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UNU Monitor is a quarterly review of the United Nations University's (UNU) current research activities, publications and forthcoming projects in the area of environment and sustainable development. This issue features an article by Ms. Caroline King and Dr. Zafar Adeel of the Environment and Sustainable Development Programme of UNU. This paper highlights some of the key findings from the UNU Project: "Environmental Monitoring and Governance in the East Asian Coastal Hydrosphere." Regional perspectives on the status of coastal ecosystems and management approaches for coastal resources are briefly summarized in this paper. Additional information concerning this project and an upcoming international conference "Conserving Our Coastal Environment" (8–10 July 2002) is available on the UNU website at <http://landbase.hq.unu.edu>. Please contact Dr. Zafar Adeel, UNU ESD (email: adeel@hq.unu.edu; fax: +81-3-3406-7347) for queries regarding this project. © 2002 Elsevier Science Ltd. All rights reserved.

Strategies for sustainable coastal management in Asia and the Pacific—perspectives from a regional initiative

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1. Introduction

The coastal areas in the East Asian and Pacific region have experienced intense development and growth during the past few decades. Rapid growth in economy and population has been accompanied by adverse impacts on environmental quality and living resources in these areas. This has created a challenge for researchers, coastal managers and policy makers to understand both the nature of developmental impacts and the drivers behind them in order to devise effective strategies to respond to the trend of degradation in coastal habitats. Successful strategies have to be designed with due consideration to the socio-economic conditions as well as the state of coastal ecosystems in the region.

Over the past few years, United Nations University's (UNU's) work on coastal areas has focused on the critical threats to these ecosystems. It has identified key interventions to address the threats to coastal areas including community-based coastal management, awareness raising, human and institutional capacity

development and monitoring the status of coastal ecosystems. The over-arching designation of "coastal hydrosphere" was created to encompass and to reflect the focus on assessment of water quality and living resources in the coastal areas. It is envisioned that important lessons relevant to environmental governance can be learnt from monitoring and assessment activities within the coastal hydrosphere. Some of the resulting recommendations by UNU to support policy-making are described in an upcoming publication (Adeel and Nakamoto, 2002).

Working through its network of researchers in the region, UNU has undertaken capacity-development work for coastal monitoring. This includes providing training opportunities for young researchers with a focus on coastal ecosystems, and offering support for the development of human and institutional capacity to undertake coastal monitoring. The elements of this capacity development for monitoring have specifically sought to deepen existing knowledge of land-based coastal pollutants. These include a group of pollutants called endocrine disruptor chemicals (EDCs) that adversely impact human and animal hormonal and immune systems.

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This paper is divided into two components. The first section describes the health of coastal ecosystems, threats from anthropogenic activities and the drivers behind these impacts. The findings provided here are based on a broader set of data gathered in different elements of the UNU project. The second section provides an overview of the key recommendations that have emerged as a result of continuous and evolving dialogue between researchers, policy makers and the general public. It is important to note that this concentration on the science-policy nexus has allowed UNU to play an important supporting role for policy development in the region and in identifying the existing research gaps.

2. Degradation of coastal ecosystems

2.1. Status of coastal ecosystems

Coastal resources play a critical role in food security and livelihoods of the people living in the Asia-Pacific region, particularly for low-income groups. The sustainable utilization of these resources and their quality directly influences human health and economic viability, making coastal pollution a truly human life-threatening issue. The description here is limited to some of the more critical coastal habitats that can serve as sentinels of the overall ecosystem health; each ecosystem is vulnerable to human exploitation in various ways:

- *Mangroves* provide under-appreciated ecological benefits such as carbon storage, (Fujimoto, 2000), nutrients for fisheries, protection from erosion, flooding, cyclones, typhoons and tidal waves (Primavera, 2000), as well as products useful to people, such as timber and honey. Most of the mangrove forests in the region are under a high level of threat due to over-exploitation and destructive practices. Some estimates indicate that more than 70% of the mangroves in Indonesia, Thailand, and the Philippines have been destroyed.
- *Coral reefs* have a species richness that attracts damaging fishing practices, bioprospectors, souvenir prospectors and tourists. Their impacts, coupled with observed global warming, have resulted in massive coral bleaching in the region. Often their remote locations and local economies of exploitation make it difficult to manage them properly (WRI, 2000).
- *Seagrass beds* are also highly diverse, but not well understood. Of the total of 70 known species of seagrass in the world, 20 were recorded in the South China Sea alone (Morton and Blackmore, 2001). In the Association of South East Asian Nations (ASEAN) as a whole, there are 318 fish species from 51 families associated with seagrass beds (UNEP,

1999). Increased sediment loads in water, due to pollution, drag fishing or dredging and construction activities threaten them with suffocation.

Further threats to the survival of all coastal ecosystems that are caused by human activities, such as pollution and climate change, vary in their intensity and effects. UNU's monitoring programme has clearly shown that land-based sources make a significant contribution to coastal pollution. Industrial activities, urban areas and agricultural activities all contribute significantly to pollution that ends up in coastal areas. The level of pollution can often be correlated to the degree of industrialization in a country (Tanabe, 2000). Similarly, the over-exploitation of coastal resources has been shown to correlate to the intensity of fishing and anthropogenic activities including aquaculture, regional trade and tourism (Burke et al, 2000). Some encouraging trends in slow, long-term reduction of pesticides, particularly DDT, are also apparent within the region.

3. The driving forces behind coastal degradation

The activities that are the direct causes of coastal degradation are often driven by a series of trends related to the socio-economic development of this region. Rapid growth has occurred, particularly in most ASEAN countries. This has multiplied the anthropogenic impacts in coastal areas (particularly before the financial crisis that hit the region in 1997), leading to a rapid deterioration of the resources. The lure of short-term benefit, and a growing sense of economic instability have often obscured the longer-term advantages of managing and protecting coastal ecosystems.

3.1. Poverty

Coastal communities have found themselves caught in a vicious circle of poverty, over-exploitation of natural resources, resulting degradation of resources for food and survival, and ever-deepening impoverishment (Hidayati, 2000). This situation is often the result of the perceived lack of livelihood choices and exploitation practices on the part of the coastal community. Nevertheless, outside forces such as the market conditions and access play an important role in shaping this situation, as do development policies in coastal areas. Studies conducted by researchers in UNU's network on coastal management continue to highlight a lack of awareness amongst policy makers of the needs of coastal communities and their role in managing their environs (e.g., Moreno-Casasola, 2000; Pollnac et al., 2001).

3.2. Urbanization and industrialization

The demographic changes that have accompanied the recent economic growth in many parts of this region have increased the pressures on the coastal environment due to increased human population and economic activities in these areas (Jiang et al., 2001). In addition to the replacement of coastal ecosystems with human settlements, this has also led to a dramatic increase in land-based pollution (GESAMP, 2001). The organizational challenges of providing the sanitation and waste-collection services, as well as regulating the waste-generating activities of industry are often overwhelming, and put strain on the traditional forms and policy approaches of local government in these areas (Leaf, 2002). Internationally coordinated efforts to help, such as UNEP's East Asian Seas Action Plan, and those of the development banks, rely on the availability of data concerning the nature of pollution in order to identify priorities. Trends in urban and industrial pollution from heavy metals and toxic chemicals have been monitored by UNU for the past 3 years (<http://landbase.unu.edu>).

3.3. Over-exploitation of coastal resources

The prevalent forms of natural resource over-exploitation in coastal areas concern fisheries, aquaculture and agriculture. Many destructive practices have been introduced in these industries in order to increase productivity, often at the expense of the coastal environment. Examples include blast fishing and by-catch, wiping out fish stocks and destroying their habitats (UNEP, 1999) and intensive short-term shrimp farming without careful management of restorative mangrove areas around the cultivation ponds (UNU, 2000). These practices have not only been difficult to regulate, but many have even been actively encouraged by official land and development policies, either in the past or ongoing (McMorrow and Talip, 2001).

3.4. Intensified agriculture

Concern to protect food security for the growing Asian population has led governments to seek increases in agricultural production known as the 'Green Revolution' (Adeel, 2002). This has entailed increasing use of manufactured fertilizers, pesticides and herbicides, which pass into coastal environments through runoff and leaching. The immediate effect of this pollution is to increase nutrient levels in water, causing eutrophication, and algal blooms known as 'red tides'. These have become common off the coasts of Asia. Most of the pesticides used in the region are also known to be EDC's that persist in the environment over prolonged periods of time, likely leading to chronic health effects on the coastal and marine animals.

3.5. Regional and global interests

International and regional development seen during the 'Asian miracle', shipping, trade and tourism have brought global business opportunities to the coastal communities of Asia and the Pacific, but they have also deepened many of the coastal environmental problems in the region. The trans-boundary nature of this development has made it almost impossible to control at the local and national levels (Budianto, 2000; Ismail, 2001). A new reassertion of local management priorities is needed, together with coordinated regional endorsement. The capacity of local managers to channel and negotiate these new forces will require a great deal of support and capacity development.

4. Strategies for protection of the coastal environment

A number of policy-making frameworks exist at different levels within the region and require skilful integration. UNU's work underlines the fact that policies can be strengthened and supplemented by the use of other interactive strategies, such as community involvement, public awareness building, human and institutional capacity building and the development of localized monitoring activities.

4.1. Community-based coastal management

UNU's work has brought to light many success stories in attempts to involve communities in local management planning for coastal areas. These lessons emphasize the importance of community organization and underline the willingness of communities to work together when they can see the direct benefits in improvements to their livelihoods. The key to the involvement of the community is their awareness of the value of their coastal environments.

4.2. Awareness raising

UNU has been working to contribute to public awareness raising concerning the importance and vulnerability of the coastal environment. This is an essential prelude to the policy and behavioral changes that are required for improved coastal conservation. According to COREMAP research in Indonesia (Hidayati, 2000), the percentage of people in urban areas, who recognize that the quality of Indonesia's coral reefs is declining, is 24% and 34%, respectively, in South Sulawesi and Riau. Tried and recommended methods of raising public awareness include use of TV, radio, books and other publications, research and public events, education and awards programmes, and publicizing of success stories.

4.3. Human and institutional capacity development

The evident need to develop the capacity of the scientific community in the region to undertake policy-relevant research and monitoring of coastal ecosystems cannot be over-emphasized. UNU is currently working with a network of institutions in Asia, providing such training and research in coastal ecology, and coastal management. Many of the findings of the project are an outcome of the discussions and mutual learning processes amongst coastal managers and scientists that have occurred during these activities.

4.4. Monitoring and assessment

In addition to training and human capacity development, UNU has developed institutional capacity for environmental monitoring in this area by coordinating and equipping laboratories in its monitoring programme. The concrete findings of this monitoring will make a direct contribution to unraveling the complex nature of coastal pollution in this region and to identifying the emerging coastal environmental governance challenges for the future.

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