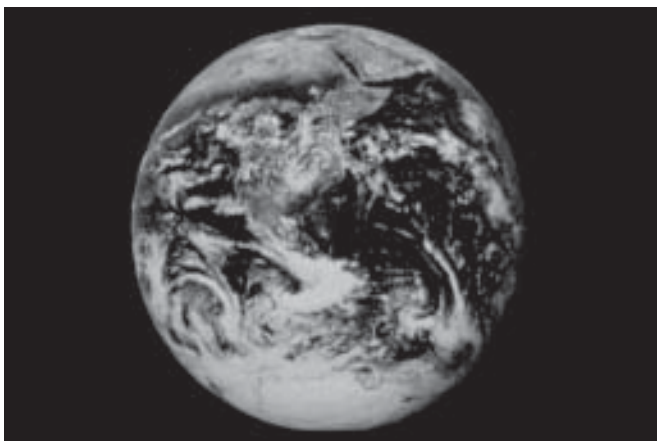
If the more extreme global warming claims become reality, many Pacific islands will be submerged, along with 80 percent of the world's populated zones. The relatively slow rate of sea-level rise would allow time to move urban centres to higher ground.

However much human activity contributes to climate change it is insignificant against the contribution of the Sun. Solar activity, together with the orbital path of the Earth, are the primary influences.

vehicles with combustion engines. Based on these assumptions we have charged off without much thought for the consequences of our actions, taking the risk avoidance approach of banning and constraining. Risk management is based on identifying risks, estimating the probability and the impact of those risks, and relating them to planned objectives, essentially an enabling process. That is much more flexible and pragmatic an approach, allowing some risks to be lightly moderated, or even left untouched, in the interests of enabling objectives to be met at acceptable risk, rather than a theoretical nil risk. Ironically, some parts of the world depend on tourists to fund conservation, yet these same tourists created pollution, flying to the area and damaging the environment by their presence. So far no alternate funding has been found.

Potentially, risk management provides the counter balance to scientific fashion. The enemy of risk management is the human instinct to bury bad news and to develop a blame culture. Governments are particularly guilty in this respect, many spending more time on massaging statistics, to produce a politically acceptable result, than they do on learning from mistakes.

Climate change and the level of earthquake and volcanic activity share a relationship, the nature of which is not yet known. The relationship between volcanic activity, or earthquakes, and the generation of tsunami is not well understood. The risk manager should have a nagging doubt about the fashionable acceptance of traffic jams as the cause of global warming, and a suspicion that more powerful forces than human activity may be responsible for climate change. Risk management requires the widest possible data over the greatest period for a broad sample. Geological survey identifies events in history at specific geographic locations and points in history,



The Earth is subject to other external forces, of which the most dramatic is the impact of an asteroid. A relatively rare event, but one that potentially brings immediate and catastrophic climate change with the extinction of life.

Below the thin crust and oceans lay unimaginable forces. As earthquakes, or as volcanic eruptions and explosions, these forces can both produce an immediate catastrophe, with significant, longer term, climatic effects.

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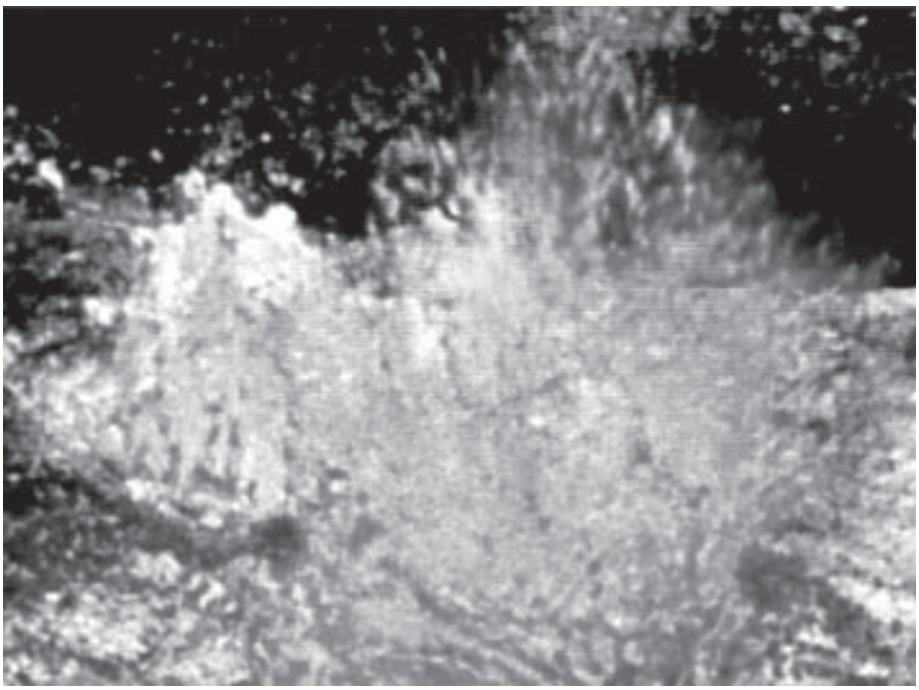


Nature's spectacular firework displays can be deadly, ejecting a blanket of ash into the atmosphere, blotting out the Sun and causing global cooling. When these forces generate tsunami, considerable damage can occur in low-lying areas bordering a submarine epicenter. Recovery and reconstruction can take years to complete.

suggesting long event cycles. Real-time measurement and recording of natural events is relatively recent. This means that historic data is very imperfect, but demonstrates some spectacular climate changes in the distant past, without man being a factor, over long cycles of change.

This provides risk management challenges because the probability is impossible to forecast with any accuracy, causal links are very difficult to identify, but the potential impact is enormous. The implementation of tsunami-monitoring systems in all seas and oceans, at the earliest time, is a risk management solution because it is affordable, practical, and reduces the impact of a tsunami. It will also provide base data to improve forecasting and risk management. The events in large areas surrounding the earthquake epicenter off Sumatra demonstrate how devastating a 30-m tsunami can be, but there is time to evacuate people. Devastating though this incident was, the 1500 BC volcanic explosion on the island of Thera, in the Aegean Sea, produced tsunami more than 10 times as large, heavily inundating the coastal areas of Italy, the Balkans, Turkey, Palestine and Egypt. Some geological studies suggest that even larger tsunami than the Thera inundations have occurred

in the distant past. As much of the world population lives near sea level, and evidence shows tsunami occurring throughout the oceans, monitoring chains are a very logical precaution.

To complete the risk management case it is necessary to provide the means to respond when a warning is given. There are practical limits to how much resource could be justified, against what may be a very long-term risk. The Indian Ocean may have suffered its only tsunami for several million years, or the next one could strike any day. Risk management may accept that the most rapidly planned evacuation to safe high ground will take one hour and that it will be impractical to conduct regular practice evacuations. That suggests inevitable loss of life near the epicenter, and that major damage will be done to the infrastructure in all countries in the affected area. The extent of damage will be in a series of contours responding to different heights of tsunami. It may become practical to permanently move populations from the lowest levels to reduce the volume of evacuation traffic and the extent of infrastructure damage.

The other essential element is for nations to agree in advance how they will respond, and what assistance they need and will accept. No single nation can store all the replacement material required to recover from an incident. The Sumatran experience demonstrates how much time can be lost as governments attempt to respond, and national pride, or political views hinder the delivery of assistance. Risk management demands an international rapid reaction force that will be admitted to devastated countries immediately and be able to draw on supplies from unaffected countries. That force requires an integrated command and control structure that is able to identify very quickly: how bad the damage is; where the relief supplies will come from, and; what transport is available to move supplies. The best-suited organizations are military units, which requires consideration in advance of political and national factors, so that they will not present an obstacle to saving life and enabling recovery.

While achievable risk management is ignored, we continue to focus major effort on what is scientific fashion. We know that we live on a very thin shell that contains a core and mantel producing huge forces and temperatures, where: solids are plastic and flow; our central star generates a fantastic heat output, driving our environment; and our star will expand as it ages, destroying our planet. The timetable is beyond our appreciation. The huge climate changes seen in history and geology are a result of these massive natural forces, where man may interfere to a minute extent. Scientific fashion is forcing the wrong priorities, injecting far more risk than is removed.

The impact of risks is easier to respond to, a temperature rise of X degrees, resulting in a sea-level rise of Y meters, maps to contours showing the extent of loss at any given level. Parts of the globe, depressed during the major Ice Ages by weight of ice, have been slowly rising, producing the same effect locally as a fall in sea level, islands once connected to neighboring land-masses until water released from the melting ice caps caused land bridges to be inundated. The total rise in sea level, if all ice melted, can be calculated, but estimating how long that would take, or what reversal will occur, is difficult to calculate. Although sea levels fluctuate, as water is released or returned to the ice caps, tectonic plate movement causes landmasses to sink or be forced up. Generally a slow movement, some events happen very suddenly, with new islands and mountains created, causing major changes to submarine contours.

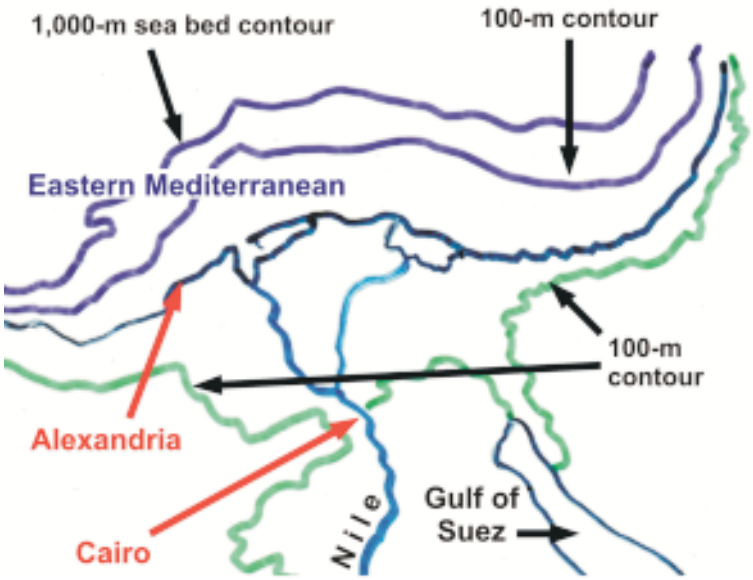
Where scientific fashion can be extreme, risk management is pragmatic, and holistic risk management considers: the original risks; the control mechanisms; and the consequences of those controls

Thera in 1500 B.C.

Thera today.

The center of the island has collapsed as a result of the explosion.

The December 2004 earthquake off Sumatra caused considerable loss of life and damage to industry and infrastructure around the Indian Ocean. In 1500 BC, the volcanic explosion under the island of Thera destroyed the heart of the island, but also created tsunami at least 10 times greater than those that devastated the areas surrounding the Sumatra earthquake.



The Thera explosion changed history, destroying the Minoan civilization and making possible the escape of the Israelites from Egypt. More than three days sailing time from Egypt, it took a matter of hours for the tsunami effect to range across the Eastern Mediterranean to Egypt, first lowering the sea level and then spreading a surge of hundred-meter tsunami, deep into Egypt and the Red Sea.

against the operational objectives. That climate change is a fact cannot be denied, it has been a factor from the formation of the Earth. Placing sole blame on pollution is a narrow and distorted view that leads to greater risk. If CO_2 pollution is to be reduced, the fast method would be to increase the use of nuclear power. That introduces other risks because nuclear proliferation can lead to weapons proliferation. However, tsunami monitoring would be helpful if a rogue state used the simplest weapons delivery system of laying nuclear mines from a commercial cargo vessel or private yacht. This can be done easily and covertly with little risk to the attacker, causing massive damage by creating artificial tsunami.

Unfortunately, politicians are addicted to short-term fixes that make them look good. A headline-grabbing ploy is to issue streams of objectives, suggesting action, but delivering nothing beneficial. Wind farm proliferation and waste recycling is very visual. When the results are analyzed carefully, the net result can be an increase in energy consumption and pollution output, because of the hidden costs of manufacture, assembly, maintenance and operation of the clean systems. Ecodiesel may sound attractive, but planting trees, on land needed to grow oil crops, could remove more CO_2. New forests support wildlife and diversity, they also look much nicer than fields of rapeseed and do not produce the pollen clouds that cause distress to people and other animals. Accepting diesel-electric power for vehicles is a more effective and pragmatic solution than trying to force vehicles off the roads. Trying to prevent developing countries from using the polluting technology, on which wealthy countries built their wealth, will generate resentment and new tensions that can produce more pollution through war that coal-fired steel furnaces ever will.

Risk management is not a panacea, but it is the best way to balance risks and aspirations. It operates within a social framework. Adequate tsunami monitoring and emergency recovery planning requires international agreement and social decisions. The reduction of pollution is a desirable policy whether or not it produces some of the wilder risks claimed by the global warming industry. The most effective way to reduce pollution is to reduce consumption, and the most effective way to reduce consumption is to control population growth. However, that requires political and social decisions. The most effective risk management is that which blends in with a chosen lifestyle, assisting, not constricting. Scientific fashion all too often produces zealots who disrupt and constrict unproductively. ■

continued from page 23

As the natural resources and environment have the potential to reduce disaster risk, long-term monitoring programs to regularly obtain updated information on the status of the environment are vital in hazard management. Existing integrated environmental monitoring programs (IEMPs) could also be extended beyond current uses by employing IEMP results in reviewing/correcting and improving management programs which are aimed at mitigating the impact of coastal hazards. As changes occur in the coastline and coastal resources, procedures need to be in place to assess those changes against natural hazard threats. This emphasizes the need for IEMP to be expanded beyond water quality monitoring, beach management, and resource and habitat assessments to include "hazard monitoring" in relation to the conditions of the coastal areas against various threats.

Integrated Land- and Sea-Use Zoning

Coastal-use zoning is used in ICM to reduce multiple and conflicting uses of the coastal area and to strengthen systematic and sustainable management of coastal resources. Zoning helps reduce conflicts by designating compatible activities for different zones and allocating coastal space for conservation and development. The participatory framework of ICM can facilitate the development of a practical and applicable zoning plan by involving various stakeholders and considering their different concerns and interests, as well as balancing economic development and environmental conservation. Zoning is also a highly political process, involving negotiation among sectors and stakeholders, and implementation needs to be supported by appropriate institutional arrangements.

Zoning is a key tool in hazard management. It involves making important decisions with regard to managing uncontrolled and improper construction of houses and establishments along or near the coasts; reducing vulnerability of settlements, infrastructure and critical facilities to storm surges and wave action, and weakening of natural defenses such as mangroves and coral reefs. It will require delineating setback, green areas, and no-build zones. It might even require relocating settlements that are in the vulnerable zones. The participatory ICM approach is therefore important to ensure that stakeholders are engaged in the decisionmaking process regarding the zonation scheme and its rationale, including the risk of natural hazards. It should be emphasized that zoning is being employed not just to manage the natural environment and resources but primarily to protect people's lives. This simple point makes institutionalization and enforcement of the zoning scheme all the more important.

Public Awareness and Stakeholder Participation

Enabling stakeholders to take an active part in planning and managing their own resources and environment is another dynamic feature of ICM. Stakeholder participation is facilitated by enhanced understanding of environmental values and threats as well as availability of opportunities for participation. The ICM framework provides opportunities for awareness building and stakeholder participation throughout the planning and implementation process. This facilitates better understanding of the goals of ICM, strengthens support in ICM implementation and provides a greater sense of ownership for the marine and coastal area.

The key to motivate people to participate in managing coastal hazards is to make them understand the benefits of their actions and consequences of inaction. The mechanism for public awareness and stakeholder mobilization is already in place in all ICM sites. Various tools have also been applied. The critical aspect to promote hazard management and developing a culture of prevention is getting the right message to the right people using the appropriate media (Box 3).

Capacity Building and Education

Local capacity building is important to ensure the sustainability

of ICM implementation. Effective application of the ICM framework requires adequate understanding of the ICM concept, framework, approaches and tools. Training on ICM project development and management and on specific technical and non-technical tools were conducted in the sites to build local capacity for ICM implementation.

Developing capacity and preparedness in relation to natural hazards can be through: a) training of coastal communities on natural disaster and safety at sea, natural resources conservation and rehabilitation, alternative forms of livelihood, and hazard and risk monitoring; and b) training of government personnel on natural disaster preparedness and management, monitoring and assessment of natural resources, and monitoring and assessment of natural hazards and other risk factors.

Institutional Arrangements and Partnerships

Institutional arrangements for ICM can be strengthened in relation to hazard management by:

- Expanding organizational and administrative frameworks in place to serve the needs of hazard management. In ICM sites, this could be done by extending ICM partnerships and collaboration with institutions specializing in natural hazards, emergency preparedness and response, early warning systems, etc., and engaging them in the different components of ICM;
- Strengthening the enforcement of environmental laws that protect natural ecosystems which have protective functions;
- Supporting the implementation of policies that may directly or indirectly contribute to risk reduction. For example, policies promoting sustainable management of fuel wood and the development of alternative sources of energy, which can reduce deforestation and control flood, avalanches and landslides; and
- Consulting with civil society, the private sector and communities to identify priority issues for hazard management, priority countermeasures, and their potential roles in hazard prevention/mitigation activities.

Box 3. Public Awareness on Hazard Management can be Raised through:

- Adequate coverage and visibility of risk reduction measures in popular media
- Development of educational materials on hazards and risk management and incorporation in formal education curriculum and other forms of informal education
- Direct involvement of communities in planning and implementation of all levels of hazard management
- Formation of community-based/volunteer groups for disaster monitoring and response
- Involving local people in developing an early warning system that is adapted to local conditions and needs, and which allows rapid and dependable distribution of warnings and advisories
- Promoting disaster preparedness at various levels (household, community, municipality, etc.) by developing, in consultation with stakeholders, and disseminating guidelines for prompt and effective response to varying types and degrees of hazard events

The Way Forward

Having discussed the key ICM elements and tools and how these can be strengthened to include elements of hazard management, following are some practical steps, which cut across various ICM activities, that can be undertaken to link coastal hazard management to the ICM process.

1. Identify natural and man-made threats to the coastal area and a strategy for ensuring community preparedness and response through the environmental profile and coastal strategy. The profile identifies and prioritizes the issues and provides the fundamental basis for the ICM program based on synthesis of available data while the CS identifies issues and corresponding strategies and action programs based on stakeholders' understanding of available information and perceptions of risk.

2. Having identified the problems, assess physical, social, economic and environmental conditions that make people vulnerable to impacts of the identified threats through RA. The foremost requirement for developing and implementing needed risk reduction measures/strategies is to understand the risk and how it relates to other man-made or natural risks.

3. Armed with adequate understanding of the type and level of risks, review existing strategies and action programs with a view to enhance effectiveness for risk reduction, and make informed decisions on where to invest and how to design hazard management efforts.

4. In developing the CSIP, formulate action programs to increase the ecosystem and population's resilience to impacts of natural hazards, addressing physical, social, economic, and environmental vulnerabilities, favoring non-structural solutions.

5. Implement action plans identified in the CSIP, including restoration/enhancement of natural defenses, emergency preparedness and response measures, awareness and capacity building among community members, strengthening partnerships among concerned government and non-governmental agencies, etc.

6. Conduct IEMP to continually assess the establishment and maintenance of natural defenses, and provide management with information on required corrective and preventive measures, as well as ways to continually improve the system.

Conclusion

Current ICM practices contribute to coastal hazard management, although these can be further enhanced. The recommendations are by no means exhaustive, and on-site ICM practitioners may come up with more innovative and cost-effective measures. Applying proposed actions will not be as simple as in writing. It should be understood, however, that the capacity and confidence among local governments and partners in implementing ICM took years to build. Likewise, infusing hazard management elements into ICM will also take time to mature. The key to incorporating hazard management into ICM would be through systematic application of RA to identify priority focus areas for risk management; consistent adaptation of ICM to further enhance awareness of natural hazards and risk reduction strategies; and conscious efforts to instill "hazard thinking" and risk reduction into policy formulation, decisionmaking and public consciousness. ■

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continued from page 29

process reach by reach and subsequently use these as a reference point for assessing progress and the practice of adaptive management.

Coastal management principles are to be tailored to unique conditions present in every coastal reach. This favors a decentralized approach and a co-management structure in which local institutions assume significant roles in planning and decisionmaking.

The governmental and non-governmental institutions with coastal management responsibilities should establish dialogues and communication channels to refine their abilities to identify threats and their root causes, to negotiate goals and strategies with a diversity of stakeholders, to practice conflict resolution and to prioritize their actions.

Use of economic assessment tools that help set priorities for investments, define and meet financing needs and sequence investments to maximize inter-sectoral collaboration and the advance towards sustainable development should be applied and promoted.

Principle 11

Develop mechanisms and tools to monitor and periodically communicate the outcomes of the reconstruction through indicators that reflect socioeconomic change and ecosystem health.

The development of simple practical indicators for assessing progress towards goals and monitoring the coastal reconstruction and rehabilitation process are crucial for adaptive management. Results of the reconstruction processes and the lessons that emerge from the application of the principles must be documented for wider dissemination on a periodic basis. Measures to keep print, radio and television media involved in the reporting process should be done through website establishment and updating and website registration with main search engines.

Principle 12

Widely disseminate good practices and lessons learned as they emerge.

Experts and leaders from the region and elsewhere must meet to review progress, celebrate success and analyze good practices for wider dissemination throughout the region.

Conclusion

Formulating principles to guide the rehabilitation and reconstruction is but the first step in the arduous reconstruction process. Those engaged in the process will need to work hard to create conditions that are better than those that existed before the tsunami and make coastal communities — particularly the poor — less vulnerable than they were before. There will be major pressures to simply put things back as they were before the disaster and to take advantage of the emergency to further individual interests rather than the common good. These pressures must be resisted. The implementation of the Cairo Principles will help grasp the opportunities generated by such a calamity and thereby create conditions that are more sustainable and more equitable than those before the tsunami. ■

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www.grid.unep.ch/product/map/download/indonesia_satellite_damage.jpg

Land-Use Planning

from page 58

Transboundary partnerships – Naga City lies on the tributary of the Bicol River, which crosses two other provinces and other localities. Thus Naga City is fully aware that solutions to recurrent flooding lie not only on efforts instituted at the city but also beyond its boundaries. The Metro Naga Development Council, a partnership of 14 neighboring local areas, is instrumental in pursuing basin-wide approaches to disaster mitigation. For example, flood control strategies from 10 previous studies within the river basin area, which have remained paper strategies for many years, would now be pursued using the resources of the Council.

Institutional management capabilities – Naga City adopted the Naga City Integrated Emergency Management System, a broadly-based approach which includes periodic hazard inventories and capacity assessment. As such, a medium-term development plan was prepared to measure all resources, both internal and external to the city government, to utilize optimally available resources. ■

Management-Based Research

from page 59

Data from maps and images taken at different years, anecdotal as well as historical records, and repeated beach profiling, reveal that segments of the coasts have been eroded from 30 m to as much as 500 m in the last 40 years. Both natural processes and man-made actions account for the observations. One cause is the shifting of the river mouths that have affected the delivery of the amount and quality of sediments. A strong earthquake in 1990 caused a widespread land subsidence which in turn caused seawater inundation and subsequent erosion in coastal plains. The regular typhoons that lash the coastal province also cause erosion. Around 5-10 m are eroded after every typhoon but usually the beaches have the ability to recover. However accounts show that starting in the 1990s recovery has not taken place. In 2001, Typhoon Feria eroded as much as 20 m of the beaches.

Human activity has also severely eroded the coasts. The extensive mining of the heavy magnetite sand from 1964–1974 along 100 km of the coast caused retreat along the shore and deepening in some portions. Corals, sand dunes and mangroves, which have the ability to attenuate incoming waves, have been destroyed. Human settlements and structures have also interfered with the natural distribution of the sediment. To protect these structures, seawalls, sandbags and groynes have been erected. The most extensive is the 1.5-km seawall in Sta. Rita. Around 60 groynes have also been constructed. These structures may have solved localized erosion but in effect aggravated those at proximate areas by not allowing the longshore drift hence depriving them of sediment nourishment.

Using the information generated from the project, the City of San Fernando planned to relocate informal settlers in the heavy eroding eastern portion to the accreting southern portion of the coast. Owners of tourist pavilions have been asked to construct stilts instead of ripraps in their seafront to allow normal distribution of sediments. Mangrove rehabilitation is to be adopted to stabilize river mouths. The provincial government will relocate instead of repair two school buildings threatened by the coastal erosion. ■

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NEWS

Plans for Three New ICM Parallel Sites in Bali Underway

BALI, INDONESIA — PEMSEA evaluated the regencies of Buleleng, Jembrana and Tabanan in Bali for their potential as new integrated coastal management (ICM) parallel sites during a site evaluation mission held on 15-17 March. The mission found strong interest and commitment among stakeholders and confirmed the regencies' local resources and capacity in adopting PEMSEA's ICM framework and approaches.

The mission, together with representatives from the Indonesian Ministry of Environment (MOE) and the Bali ICM Management Project, met with the local stakeholders of the three regencies including representatives of relevant government departments and heads of traditional villages. Field visits were conducted to locations encompassing key management issues and interests. The experiences from the Bali and Sukabumi ICM projects were shared with local stakeholders, along with the achievements of other ICM sites in the region.

In Jembrana Regency, the stakeholder consultation meeting recognized that linking forest and rivers with the coast and marine waters should be the basic framework of Jembrana's coastal management, considering that the regency holds 70 percent of Bali Island's forest cover. A major concern on Jembrana coast is beach erosion, mostly caused by natural processes and worsened by sand and gravel mining and the construction of coastal structures. The stakeholders agreed that the focus of their ICM program should be on strengthening the capacity of village members in managing and protecting the coastal areas and their understanding of coastal natural processes and habitats.

Buleleng Regency differs slightly from Jembrana in that its major concern is resource use conflicts arising from the numerous coastal activities, ranging from aquaculture, mariculture and an emerging tourism industry. Consultations with stakeholders highlighted the need to apply a coastal-use zoning scheme in Buleleng's coastal area. It was also suggested that existing stakeholder efforts in environmental protection be strengthened through education and training.

In Tabanan Regency, stakeholders expressed the need to preserve Tabanan's natural resources and habitat thus providing a strong foundation for promoting eco-cultural tourism -– an alternative economic activity the Regency aims to develop. The evaluation team visited a village where tourists can experience Balinese daily life and culture with activities such as cooking, planting, singing, dancing and joining in family gatherings. Village members hope that the cultural tourism would bring in significant local income that would in turn, discourage the illegal practice of sand and gravel mining in Tabanan.

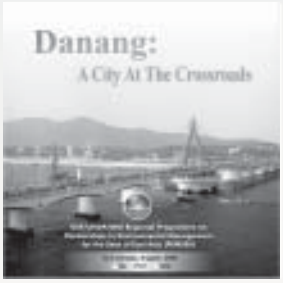
The mission concluded that ICM could make a positive contribution to the three regencies, providing local government units with a mechanism and process to harmonize both the economic development and environmental management of marine and coastal resources. ■

WATCH

VCD (PAL, NTSC)

Melasti – A Festival of Hope (13 min) looks at the environmental challenges in the marine and coastal areas of Bali, Indonesia, and the partnerships established for its conservation and sustainable use. It offers a unique glimpse of Balinese life, particularly on its three inseparable threads: faith, culture and the environment.

VCD (PAL, NTSC)



This documentary (12.5 min) provides a glimpse of strategies in balancing economic growth and environmental sustainability in Danang City, Vietnam. It looks into environmental issues and how the people of this fast developing city provide solutions to improve environmental management.

Visit our online bookstore at pemseabookstore.way.to.

NEWS

4th RNLG Annual Forum Calls for Stronger Leadership and Partnership in Local Actions

BALI, INDONESIA –- Over 100 government leaders, and coastal and marine experts from 22 PEMSEA ICM sites and candidate parallel sites, along with representatives from international and regional organizations have called for strengthening the implementation of integrated coastal management (ICM) to achieve sustainable coastal development in East Asia. The call came at the Fourth Annual Forum of the Regional Network of Local Governments Implementing Integrated Coastal Management (RNLG) on 26-28 April, with the theme "Building Better Coastal Governance through Stronger Alliance."

The forum participants reviewed and synthesized a decade's worth of ICM experiences and lessons learned from PEMSEA ICM sites as well as various ICM initiatives in Indonesia. In view of the recent Indian Ocean tsunami, a special session was organized to consolidate lessons learned from the tsunami tragedy and identify effective strategies for reducing and mitigating natural and man-made coastal hazards. The forum recognized that ICM was a useful framework for coastal hazard management.

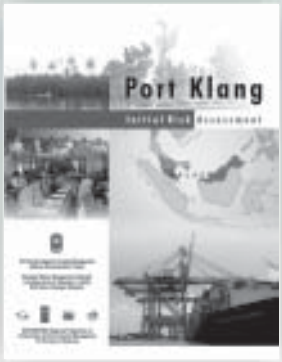
The Fourth RNLG Forum also saw the significant adoption of the Bali Resolution on the establishment of the PEMSEA Network of Local Governments for Sustainable Coastal Development (PNLG), which transforms the existing RNLG into the PNLG. The PNLG is a more self-sustaining and local government-driven network.

The forum was co-organized by PEMSEA and the Ministry of Environment of Indonesia and hosted by the Bali Provincial Government. The next forum will be organized as a side-event during the East Asian Seas Congress 2006, to be held in PR China in December 2006. Danang, Vietnam has offered to host the 6th forum, which will be held in 2007. ■

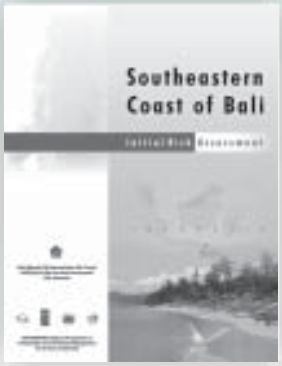
READ

PUBLICATIONS
HOT OFF THE PRESS

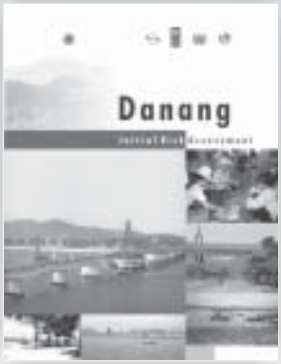
Bohai Sea Environmental Risk Assessment, 114 pp.



Port Klang Initial Risk Assessment, 96 pp.



Southeastern Coast of Bali Initial Risk Assessment, 100 pp.



Danang Initial Risk Assessment, 130 pp.

East Asian Governments Meet in Manila for Sustainable Development Strategy

QUEZON CITY, PHILIPPINES — Over 30 government experts from PEMSEA participating countries convened in Manila to formulate operational details for implementing the Sustainable Development Strategy for the Seas of East Asia (SDS-SEA). Organized by PEMSEA Regional Programme Office, the Working Group Meeting was held 15-18 May, and was hosted by the Department of Environment and Natural Resources of the Philippines.

This Meeting is considered as a critical step in the transformation of the existing project-based PEMSEA arrangement into a long-term and effective regional mechanism for implementing the SDS-SEA. The draft documents prepared for the Meeting were endorsed for consideration by the 11th PEMSEA Programme Steering Committee Meeting, to be held in Cambodia in August.

The SDS-SEA was adopted by 12 governments of the East Asian Region in December 2003 with the signing of the Putrajaya Declaration by Ministers and senior officials of PEMSEA participating countries.

Experts to Gather for Effective Water Ecosystem Management

MASAN, RO KOREA –- The Ministry of Maritime Affairs and Fisheries (MOMAF) of RO Korea and PEMSEA are preparing an international workshop that will gather various water experts together to discuss the challenges of managing interrelated river basins, estuaries and coastal seas.

The Workshop on Ecosystem Management for Interrelated River Basin, Estuaries and Coastal Seas will be held 1-3 June in Masan, RO Korea. It will be attended by experts from the Seto Inland Sea (Japan), Bohai Sea (PR China), Jakarta Bay (Indonesia), Manila Bay (Philippines), and Masan-Chinhae Bay (RO Korea).

The Masan workshop aims to identify the major challenges to ecosystem management of interrelated river basins, estuaries and coastal seas, review experiences and lessons learned from the practices in tackling such challenges, and outline response strategies and a mode of implementation for the East Asian region. The workshop will focus on three major areas of concern: a) policy, legal and other institutional arrangements; b) living resource restoration and ecological implications and c) water pollution reduction relating to the integrated management of river basins, estuaries and coastal seas.

The workshop proper will run for the first two days, and will be followed by a half-day field excursion on 3 June to the Masan-Chinhae Bay and Moon Island. The international event is part of MOMAF and PEMSEA's joint endeavor to build regional capacity in the sustainable development of water bodies in East Asia.

As part of the preparations, MOMAF has launched a website on the workshop which can be visited at www.meps.info/pemsea.

PEMSEA

NEWS

Manila Bay IIMS Now Online

QUEZON CITY, PHILIPPINES — Environmental management for the Manila Bay area received a strong boost in March with the successful development and testing of PEMSEA's internet-based Integrated Information Management System for Coastal and Marine Environment (IIMS) – a decision-support system providing vital information for managers and decisionmakers in addressing environmental issues in the Manila Bay Area.

The web-based capability of IIMS was successfully tested by PEMSEA's IIMS Team and the IIMS Technical Working Group of the Manila Bay Environmental Management Project (MBEMP) during field trials that ran from 1-7 March. The MBEMP PMO, its Site Management Offices (SMOs) and the Environmental Management Bureau (EMB) of the Philippine Department of Environment and Natural Resources (DENR) served as test sites.

The successful testing proved the functionality of IIMS by enabling rapid access to information by stakeholders of Manila Bay, and the timely updating of data by the MBEMP's SMOs, which are located in the bay's surrounding provinces.

IIMS was developed to provide local governments with a standardized system for data collection, collation and recording, as well as a means for adequate data analysis, interpretation and information packaging. The system was also designed to address the issue of data inaccessibility by making its results available through the Internet.

The IIMS for the Manila Bay Area can be accessed online through the EMB website at www.emb.gov.ph/iimsweb.

At present, DENR is working on the institutionalization of IIMS as a common database platform for DENR and EMB regional offices covering the Manila Bay area. It is expected that the IIMS will enhance the Department's capability of managing its data management and decisionmaking process, and sharing of data with other agencies with management responsibilities and interests in the Manila Bay area.

PEMSEA is now working on linking IIMS among sites in the East Asian region, to facilitate the sharing of information – this time on a regional scale. ■

EVENTS

11th Programme Steering Committee (PSC) Meeting

1–4 August 2005 • Siem Reap, Cambodia

The 11th Programme Steering Committee (PSC) Meeting will be held in Siem Reap, Cambodia on 1–4 August 2005. PSC meetings serve as a venue for PEMSEA participating countries to review the progress of PEMSEA activities in the East Asian region and to make recommendations for their effective implementation.

The objectives of the 11th PSC Meeting are to:

- Review and approve the Draft Documents on the Regional Implementing Mechanism for the Sustainable Development Strategy for the Seas of East Asia (SDS-SEA) submitted by the Working Group;
- Secure country support for the transformation of the Regional Programme Office into a country-supported PEMSEA Resource Facility;
- Discuss different financial sources and arrangements for the third phase of the programme; and
- Discuss further details on EAS Congress 2006 and the Ministerial Forum.

The Ministry of Environment of Cambodia will host the 11th PSC Meeting. ■

The East Asian Seas Congress 2006

12 to 16 December 2006
PR China

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*We only have **one ocean**…*
and it needs our help.

*As **one people**, it is time once again*
to come together in a globally
significant event…

to make a commitment
*and work, guided by **one vision**,*
for the sustainable development
of our seas and the welfare
of future generations.

Featuring the

Ministerial Forum on the Implementation of the Sustainable Development Strategy for the Seas of East Asia (SDS-SEA)*

(14 to 15 December)

International Conference on Coastal and Ocean Governance

(12 to 14 December)

and

Meeting of the EAS Partnership Council*

(16 December)

**By invitation*

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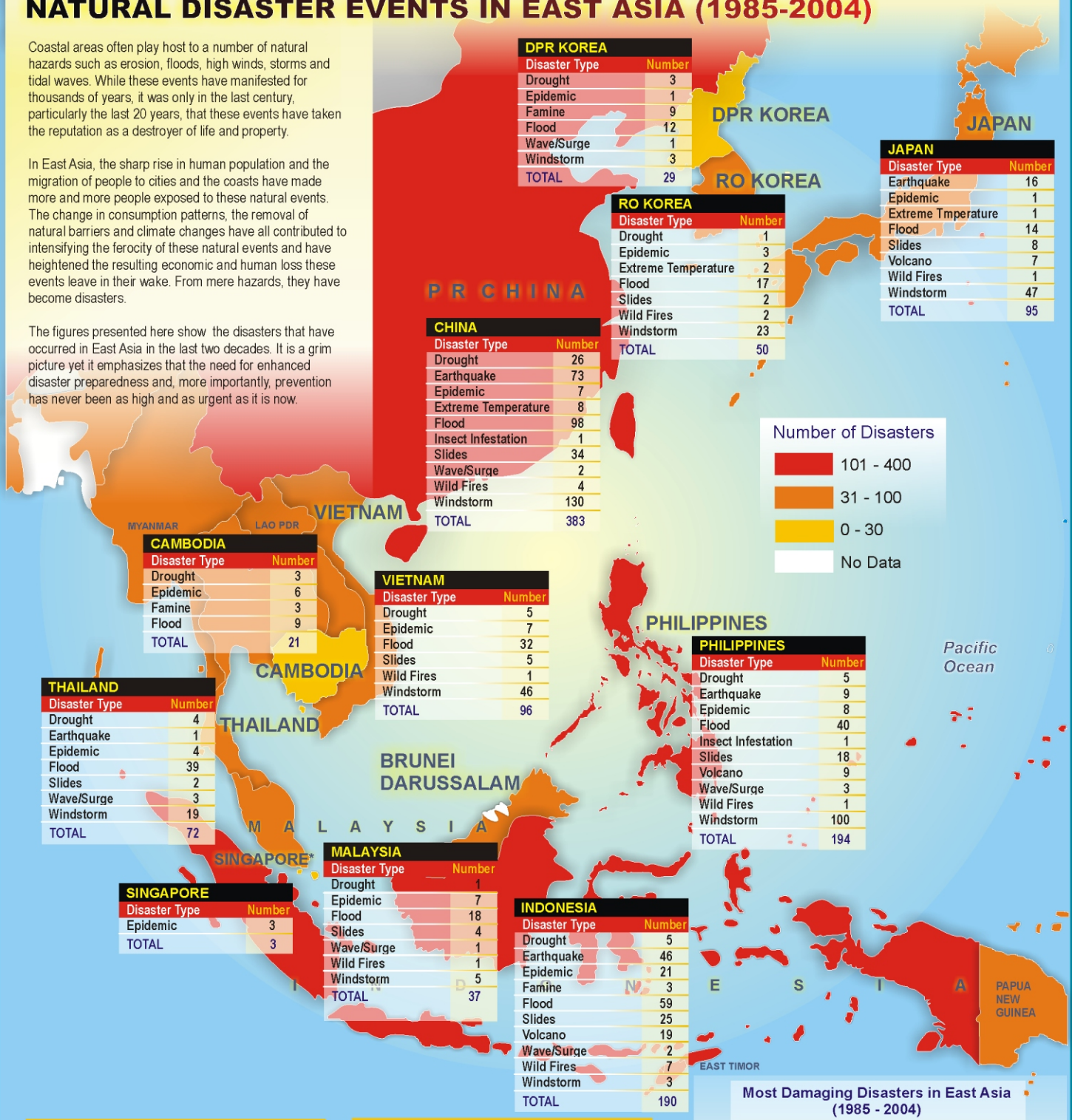
NATURAL DISASTER EVENTS IN EAST ASIA (1985-2004)

Coastal areas often play host to a number of natural hazards such as erosion, floods, high winds, storms and tidal waves. While these events have manifested for thousands of years, it was only in the last century, particularly the last 20 years, that these events have taken the reputation as a destroyer of life and property.

In East Asia, the sharp rise in human population and the migration of people to cities and the coasts have made more and more people exposed to these natural events. The change in consumption patterns, the removal of natural barriers and climate changes have all contributed to intensifying the ferocity of these natural events and have heightened the resulting economic and human loss these events leave in their wake. From mere hazards, they have become disasters.

The figures presented here show the disasters that have occurred in East Asia in the last two decades. It is a grim picture yet it emphasizes that the need for enhanced disaster preparedness and, more importantly, prevention has never been as high and as urgent as it is now.



DPR KOREA	
Disaster Type	Number
Drought	3
Epidemic	1
Famine	9
Flood	12
Wave/Surge	1
Windstorm	3
TOTAL	29

JAPAN	
Disaster Type	Number
Earthquake	16
Epidemic	1
Extreme Tmperature	1
Flood	14
Slides	8
Volcano	7
Wild Fires	1
Windstorm	47
TOTAL	95

RO KOREA	
Disaster Type	Number
Drought	1
Epidemic	3
Extreme Temperature	2
Flood	17
Slides	2
Wild Fires	2
Windstorm	23
TOTAL	50

CHINA	
Disaster Type	Number
Drought	26
Earthquake	73
Epidemic	7
Extreme Temperature	8
Flood	98
Insect Infestation	1
Slides	34
Wave/Surge	2
Wild Fires	4
Windstorm	130
TOTAL	383

CAMBODIA	
Disaster Type	Number
Drought	3
Epidemic	6
Famine	3
Flood	9
TOTAL	21

VIETNAM	
Disaster Type	Number
Drought	5
Epidemic	7
Flood	32
Slides	5
Wild Fires	1
Windstorm	46
TOTAL	96

THAILAND	
Disaster Type	Number
Drought	4
Earthquake	1
Epidemic	4
Flood	39
Slides	2
Wave/Surge	3
Windstorm	19
TOTAL	72

PHILIPPINES	
Disaster Type	Number
Drought	5
Earthquake	9
Epidemic	8
Flood	40
Insect Infestation	1
Slides	18
Volcano	9
Wave/Surge	3
Wild Fires	1
Windstorm	100
TOTAL	194

SINGAPORE	
Disaster Type	Number
Epidemic	3
TOTAL	3

MALAYSIA	
Disaster Type	Number
Drought	1
Epidemic	7
Flood	18
Slides	4
Wave/Surge	1
Wild Fires	1
Windstorm	5
TOTAL	37

INDONESIA	
Disaster Type	Number
Drought	5
Earthquake	46
Epidemic	21
Famine	3
Flood	59
Slides	25
Volcano	19
Wave/Surge	2
Wild Fires	7
Windstorm	3
TOTAL	190

Natural Disasters: The Material Cost (In US$ [thousands])

COUNTRY	YEAR	
	1985 - 1994	1995 - 2004
CAMBODIA	0	156,542
CHINA	40,999,930	94,199,415
DPR KOREA	0	22,709,400
INDONESIA	454,063	22,760,547
JAPAN	13,923,800	149,603,300
MALAYSIA	11,500	18,205
PHILIPPINES	3,642,287	1,715,160
RO KOREA	1,718,093	9,121,063
SINGAPORE	0	0
THAILAND	3,076,667	1,447,344
VIETNAM	411,100	2,291,645
TOTAL	64,237,440	304,022,621

Natural Disasters: The Human Cost (In Fatalities)

COUNTRY	YEAR	
	1985 - 1994	1995 - 2004
CAMBODIA	656	613
CHINA	20,909	20,695
DPR KOREA	321	220,473
INDONESIA	5,608	171,503
JAPAN	812	5,850
MALAYSIA	406	602
PHILIPPINES	15,608	6,549
RO KOREA	1,317	1,182
SINGAPORE	0	36
THAILAND	1,459	9,649
VIETNAM	4,528	7,863
TOTAL	51,624	445,015

Most Damaging Disasters in East Asia (1985 - 2004)

Disaster	Frequency	Total Affected[1]
Flood	364	1,629,587,307
Windstorm	400	361,539,736
Drought	59	239,423,385
Earthquake	147	23,420,400
Famine	15	16,092,000
Wild Fires	21	3,097,353
Volcano	35	1,554,297
Epidemic	76	1,357,268
Slides	99	791,433
Wave / Surge	13	641,612
Extreme Temperature	12	36,980
Insect Infestation	2	200

[1] Total affected includes those killed, injured and displaced.

Source of data:
EM-DAT Emergency Disasters Data Base. www.em-dat.net/