

Introduction: Sustainable Development in Asian Coastal Zones

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Tropical Asian coastal-marine waters and associated terrestrial ecosystems, particularly those in Southeast Asia, comprise one of the world's richest biogeographical areas, in which most shallow-water marine plants and animals reach the peak of their species diversity. That is associated with very high production of organic matter and resultant high fishery yields in coastal waters, and a tremendous variety of economically important products.

Most nations in the region are economically dependent on coastal environments. Coastal lowlands and deltas are Southeast Asia's main rice bowls; marine and freshwater fish provide about 60% of the regions' animal protein and are major sources of foreign currency; beaches and coral reefs sustain major tourist industries; aquaculture is of major economic importance to each country in the region; and coastal mining and hydrocarbon extraction is locally of major importance. In addition, the coastal zone of is home to 60-75% of Southeast Asia's human population and the location of major industrial complexes, and most of the region's burgeoning cities and major infrastructural investments.

Population growth rates are high with an average doubling time of about 25 years, and so place tremendous pressure on coastal resources and ecosystems. Nevertheless, despite recent economic setbacks, per capita income has increased dramatically in Singapore, Thailand, Malaysia, and Brunei during the last 20 years.

But the larger and more heavily populated countries of Indonesia and the Philippines still have relatively low capita incomes. Thus poverty in the coastal areas of these and other countries forces people to exploit beyond sustainable limits the existing resources.

As a consequence, in coastal fisheries, for example, the last two decades have witnessed a dramatic decline in harvest rates and continuous conflict between small-scale fishers and commercial operators, particularly commercial trawlers that encroach into inshore fishery grounds. As a consequence, in some areas trawling in coastal waters was banned, and international trespassing has been a common problem in the region. Small-scale fisheries are plagued with dwindling stocks from overfishing and destructive fishing methods. Mechanical push netting, and using dynamite for blast fishing and cyanide for aquarium fish collection are increasingly used in on reefs and in inshore waters, where fishers seek more efficient harvesting methods as fish become scarce. More than half the coral reefs in the Philippines, for example, are severely damaged, with only 30% of live coral cover in good condition. A similar situation exists in Indonesia, Malaysia and Thailand, where coral mining, destructive fishing methods and siltation from deforestation are all common. Coral reefs, in addition to buffering waves and reducing coastal erosion, supply 10 to 25% of animal protein to coastal populations and up to 100% to those in adjacent settlements.

Meanwhile, along the coastal fringe mangrove resources are dwindling owing to competitive use of these areas for human settlement, agriculture, logging, tin mining, and aquaculture. In the Philippines, for example, about 65 to 75% of the original 450,000 ha of mangroves has been destroyed. Of that area about 65% has been converted to fishponds, and shrimp farming is now an important alternative use of the mangrove habitat because of its rapid and large economic returns.

Water quality along many coastal areas is rapidly declining as more terrestrial wastes are flushed into the sea. All major Southeast Asian cities are adjacent to now essentially dead marine ecosystems and highly polluted waters. Singapore is the only state in the region that treats domestic waste. Deforestation, agriculture and mining dump large amounts of silt into the marine environment. Siltation decreases marine ecosystem productivity, smothers coral reefs and makes coastal waters less desirable for tourism.

Thus, natural resources depletion and environmental degradation are serious problems in most areas in the region. Development is constrained as water pollution increases and ecological productivity declines. It is, therefore, ever more costly just to maintain some semblance of environmental quality, especially in most heavily populated areas.

As a result of those and other factors, the principal problem to be addressed concerning coastal resources management is how to maintain the integrity of the resource base for sustainable use. Resources are being overused, and the basis of their production eroded. Unisectoral management approaches in Southeast Asia, as elsewhere, have clearly proven inadequate to achieve the sustainable management of coastal resources. A major failing is the lack of recognition of the linkages among upland, coastal and marine systems. The profound impact of siltation on many marine areas provides an obvious example. The extensive conversion of mangrove habitats and coastal wetlands to alternative uses is another case of ignoring the ecological linkages important for nutrient and species support of offshore marine ecosystems. These simple relationships need to be included in management models. Unisectoral management strategies fail to recognize how different ecosystems and resources are interdependent. Without more integrated approaches we will continue to see increasingly costly external effects of development, such as those arising from water pollution from industrial and urban sources. But in the formulation of more integrated approaches to coastal resources management it will have to be recognized that:-

- most renewable resources are already heavily exploited and ecosystems are under stress;
- environmental degradation is severe;
- poverty is endemic;
- institutional frameworks are inadequate;
- law enforcement is mostly poor;
- there is a lack of public appreciation of renewable resources and management; and
- there is a lack of integrated management approaches and capabilities.

Successful resources management policy depends on firm political will, and institutional commitment at the national and local levels is fundamental to achieve sustainable use. But commitment is often frustrated by institutional and administrative constraints that prevent effective coordination among national and local agencies. Resources management agencies often have to bow to the priorities of fulfilling national economic targets. Interagency conflicts are common and can often scuttle implementation plans that involve more than one agency.

Past regulatory measures have not been very successful, often because of the lack of cooperation and support of the community and the inefficiency of law enforcement. Adequate consultation with local communities is therefore an important part of the planning and implementation process. Management strategies need to consider community perceptions and customs, particularly traditional use rights and practices. They will also need to identify more precisely the range of stakeholders in a coastal area and its various resource systems.

If community participation is successful, resource management can be sustained by communities themselves. In fact, the real problem may be to assist people to manage their own coastal resources for which they have a sense of ownership and control. Such community-based management has proven historically effective in many parts of the Asia-Pacific Region.

In the seminar those problems were addressed in terms of sustainability in both urban and rural areas, and community-based governance of coastal resources. The theme of sustainability was taken first.

Sustainable cities is the theme of two papers. In "*Asian Coastal Cities: the Sustainable and the Unsustainable*", Peter Newman focus on urbanization, transportation and sustainability. Two types of coastal city can be identified in rapidly urbanizing coastal Asia. The first is exemplified by the three wealthy cities of Singapore, Hong Kong

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and Tokyo, that have invested heavily in transit systems and built their cities around them. The second type is represented by the seven newly industrializing cities of Bangkok, Jakarta, Surabaya, Manila, Kuala Lumpur, Seoul, and Beijing that have used an automobile-based paradigm of development. Traffic problems of the second type are producing some of the worst urban environmental outcomes in the world, and these cities demonstrate comparatively little obvious economic benefit on all indicators examined. The policy implication is that investment should prioritize electric rail options. Because the urban form of these cities is still oriented to dense corridors, the resulting improvements in economic and environmental performance could be quite dramatic. The coastal cities and towns of Thailand are home to about one-third of the country's population and nearly two-thirds of its urban population. They are also the focus of the country's economy as well as being notorious for pollution and congestion. In *"Thailand's Coastal Cities: Planning for Sustainability"*, Chamlong Poboon examines two recent initiatives to introduce sustainable planning and management for the cities, based on the 1992 Earth Summit's Local Agenda 21. To move the cities and towns toward livability and sustainability, they have introduced the four key strategies: 1) preparation and implementation of planning procedures; 2) community participation; 3) awareness raising; and 4) the application of indicators. In addition, the Bangkok Metropolitan Administration has adopted the WHO's Healthy Cities concept, comprising 23 key indicators for the 11 pilot districts. Two papers examine population and sustainability in the coastal zone. First, in *"Population and Sustainability: is there Hope for Coastal China?"*, Guo and Marinova examine population changes and land management resulting from the one-child policy and the open-door economic development. They argue that industrialization and land degradation, rather than population growth, are mainly responsible for the loss of arable land, and that controlling population growth is the starting point for achieving sustainable development. China must soon to address its ecological problems, particularly on the coast, if future generations are not to be burdened with an aging population and environmental degradation.

In *"Overview of Indonesia's Coastal Ecosystem: Efforts toward Sustainability"*, Hari Harsono Amir describes the importance of the major coastal ecosystems of Indonesia. Since it is now evident that economic development and human activities have resulted in environmental degradation in coastal areas, at a level that threatens the capacity of these coastal areas to support further economic development, it has become crucial to develop policy and implement action plans that incorporate the ecological principles that permit the sustainable use the coastal areas and resources for the benefit of the entire Indonesian people. The successful implementation of policy, plan and program to sustainably develop the coastal areas necessitates a new partnership among all key stakeholders in society to cooperate fully in protecting the coastal areas while meeting the needs and aspirations to enhance the quality of life of the people.

Particular examples of the sustainable development of resources in Indonesia and the Maldives are examined in the next three articles. First, in *"Tidal Swamp Development in Kalimantan"*, Schlapfer and Marinova examine the impact of rice technology on the coastal peat swamp areas of Kalimantan, Indonesia. The problems associated with rice technology transfer and economic development by the Indonesian Government in Kalimantan are discussed in general and specifically in relation to the Sawah Project. The Indonesian Government has taken the approach of non-consultation and non-cooperation with traditional technology. Schlapfer and Marinova compare the approach of the Melayu merchants to swamp land development with the government technocrats, in an attempt to highlight the importance of adapting introduced technology to the local context, and consider traditional knowledge as a possible useful tool to sustainable development. They argue that perhaps the technocrats system of swampland use may prove to be an illusion, whereas the apparently more transient system of the Melayu merchants could prove to be more permanent.

The rubber industry in Indonesia is unsustainable mainly because of such environmental problems as land clearing and degradation, loss of biodiversity, water and air pollution, and heavy resource use. Underlying these environmental problems are social and structural problems. In the second article in this sub-section, *"Moving Toward Sustainability in Agro-forestry: The Case of Smallholder Rubber in Indonesia"*, Zahari Zen, Peter Newman and Laura Stocker describe a set of strategies for developing the Indonesian rubber industry in a more sustainable way. Among their recommendations are: the deployment of new technologies, such as the mini-creper machines, for smallholders; the integration of "downstream" and "upstream" elements of the rubber industry through a partnership approach across the industry; and a strong policy role for the government in protecting the environment and reducing poverty. The government should also partly fund mixed replanting schemes to improve farming performance, and provide land title to prevent further destruction of the forest.

In the last article in this sub-section, "*Tourism and the Management of Environmental Impacts in the Republic of Maldives*", Simad Saeed and David Annandale examine the key issues of the environmental impact of tourism and environmental regulation in a small South Asian archipelagic state that has undergone rapid economic change over the last 25 years, owing to the development and expansion of an entirely new tourist industry. Although this economic restructuring has not been without environmental challenges, the overall environmental impact has been relatively minor. The authors examine the development of the tourism industry in the Maldives, and indicate how strict, integrated Government regulation has adequately managed environmental impacts.

Basic science has a fundamental role in the formulation of ecologically sound policy for coastal zones. In "*From Minamata to Green Chemistry: Implications for Policy Development for Coastal Zones*", John Webb presents an analysis of the perspectives provided by chemical sciences of selected environmental processes at work in coastal zones. He argues that these perspectives serve to inform the planning for the wise and sustainable development of such areas and ecosystems. In particular, instances are described that illustrate the processes within the environment of biotransformation, bioaccumulation and the use of bioindicators. Bioremediation is also outlined. The exemplar of mercury poisoning at Minamata Bay, Japan, is considered in some detail. The complex but conventional analysis of environmental consequences of pollutant production and release is contrasted with the more recent emergence of green chemistry, or environmentally benign chemistry, to prevent pollution at the source, that is, in the design and selection of chemical products and processes.

The second set of articles focuses on the issues of community-based management and governance of coastal resources and environments. In "*The Role of Local Management and Knowledge Systems in Small-Scale Fisheries: a Review of Major Issues and Research Needs in Asian Coastal Zones*", Kenneth Ruddle provides an overview of the "design principles" of local resource management systems and their knowledge bases. He demonstrates that in tropical developing countries there already exist or existed sophisticated traditional, community-based fisheries management systems, grounded in often encyclopaedic systems of local knowledge, and well adapted for local use. Such traditional fisheries management systems have been documented throughout the world. They are especially rich in the Asia-Pacific Region, where they are generally highly regulated, common property regimes. In this article the author summarizes the main functions, characteristics and design principles of such systems and their local knowledge base, describes their geographical distribution in Asia, and suggests areas and topics of research that could form a basis for collaborative undertakings.

One of the most frustrating problems in coastal zone management is the need to accommodate all stakeholders in policy design. In "*Establishing Customer Requirements in Multi-Sector Coastal Policy-making Toward Global Quality Coastal Zones*", Richard Tabor Greene presents customer requirements gathering as a powerful, viable, and proven technique for resolving stakeholder conflicts and refusals of future effects. Customer requirements gathering is a principal technique of two movements—the total quality and global quality movements—both of which offer other tools directly resolving coastal zone policy issues. The author presents the systems science basis of coastal zone "linkage" problems among stakeholders and the two movements, total and global quality. This is followed by a detailed examination of the role of gathering customer requirements in handling coastal zone problems: the concept of customer, the role of customer requirements in resolving stakeholder conflicts, what customers of policies require of them, what businesses know about customer requirements gathering, what beyond gathering such requirements is needed, implementing customer requirements gathering in coastal zones. Finally a broader examination is made of global quality tools in general applied to coastal zone issues: changing commonsense as definition of policy victory, a sequence of quality tools which create kinds of modesty needed for further change, Japanese policy problems that resemble coastal zone problems and were solved by quality tools, handling the cognitive deficits of poverty using quality tools, examples of policy applications of such tools, and comparison of global quality with other coastal zone policy-problem solution approaches.

In "*Community Involvement in Ocean Policy, Coastcare and the Establishment of Marine Protected Areas in Australia*", Laura Stocker and Susan Moore review the recent history of marine and coastal policies in Australia. The authors show that five elements of capacity building, namely integrative place-making, collaborative policy-making, inclusive stakeholder involvement, and building relational resources, have emerged to some extent in Australian coastal and marine policies of the 1990s, and suggest that opportunities exist for developing these elements further, and that the process of collaborative learning is one way to help achieve this.

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In many developed countries ocean or coastal zone policies include the provision for citizen participation in the policy-making process, in addition to the more usual restrictions and regulations regarding environmental protection. In Japan, however, based on the experiences of public nuisance in 1960s, government regulates sources of pollution sources but does not respect citizen participation. In some ways it may be said that the public sector brought about the environmental destruction by ignoring citizens' opinions. This is especially true regarding coastal reclamation, which has resulted in the disappearance of wetlands and natural coastlines. In "*Local Government and the Citizen in Coastal Zone Management - A Case Study of Reclamation in Hakata Bay, Japan*", Yoshio Murakami demonstrates many procedural defects in public sector coastal reclamation activities in Japan, using Hakata Bay, Fukuoka Prefecture, as an example.

Although the Japanese system of coastal fisheries management, based on the local Fisheries Cooperative Association, has long been highly regarded, it is not without problems. In "*Rural Depopulation and its Impact on the Structure and Organization of Nearshore Fisheries in Japan: A Case Study of Fishing Communities in Hirado, Kyushu*", R.T.A. Irving examines a major challenge to this system posed by demographic change. The rural exodus of young people in the 1960s left many fishery operators without a successor in place to exercise fishing rights when fishery operators are forced to retire because of old age. The decline in numbers of fishery operators means that changes in the spatial and possibly functional structure of FCAs will be required. This, in turn, may have a negative impact on the future sustainability of aquatic resource management in Japanese coastal waters.

The final article addresses the role of the local community in pollution management. Because most scientific or engineering techniques for pollution monitoring and control are sophisticated and costly, and since often the lack of public awareness and participation is a contributing factor for the failure of pollution management, the development of simple techniques for local communities to monitor coastal pollution is of great importance, especially in developing countries. In "*Community-Based Science for Coastal-Marine Pollution Monitoring: Toward Environmental Education and Policy*", Kim Chi Tran describes a simple methodology for monitoring of some coastal-marine pollution issues. Some aspects of environmental education, public awareness and policy are discussed, and a national program on coastal pollution monitoring in Vietnam is proposed.