Regional Workshop on Partnerships in the Application of Integrated Coastal Management

12-14 November 1997
Burapha University, Bangsaen, Chonburi, Thailand

WORKSHOP PROCEEDINGS




GEF/UNDP/IMO
Regional Programme for the Prevention and Management
of Marine Pollution in the East Asian Seas
Quezon City, Philippines

Regional Workshop on Partnerships in the Application of Integrated Coastal Management

12-14 November 1997
Burapha University, Bangsaen, Chonburi, Thailand

Organized by

Global Environment Facility (GEF)/
United Nations Development Programme (UNDP)/
International Maritime Organization (IMO)/
Regional Programme for the Prevention and Management
of Marine Pollution in the East Asian Seas (MPP-EAS)
and
Burapha University, Bangsaen, Chonburi, Thailand

Hosted by

Burapha University, Bangsaen, Chonburi, Thailand

Laem Chabang Municipal Government, Thailand

Eastern Region: Environment Office, Office of Environment Planning and Policy, Thailand

Department of Marine Science, Chulalongkorn University, Thailand

Aquatic Resources Research Institute, Chulalongkorn University, Thailand

Marine Science Association, Thailand

Integrated Tropical Coastal Zone Management Programme,
Asian Institute of Technology, Thailand

Harbour Department, Ministry of Transportation
and Communications, Thailand

The Royal Government of Thailand

Sponsored by

MPP-EAS

Regional Workshop on Partnerships in the Application of Integrated Coastal Management

12-14 November 1997
Burapha University, Bangsaen, Chonburi, Thailand

1998

Published by the GEF/UNDP/IMO Regional Programme for the Prevention and Management of Marine Pollution in the East Asian Seas (MPP-EAS)
Quezon City, Philippines

GEF/UNDP/IMO MPP-EAS. 1998. The Regional Workshop on Partnerships in the Application of Integrated Coastal Management. MPP-EAS Workshop Proceedings No. 10, 167 p. Global Environment Facility/United Nations Development Programme/International Maritime Organization Regional Programme for the Prevention and Management of Marine Pollution in the East Asian Seas, Quezon City, Philippines.

Editorial Supervision: Leticia B. Dizon, PhD
Layout and Production: Maricel T. Bigal

Contents

Session 3: Developing Financing Mechanisms

Session 4: Integrated Waste Management

Session 5: Scientific Support Systems

Session 6: Capacity Bulding

Session 7: National ICM Activities

The Next Step

Workshop Summary

The Regional Workshop on Partnerships in the Application of Integrated Coastal Management

Burapha University, Bangsaen, Chonburi, Thailand
12-14 November 1997

The Regional Workshop on Partnerships in the Application of Integrated Coastal Management (ICM) was held in Burapha University, Bangsaen, Chonburi, Thailand from 12 to 14 November 1997. The workshop extended the experience gained and lessons learned from integrated coastal management (ICM) demonstration projects in Batangas Bay, Philippines and Xiamen, People's Republic of China, promoted regional networking of local governments operating ICM programs, and fostered partnerships among organizations implementing ICM programs.

The workshop was organized by the Global Environment Facility (GEF)/United Nations Development Programme (UNDP)/International Maritime Organization (IMO) Regional Programme for the Prevention and Management of Marine Pollution in the East Asian Seas (MPP-EAS), based in the Philippines, in collaboration with Burapha University. The meeting was sponsored by the MPP-EAS. About eight local governments, local institutions and government agencies co-hosted the workshop.

The workshop was attended by around 120 participants and observers from the East Asian Seas Region including Cambodia, Malaysia, Indonesia, Japan, People's Republic of China, Philippines, Republic of Korea, Singapore, Thailand and Vietnam, consisting primarily of government officials, university professors and individuals from the private sector. There were also representatives from the Wetlands International Asia-Pacific; IUCN (the World Conservation Union); the International Oceanographic Commission; the Food and Agriculture Organization; and coastal resource management projects in Indonesia, Malaysia, the Philippines, Republic of Korea and Thailand.

ICM is an alternative to traditional methods of planning and management in coastal areas. It includes a series of techniques and practical tools to assist policy-makers, planners and resource managers to consider all aspects of development in the coastal areas including the long-term impact on environment and living resources in the coastal waters. ICM initiatives are also designed to develop public awareness, build technical capacity, foster cooperation among stakeholders in the coastal area, strengthen institutional and legal mechanisms, and formulate and implement practical action plans. ICM improves the traditional forms of development planning by: a) developing an understanding of the natural resource systems which are in place in the coastal area; b) identifying and optimizing multiple use of the coastal resource systems; c) implementing interdisciplinary approaches and cooperation and coordination among public and private sectors; and d) assisting governments to improve the efficiency and effectiveness of capital investments and use of natural and human resources.

The Regional Programme Manager in his keynote address entitled "Marine Pollution Prevention and Management in the East Asian Seas: A Paradigm Shift in Concept, Approach and Methodology" emphasized the severe environmental challenges in the East Asian Seas region. The support of the government is needed to translate and extend the tested working models into their regular action programs throughout the coastal areas and the subregional seas. This would lead to a new paradigm at which marine environmental degradation can be arrested, environmental quality improved and damaged habitats restored.

Thirty-five papers were presented in nine sessions which cover policy and institutional arrangements, marine pollution monitoring, financing waste management, scientific support systems, capacity building, national ICM initiatives, partnership and networking. The ultimate goal of the event was to promote a regional network of ICM sites, to serve as a "self-help" mechanism for local governments currently involved in planning to develop this innovative approach to managing their coastal areas.

Session 1—ICM Policy and Institutional Arrangements—focused on the institutional arrangements that have been developed in order for ICM initiatives to be sustained. The papers showed how to apply the ICM system, how it can be institutionalized, how to assess success, how foreign funds are used for enhancing indigenous capabilities, how science helps in ICM and showed a need to integrate policy on the local and national levels. An important aspect in this session was about sustainability of the ICM system after a project finishes. For example, Xiamen Mayor Zhu Yayan said that after the Xiamen demonstration project finishes, the ICM process is not stopped because of the institutional mechanisms and marine management already set out in the government.

The session highlighted successful applications of the ICM system for marine pollution prevention, reduction and management in both Batangas and Xiamen. A common model of ICM observed in the two sites has five components, namely: (a) decision-making mechanisms based on stakeholder consultation and participation; (b) a legal framework and enforcement mechanism; (c) environmental monitoring and assessment program; (d) scientific and information support; and (e) sustainable financing mechanisms.

Participants noted that the ICM system in Batangas is heavily driven by public and private sector partnership and initiatives from coastal communities, while the Xiamen experience was known for forging inter-agency consultations and coordination in coastal policies. The two sites offered examples of ICM application in both developing (Philippines) and transitional (PR China) economies.

Participants recognized in particular that the demonstration project achievements in Xiamen and Batangas would be sustainable beyond project life as ICM mechanisms developed under the projects were premised on the local legislation and absorbed into local government regular programs and budget. These mechanisms also provided avenues for applying scientific results for management improvement.

Session 2 —Marine Pollution Monitoring. The paper by Gil Jacinto focused on a site-specific programmatic approach to marine pollution monitoring. Monitoring experiences in Xiamen by Xu Kuncan and Hong Lijuan and in Vietnam by Pham Van Ninh were shared.

Session 3—Developing Financing Mechanisms. Papers covered: (1) the participation of the private sector, a group of private companies working for the sustainable development of Batangas Bay, in the Philippines (Frederick Contreras); (2) the use of a foundation which would contribute to the research on marine environmental protection, rational use of marine resources and integrated management of marine development (Dai Songruo); (3) an economic valuation of mangrove resources in Indonesia (Tridoyo Kusumastanto and Mei Mei Meilani); (4) the need for adequate legislative framework for incentives for sustainable uses of marine and coastal resources in the Philippines (Ma. Arlene Mendoza).

Session 4—Integrated Waste Management. Adrian Ross discussed the development of an integrated waste management action plan for Batangas Bay, its basic components, key components of plan development and the measures of success during implementation of the plan. Zhuang Shijian discussed integrated waste management in Xiamen. Another paper by Adrian Ross examined the sources, volumes and characteristics of waste generated in the East

Asia Region, and the management systems that have been put in place to collect, process and dispose of unwanted by-products of human activity.

Session 5—Scientific Support Systems. Papers covered issues in demonstration sites in Xiamen and Batangas on: (1) ecosystem-based marine functional zonation (Ruan Wuqi); (2) water use scheme (Ernesto Serote); (3) ecological and socioeconomic impact assessment of coastal development (Huasheng Hong and Xue Xiongzhi); (4) carrying capacity for mariculture; (5) hydrodynamic modelling (Cesar Villanoy); (6) fishery resource assessment and management (Porfirio Aliño); and (7) pesticide risk assessment (Mario Delos Reyes and Davide Calamari).

Session 6—Capacity Building. Huming Yu and Chou Loke Ming presented papers on training in integrated coastal management. A discussion followed on the attributes of a good coastal manager underlying the training needs and requirements.

Session 7—National ICM Initiatives. The session showed a spectrum of activities in different countries relating to coastal and marine management policy on the national level. An awareness was shown by the different countries of the contribution of the coastal area to the economy and that the region should move jointly to tackle problems. The coastal and marine policies and programs of the region were presented by: Rokhmin Dahuri (Indonesia); Seoung-Yong Hong and Jihyun Lee (Korea); Gil Jacinto (Philippines); Ampan Pintukanok (Thailand); Annabelle Cruz-Trinidad (Philippines); Du Bilan (People's Republic of China); and Almah Bt. Awaluddin (Malaysia).

Events in these countries notably after the 1992 UNCED clearly show an urgent need for formulating national integrated coastal and marine policies as part of a sustainable development program. The workshop identified a two-fold strategy for the region to pursue in the years to come: extension and networking of ICM practices on the local level through demonstration projects, and enhancing the capability of the countries in formulating and implementing integrated national coastal and marine policies.

Discussion: The Next Step

Building Partnerships

After the sessions, Dr. Chua Thia-Eng, Regional Programme Manager, presented a paper on "Building Partnerships for the Protection and Management of the Marine Environment of the East Asian Seas", which is a general outline of the next phase of the Regional Programme.

It shows that much of the difference between these pilot projects and other regional programs is the fact that actions were taken to move ICM from planning to implementation. Some key ways used for their successful implementation include: integration, persuasion, patience and coordination. The lessons learned from the pilot projects and experiences from the Programme will be used for the next phase which will emphasize partnership.

The first task is to build capacity in the region through increasing the number of pilot projects in a parallel process approach, where the Programme will advise new projects. The next phase will also promote a fast track planning and information gathering process—from the conventional 5-8 years to 12-18 months. The pilot projects, including the Malacca Straits project, will be used for replication to other areas. In order to build capacity, increased emphasis will be on training programs. In addition, public-private partnerships will be increased. Additional projects which will come under the umbrella of the Regional Programme will be formulated for funding from additional donors.

In the past, environmental impact assessment was not necessarily effective and used as it was designed to. Therefore, the next phase will establish an integrated information management system. Nongovernment organizations will be incorporated—with training courses to religious groups and leaders, environmental journalists and others. Policy work will be expanded to advise on the development of each country's marine policies. The net benefits of implementing existing international conventions will be examined. Regional cooperative mechanisms could emerge in due course.

Experience and Lessons Learned from Batangas and Xiamen

ICM was an ambitious concept. While it is important to keep the big picture in mind, it is still ever more useful to focus attention on each small project. Moreover, some participants observed that the role of local communities and public group should be to express their ideas and the Programme will be the one to adjust the national scheme design to the project that fits their need.

Some stressed that partnership in education was one aspect that could be given more emphasis at a regional level and for the next phase. Fast tracking may need to be considered in each country separately as the capacity varies between countries. Before trying it out in a regional program, considerations in each country of the capacity is important.

It was noted that the Xiamen Demonstration Project has been so successful because it had a lot of public support for making the changes. As to the Batangas Bay Project, public-private partnerships were very important in making the project successful.

Some participants stressed the need to reach out more to mayors, politicians, economists, as well as scientists. They were impressed that Batangas and Xiamen were able to impact on the "mainstreamers", i.e., those established in government.

As to monitoring, it was noted that the most beneficial aspect of monitoring in Xiamen has been the vast amount of information that is provided and accessible to everyone and has been applied to decision-making.

The monitoring network has been very useful for the above reason and also the idea for an education network throughout the region would be very effective, building on our experiences of the existing networks.

Developing Regional Network of ICM Projects and Sites

A suggestion was raised for a network of local governments which should have clear tasks, e.g., learning about each other's experiences, training and information sharing among government policy-makers. It was noted that Xiamen had a training course, attended by policy-makers and scientists. The Xiamen Project realized that if they did not continue pushing for ICM, it would not happen. Some legislation was still lacking and to develop it, it would be useful to see what other countries have done. For this, networks are useful.

One comment dealt with the concept of environmental and ecological projection which needs to be more instilled in the masses or the majority of the public. This is important to sustain ICM in the future.

Several questions were raised: What has been the spin off at the national level of the pilot projects? What happens if there is no political will? What can the scientists do to convince local governments of the need for ICM approaches? How to bridge the gap between scientists and policy-makers, especially local governments? Fast-track is perhaps going to be difficult, especially given the experience of the Philippines.

In response to these questions, some stressed that the need for models came about because people and especially politicians needed to actually see the process and results in action. Models are the best way to convince the governments of the benefits of ICM.

Political will has to be coming both from the top and the bottom which is the public at large. Mayors must face their constituents in the elections each period. Networking is important. People as users of the network information may be willing to pay for the information. This would help sustain it. Scientists have to be convinced to collect the data which can be *most used* to address management needs.

Some efforts by managers and scientists in developing an environmental profile and strategic management plan in Batangas and Xiamen helped create a common "language" between the managers and scientists. Emphasis is placed on exchanging information within the region for the benefit of all the countries and the sustainability of the region's important resources.

Workshop Recommendations

It was recommended to develop a regional network of local governments operating ICM programs for the purpose of mutual assistance and extension of "good practices" in coastal management. Such a network would provide a mechanism to invigorate and sustain

networking of marine environment monitoring programs as part of various local ICM initiatives across the region.

It was also recommended that existing ICM related training and education efforts be linked up to help build up regional capability for ICM application. However, the workshop recognized the need to explore implications of the proposed networking efforts before action could be taken.

Strong support was expressed by the workshop participants on the followup strategies and activities of the Regional Programme. The next step in the region would emphasize on networking, partnership and capacity building, specifically building up a planning and management capacity; increasing environmental investments; advancing scientific inputs for environmental management decision; establishing integrated information management systems; enhancing the knowledge and technical skills of NGOs and related groups; facilitating the formulation or strengthening of national coastal and marine policies and strategic action programs; and augmenting regional commitment to implement international conventions.

ANNEX I

Opening Ceremonies

Welcome Address

PHASOOK KULLAVANIJ
President, Burapha University
Bangsaen, Chonburi 20131
Thailand

Distinguished Participants, Ladies and Gentlemen:

It is a pleasure and honor for me to meet all of you today. This is a great occasion because, although we come from different countries with different cultures and different languages, we are here together with the same purpose, i.e., to enlarge on the partnership for international application of integrated coastal management, and to work together to better our common environment. I believe that it is well known that most environmental problems are not restricted by national boundaries. Whatever environmental problems that occur in one country can very quickly expand and engulf other countries. The recent forest fires in Sumatra and Kalimantan in Indonesia are examples that are painful not only for people in Indonesia, but also for people in Thailand and other countries. Other problems in the coastal areas and in the ocean pose similar threats to all of us. Problems such as oil spills from shipping accidents are well known. To correct, and better yet, to prevent such problems is every nation's concern. Hence, there is an urgent need for collaboration, for working together, and for learning from each other's experiences. In this workshop, we will hear about the examples from the municipalities of Xiamen in the People's Republic of China, and from Batangas in the Philippines. Thus, this workshop will be a step forward for international cooperation.

I would like to thank Dr. Chua Thia-Eng, the Regional Programme Manager of GEF/UNDP/IMO Regional Programme for the Prevention and Management of Marine Pollution in the East Asian Seas and his group for extending the financial help from the Programme to make this workshop possible. I also thank all organizations and individuals who have contributed toward the setting up of this workshop. For the part of Burapha University, I would like to thank the Institute of Marine Science, and the Department of Aquatic Science, especially to Dr. Voravit Cheevaporn and his team who helped in arranging the meeting. But most of all, I would like to thank all participants in making this workshop complete. I hope that all of you will enjoy your stay in Thailand, and please remember to visit us again as soon as possible. Thank you.

Speech

ERIC RASMUSSEN
United Nations Development Programme
Bangkok, Thailand

Distinguished Participants, Ladies and Gentlemen

On behalf of the United Nations Development Programme (UNDP), I have the great honor to attend the Regional Workshop on Partnerships in the Application of Integrated Coastal Management, and to deliver this statement on behalf of my organization.

I would like to take this opportunity to thank the Royal Thai Government for hosting this important Workshop, and the organizers of the Workshop namely:

- the Ministry of Transportation and Communications;
- Burapha University in Bangsaen;
- the Municipal Government of Laem Chabang;
- the Office of Environmental Planning and Policy;
- Chulalongkorn University;
- the Marine Science Association;
- the Asian Institute of Technology; and
- the Regional Programme for the Prevention and Management of Marine Pollution in the East Asian Seas which is a joint Global Environment Facility/UNDP/International Maritime Organization Programme.

As we are aware, the rapid economic expansion and achievement in this region during the past decade has been accompanied by adverse social and environmental impacts. These include an uneven distribution of economic growth and a consequent growing gap between rich and poor, as well as severe environmental and ecological degradation in both rural and urban settings.

As a response to these problems, sustainable human development is a concept which aims at the enhancement of overall human well-being, and calls for simultaneous consideration of economic, social, political as well as environmental factors.

This development approach needs to be integrated and holistic, and above all, to put people at its center. There is, therefore, an urgent need to involve people and thereby create public awareness, understanding and action regarding environmental issues. Such a capacity building process through the participation and involvement of the users and consumers, particularly at the grassroots level, and those directly affected by use of natural resources and its by-products, is a key factor for sound environmental management.

As capacity building is an integral part of the Regional Programme for the Prevention and Management of Marine Pollution in the East Asian Seas, UNDP, therefore, accords high priority to this Regional Programme and also to this Regional Workshop which strengthens a partnership approach in addressing common concerns and issues related to marine pollution prevention and management.

We are pleased to note that the Programme successfully concluded its three integrated coastal management (ICM) training courses, which helped strengthen the capacity of personnel tasked with the development and implementation of ICM activities in the countries of the region. These persons could serve as ICM focal points in their respective countries.

Strengthening the capacity on monitoring has also been initiated through this Programme. With more people trained through in-service training, internship and staff exchange programs, there will certainly be an upgrading of technical capacity in the region in pollution monitoring. The regional network which builds around demonstration sites in Batangas in the Philippines, and in Xiamen in China, is a good way of upgrading technical capability through membership and partnership in network.

We are also pleased to note that a partnership between the public and private sectors has been strengthened through a series of case studies under this Programme. Cooperative and collaborative efforts have also been forged by the Programme with other UN agencies such as FAO, and other donors.

UNDP is confident that the Programme, through the application of integrated coastal management and pollution risk assessment, will contribute to some degree, to the pollution prevention and management in the East Asian Seas, to the upgrading of technical and management capability, and to enhanced partnership between the public and private sectors in jointly addressing marine pollution problems.

UNDP considers that the Programme has been a cost-effective investment by the Global Environmental Facility (GEF). It has been able to leverage substantial additional funding, thus extending the work that was not possible through the GEF funds alone. The Programme has also established the framework for the protection of an international water environment, and demonstrated the successful applications of the integrated coastal management approach in a manner which can be replicated elsewhere to protect other coastal and marine areas of global significance.

We hope that the participants at this Workshop will have a great opportunity to exchange their views and knowledge on this important issue of marine pollution. We look forward to the outcome and the success of the Workshop.

Thank you for your attention.

Opening Remarks

CHUA THIA-ENG
Regional Programme Manager
GEF/UNDP/IMO Regional Programme for the Prevention and Management of Marine Pollution in the East Asian Seas
P.O. Box 2502, Quezon City 1165
Philippines

On behalf of the Regional Programme for the Prevention and Management of Marine Pollution in the East Asian Seas, I wish to welcome all of you to this regional workshop and to Bangsaen, Thailand. I wish to express our appreciation on behalf of the GEF, UNDP and IMO to Dr. Phasook Kullavanij for opening this important meeting. I wish also to place on record our appreciation of the host institution, Burapha University and the co-sponsoring organizations of this workshop. It is only appropriate at this juncture to recognize the presence of the Honorable Mayor of Xiamen, Mr. Zhu Yayan, and the Honorable Mayor of Bauan, Batangas, Mr. Bienvenido Castillo and other distinguished participants. I also wish to acknowledge our colleagues from the international agencies, NGOs and the donor community.

This workshop is one of a series of activities organized by the Regional Programme primarily to address marine pollution problems of the East Asian Seas region. The title of the workshop is "Partnerships in the Application of Integrated Coastal Management". As the title implies, "partnership" is the emphasis of this workshop. It is also the key to successful management of the coastal and marine areas.

All of you are aware of the recent environmental crisis in Southeast Asia. First, the forest fires in Indonesia and Malaysia that resulted in the loss of thousands of hectares of forests. It created serious haze problems across the region. The plane crash in Sumatra and a ship collision in the Malacca Straits, both of which resulted in loss of lives, were attributed to the haze. The severe air pollution has also resulted in a high incidence of respiratory disease with some mortalities. Recently, one of the worst oil spills in the region occurred in the Strait of Singapore with about 25,000 tonnes of persistent marine oil threatening marine life and affecting coastal resorts with serious economic losses.

What do all these incidents tell us? They tell us a lot, indeed. Most importantly, they tell us that environmental issues are no longer isolated incidents but have cumulative impacts on the global environment. Therefore, environmental issues can be categorized as transboundary in nature. Thus, the forest fire and haze issues clearly demonstrated the regional and global environmental impacts which require global cooperation in general, and very close cooperation at the regional or subregional levels.

The forest fire and tanker collision incidents are evidence of the changing production and consumption patterns brought about by increasing globalization of the economy. The shipping accidents in the Straits of Malacca call for more efficient navigational aids to be installed in the international waterway, especially considering the fact that it is one of the world's most congested shipping routes. The proposed marine electronic highway to be established in the Straits will now become a subject for serious consideration by the relevant authorities of the littoral States. It goes without saying that any improvement in navigational safety is an assurance for a cleaner sea.

Recognizing the increasing consumption of energy in the region, especially towards the 21st century, the transport of oil in the Malacca Straits to meet that need will certainly increase several fold. The sea can no longer be considered as the dumping ground of waste generated by human activities or to consider it as having unlimited capacity to absorb waste. Our

consumption and production patterns have greatly stressed and degraded the fragile ecosystems that provide valuable services and goods. We must take the health of the environment as part of our own health and that of the society at large.

The tanker collision incident in the Strait of Singapore tells us of the importance and usefulness of ratifying international conventions. In this case, the cost of combating the spills is enormously high and the countries which have ratified the Civil Liability and Fund Conventions would be able to obtain compensation. Based on the situation in the Strait of Singapore, the CLC (1969) allows the countries concerned to claim as much as US$12.4 million from the ship owners while the Fund Convention (1971) allows the claimants to Special Drawing Rights (SDRs) of up to US$60 million. Both the CLC and Fund Conventions were amended in 1992 and their ratification would mean that in addition to the amount allocated under the CLC, affected countries can claim up to US$125 million which is the upper limit of the SDR. Unfortunately, not all countries have ratified the 1992 protocols and thus, their ability to seek full compensation will be limited.

I cited the above cases to demonstrate that the coastal areas are vulnerable to the impacts of numerous land- and sea-based activities. The interrelationships among various economic activities and their influence on land-sea interaction in the coastal zone make it extremely important to place special management attention to this complex interface between the land and the sea. It also underscores the importance of partnership of all stakeholders to work together. Otherwise, environmental problems will be very difficult to resolve.

The coastal areas contribute more than 40% of the national GNP in most littoral countries in the East Asian Seas region. A large proportion of it is derived from maritime trade. Any disruption in the coastal zone economy will have a far reaching impact on the concerned country and vice versa. Thus, the ongoing currency crisis in Southeast Asia has certainly affected the coastal areas in the region but the extent of impact is yet to be quantified.

Environmental management of the coastal areas, therefore, has to set its target to ensure sustainable development of the coastal and marine areas without compromising the functional integrity of the ecosystems. The integrated coastal management (ICM) approach was developed to address precisely this concern.

The main purpose of this workshop is to share the lessons learned and experience gained in two demonstration sites in Batangas and Xiamen which applied ICM for the prevention and management of marine pollution. The two demonstration sites under their respective local governments have achieved significant successes in many areas. I hope that in this workshop we will be able to share these experiences with our colleagues from other countries.

To our participants, I wish you all a fruitful meeting in the next three days and I look forward to joining you in sharing our views and experience on areas of mutual interest. I also wish you all a pleasant stay in Bangsaen.

Thank you and good morning.

ANNEX 2

List of Participants

Cambodia

Mr. Long Rithirak
Technical Adviser to the Minister
and Chief of Coordinating Unit
Ministry of Environment
48 Samdech Preah Sihanouk
Tonle Bassac, Chamcarmon
Phnom Penh, Cambodia
Tel: 855 23427844
Fax: 855 23720371

Mr. Pich Sam Ang
Deputy Director
Department of Nature Conservation
and Protection
Ministry of Environment
48 Samdech Preah Sihanouk
Tonle Bassac, Chamcarmon
Phnom Penh, Cambodia
Tel: 855 23427844
Fax: 855 23720371

Indonesia

Ir. Alam Syah Mapparessa
Programme Implementation Officer
Subdirectorate for Water and Marine Pollution
Control
Environmental Impact Management Agency
(BAPEDAL)
Arthaloka Bldg., Lantai XI
Jln. Jend. Sudirman No. 2
Jakarta 10220, Indonesia
Tel: 6221 251 1540; 251 1549 ext. 201;
251 2562
Fax: 6221 251 1547; 251 1483

Ir. Irwandi Idris
Head of Sub-directorate for Marine Resources
Development
Directorate for Living Environment Development
and Management
Directorate General for Development
Jalan Taman Makam Pahlawan No. 20 Kalibata
Jakarta Selatan, Indonesia
Telefax: 6221 794 2661

Dr. Rokhmin Dahuri
Director
Center for Coastal and Marine Resources Study
Bogor Agricultural University
Kampus IPB Darmaga
Bogor, Indonesia
Tel: 62-251 625556
Fax: 62-251 621086
Email: r-dahuri@indo.nt.id

Dr. Tridoyo Kusumastanto
Center for Coastal and Marine Resources Study
Bogor Agricultural University
Kampus IPB Darmaga
Bogor, Indonesia
Tel: 62-251 625556
Fax: 62-251 621086
Email:tridoyo@indo.nt.id

Japan

Dr. Kenji Hotta
Professor
College of Science and Technology
Department of Oceanic Architecture
and Engineering
Nihon University
7-24-1 Narashinodai
Funabashi-shi, Chiba 274, Japan
Tel: 81 474 69 5484
Fax: 81 474 67 9446
E-mail: k-hotta@ocean.cst.nihon-u.ac.jp

Malaysia

Ms. Almah Bt. Awaluddin
Visiting Scholar, Maritime Institute of Malaysia
16th Floor, Wisma Sime Darby
Jalan Raja Laut, 50350 Kuala Lumpur
Malaysia
Tel: 603 2912960
Fax: 603 2939117

Mr. Zamsari Mohd. Din
Assistant Environmental Control Officer
Department of Environment
Floor 13, Wisma Sime Darby, Jalan Raja Laut
50662 Kuala Lumpur, Malaysia
Tel: 603 294 7844 loc. 428/429
Fax: 603 293 7655

Dr. Zubir Din
Director
Center for Marine and Coastal Studies
Universiti Sains Malaysia
11800 Pulau Pinang, Malaysia
Tel: 604 860 2103
Fax: 604 6572960
Email: zubir@usm.my

People's Republic of China

Mr. Chen Gang
Lecturer
Department of Oceanography
Xiamen University
422 Siming South Road, Xiamen 361005
People's Republic of China
Fax: 86 592 2186397
Email: chengang@jingjian.xmu.edu.cn

Mr. Chen Guoqiang
Director
Office of Xiamen Demonstration Project
2nd Floor B1 Building
Bailuzhou, Hubinzhong Road, Xiamen 361004
People's Republic of China
Fax: 86 592 5113741

Ms. Dai Songruo
Lecturer, Economics Institute of Xiamen
Planning Commission
7th Floor Zhenye Building
Hubinbei Road, Xiamen 361012
People's Republic of China
Tel: 86 592 508 3317
Fax: 86 592 5051102

Mrs. Du Bilan
Professor in Oceanography
China Institute for Marine Development Strategy
of State Oceanic Administration.
1 Fuxingmenwei Ave., Beijing
People's Republic of China
Tel: 8610 6803 2211; 2211 5907
Fax: 8610 6803 3515

Mr. Fan Zhijie
Marine Pollution Data Manager of China
Institute of Marine Environmental Protection
State Oceanic Administration
42 Linghe Street
P.O. Box 303, Dalian 116023
People's Republic of China
Tel: 86411 467 1429
Fax: 86 411 467 2396
Email:fanzj@baleen.dlmu.edu.cn

Dr. Hong Huasheng
Professor, Environmental Science
Research Center
Xiamen University, Xiamen 361012
People's Republic of China
Tel: 86 592 218 2216
Fax: 86 592 2095242
Email: hshong@xmu.edu.cn

Ms. Hong Lijuan
Vice Director, Environmental Monitoring
Station of Xiamen Port Authority
93 Dongdu Road, Xiamen 361012
People's Republic of China
Tel: 86 592 601 3077; 601 9282
Fax: 86 592 6010034

Mr. Lu Zhenbin
Research Fellow, Fujian Institute of Fishery
7 Haishan Road, Xiamen 361012
People's Republic of China
Tel: 86 592 601 6591
Fax: 86 592 6013055

Mr. Li Shunan
Programme Officer
Marine Administrative Office
No. 3 Zhonghungdadao
Fangchanggang, Guanxi
People's Republic of China
Tel: 86 770 282 9650
Fax: 86 770 2821542

Mr. Lu Fude
Division Director of Rules and Regulation
Hainan Marine Bureau
Yiyuan Building 69
Haifu Road, Haikou 570203
People's Republic of China
Tel: 86 898 533 3377
Fax: 86 898 533 7254

Mr. Ruan Wuqi
Director
Fujian Institute of Oceanography
#34 Haishan Road, Xiamen 361012
People's Republic of China
Telefax: 86 592 6014700

Mr. Shi Qian
Project Officer
Office of Xiamen Demonstration Project
2nd Floor B1 Building
Bailuzhou, Hubinzhong Road, Xiamen 361004
People's Republic of China
Fax: 86 592 5113741

Mr. Xu Kuncan
Professor
Third Institute of Oceanography
State Oceanic Administration
178 Daxie Road, Xiamen 361004
People's Republic of China
Tel: 86 592 208 5880
Fax: 86 592 2086646

Dr. Yuan Dongxin
Professor
Environmental Science Research Center
Xiamen University, Xiamen 361012
People's Republic of China
Tel: 86 592 2186416
Fax: 86 592 218 0655
Email: YUANDX@jingjian.xmu.edu.cn

Mr. Zhang Hanchang
Vice Bureau Director
Marine and Aquatic Bureau
Guandong, People's Republic of China
Tel: 86 662 3322352
Fax: 86 662 2322101

Mr. Zhang Rensong
Deputy Director, Xiamen Legal Bureau
No. 61 Hubinbei Road
Xiamen 361012
People's Republic of China
Tel: (86) 592 509 4307
Fax: (86) 592 505 7305

Mr. Zhuang Shijian
Senior Engineer
Environmental Monitoring Station of Xiamen
56 Southern Hubinnan Road, Xiamen 361004
People's Republic of China
Telefax: 86 592 2024424

Mr. Zu Yayan
Deputy Mayor, Xiamen Municipal Government
No. 61 Hubinbei Road, Xiamen
People's Republic of China
Tel: 86 592 505 2654
Fax: 86 592 505 2338

Philippines

Ms. Eunice Agsaoay
Special Counsel
Office of the Undersecretary for Legal Legislative Affairs and Attached Agencies
Department of Environment and Natural Resources
DENR Compound, Visayas Avenue
Quezon City, Philippines
Tel: 632 926 3011
Fax: 9279107
Email: legal1@denr.gov.ph

Mr. Jose Alfaro
Councilor/Ormoc Bay Management Council
Chairman, Ormoc City Council
Ormoc City, Leyte, Philippines
Tel: 6353 255 2521
Email: JOSEALLO@ormoc.webling.com

Dr. Porfirio Aliño
Professor, Marine Science Institute
University of the Philippines
Diliman, Quezon City
Philippines
Tel: 632 9205301-99 loc 7426 or 7427
Fax: 632 924 7678
Email: pmalino@msio1.cs.upd.edu.ph

Ms. Maribel Aloria
Environmental Monitoring Specialist
Environment and Natural Resources Office
Provincial Government of Batangas
Capitol Site, Batangas City
Philippines
Tel: 63 43 723 2468
Fax: 63 43 723 2468

Mr. Bienvenido Castillo
Mayor
Municipal Government of Bauan
Poblacion, Bauan
Batangas, Philippines
Tel: (6343) 727 1253
Fax: (6343) 727 1004

Mr. Frederick Contreras
Secretary for BCRMF

Environmental and Quality Management
Technologist
Shell Refinery Shell Compound
Tabangao Refinery, Batangas City
Philippines
Tel: (632) 816 6501 loc 4267
Fax: (632) 816 6565

Ms. Evelyn Estigoy
Director
Environment and Natural Resources Office
Provincial Government of Batangas
Cpitol Site, Batangas City, Philippines
Tel: (6343) 723 2468
Fax: (6343) 723 2468

Dr. Dioscoro Melana
Regional Technical Director for Research
Region 10
Department of Environment and Natural Resources
Macabalan, Cagayan de Oro City
Philippines
Tel: (8822) 726 243; 727891
Fax: (8822) 726280
Email: redvic@cebu.webling.com

Ms. Arlene Mendoza
Lawyer, Office of Undersecretary for Legal Legislative Affairs and Attached Agencies
Department of Environment and Natural Resources
DENR Compound
Visayas Avenue, Quezon City
Philippines
Tel: (632) 9263011
Fax: (632) 9279107
Email: denr-legal@gaia.psdn.iphil.net

Mr. Leo Pura
Research Associate
Coastal Management Center
Rm. 2603-D PSEC
Exchange Road, Ortigas Complex
Pasig City, Philippines
Tel: (632) 635 4217; 635 5065
Fax: (632) 635 4216
Email:cmc@pworld.net.ph

Prof. Ernesto Serote
Associate Professor
School of Urban and Regional Planning
University of the Philippines
Diliman, Quezon City, Philippines
Tel: (632) 926 2120
Fax: (632) 927 3595

Dr. Cesar Villanoy
Professor, Marine Science Institute
University of the Philippines
Diliman, Quezon City, Philippines
Tel: (632) 920 5301 loc. 7417
Fax: (632) 924 7678
Email: cesar@msi01.cs.upd.edu.ph

Republic of Korea

Mr. Chae Jang-Won
Director, Coastal and Harbour Engineering
and Resources Center
Korea Ocean Research and Development Institute
Ansan P.O. Box 29, Seoul 425600
Republic of Korea
Tel: 82 345 400 6320
Fax: 82 345 408 5823
E-mail: jwchae@sari.kordi.re.kr

Mr. Cho Hong-Yeon
Senior Researcher, Korea Ocean Research and
Development Institute
Ansan P.O. Box 29
Seoul 425600, Republic of Korea
Tel: 82 345 400 6312
Fax: 82 345 408 5823
Email: hycho@sari.kordi.re.kr

Dr. Seoung-Yong Hong
President, Korea Maritime Institute
Yoong-Jeon Building
154-10, Samsung-Dong, Kangnam-Gu
Seoul, 135-090 Republic of Korea
Tel: (82) 2 553 1521
Fax: (82) 2 865 7090
Email:syhong@sugi.kmi.re.kr

Dr. Jihyun Lee
Senior Researcher, Division of Marine Policy
Korea Maritime Institute
Yoong-Jeon Building
154-10, Samsung-Dong, Kangnam-Gu
Seoul, 135-090, Republic of Korea
Tel: (82) 2 569 2761 ext. 309
Fax: (82) 2 558 1858
E-mail: jhlee@suji.kmi.re.kr

Singapore

Dr. Chou Loke Ming
Director, Tropical Marine Science Initiative
National University of Singapore
10 Kent Ridge Crescent
Singapore 119260
Tel: 65 774 9652
Fax: 65 774 9654

Ms. Soh Suat Hoon
Scientific Officer,
Strategic Planning and Research Department
Ministry of the Environment Environment
40 Scotts Road
#11-00 Singapore 228231
Tel: 65 731 9103
Fax: 65 731 9922/235 3379
Email: SOH_Suat_Hoon@env.gov.sg

Thailand

Dr. Ampan Pintukanok
Chief, Marine and Coastal Resources Sub-division
Natural Resources and Environmental Management Division
Office of Environmental Policy and Planning
60/1 Soi Phibun Wattana 7, Rama VI Road
Bangkok 10400, Thailand
Tel: (662) 2795202/2799182
Fax: (662) 2713226/2798088

Ms. Kannegar Boontanon
Senior Inland Waterways Transport Planning Expert
The Harbour Department
Yotha Road, Bangkok, Thailand
Tel: (662) 2369990
Fax: (662) 236 7248

Ms. Donna Nickerson
Coastal Management Officer, RAPI
Food and Agriculture Organization
Regional Office for Asia and the Pacific
Maliwan Mansion 39, Phra Atit Road
Bangkok 10200, Thailand
Tel: (662) 281 7844
Fax: (662) 280 0445
Email: Donna Nickerson@field.fao.org

Dr. Amador A. Remigio
Asst. Professor, Asian Institute of Technology
Km 421 Phaholyothin Highway
Phathumthani, Bangkok, Thailand
Tel: (662) 524 6144
Fax: (662) 524 5597
Email: REMIGIO@AIT.AC.TH

Dr. Suraphol Sudara
Head, Department of Marine Science
President, Marine Science Association of
Thailand
Chulalongkorn University
Bangkok, Thailand
Tel: (662) 218 5390
Fax: (662) 255 3381
Email: ssurapho@netserv.chula.ac.th

Vietnam

Mr. Nguyen Tac An
Deputy Director , Institute of Oceanography
Cauda, Nha Trang, Vietnam
Tel: 84 58 881152
Fax: 84 58 881151 / 881153
Email: haiduong@nhatrang.teltic.com.vn

Dr. Pham Van Ninh
Director, Center for Marine Environment Survey
Research and Consultation
Vien Co Hoc, 224 Doi Can
Hanoi, Vietnam
Fax: 844 832 7903
Tel: 844 8326136
Email: pvninh@01.ac.vn

Coastal Resource Management Project

Dr. Ian Dutton
Chief of Party
Coastal Resource Management Project—Indonesia
Jl. Madiun No.3 Menteng
Jakarta 10320, Indonesia
Tel: 6221 3926423
Fax: 6221 3926424

Ms. Annabelle Cruz-Trinidad
Policy Advisor
Coastal Resource Management Project—Philippines
c/o PRIMEX, Rm. 54
Manila Luxury Condominium, Pasig City
Philippines
Tel: 632- 634 7338
Fax: 632- 6347340
Email: abbie@trinidad.com.ph

International Oceanographic Commission (IOC)/WESTPAC

Dr. Maarten Kuijper
Associate Expert
IOC/WESTPAC
c/o National Research Council (NRCT)
196 Phaholyothin Road,
Chatujak, Bangkok 10900, Thailand
Tel: (662) 561 5118
Fax: (662) 561 5119

IUCN (World Conservation Union)

Mr. Sulma Wame
Project Support Officer
IUCN-Vietnam
13 Tran Hung Dao St.
I.O.P. Box 60, Hanoi, Vietnam
Fax: (84) 4 825 8794
Email:IUCN@BDVN.VNMAIL.NRT

Wetlands International—Asia Pacific

Dr. Vidhisha Samarasekara
Technical Officer
Wetlands International—Asia Pacific
Institute of Postgraduate Studies and Research
University of Malaya
50603 Kuala Lumpur, Malaysia
Fax: 603 757 1225

Burapha University
Bangsaen, Chonburi 20131, Thailand
Tel: (6638) 745900
Fax: (6638) 390038

Dr. Phasook Kullavanij
President, Burapha University
Tel: (6638) 745900
Fax: (6638) 390038

Mr. Kashane Chalermwat
Head of Department
Department of Aquatic Science
Tel: (6638) 745900 ext.3092
Fax:(6638) 390345
Email: kashane@bucc.buu.ac.th

Dr. Picharn Sawangwong
Vice President
International Relations
Tel: (6638) 390067

Dr. Vipoosit Manthachitra
Lecturer
Department of Aquatic Science
Tel: (6638) 745900
Fax: (6638) 390354

Dr. Voravit Cheevaporn
Associate Professor
Department of Aquatic Science
Tel:(6638) 745900 ext.3093
Fax:(6638) 390047/390345
Email:voravit@bucc.buu.ac.th

International Maritime Organization
GEF/UNDP/IMO Regional Programme
for the Prevention and Management
of Marine Pollution in the East Asian Seas
DENR Compound, Visayas Avenue
Quezon City, Philippines
P.O. Box 2502, Quezon City 1165, Philippines
Tel: (632) 926 9712; 920 2211 loc 4 & 6
Fax: (632) 926 9712
Email: imo@skyinet.net; imo@klink.com.ph
Wsite: http//www.skyinet.net users/imo/

Dr. Chua Thia-Eng
Regional Programme Manager

Mr. Adrian Ross
Senior Programme Officer

Dr. Huming Yu
Senior Programme Officer

Dr. Gil Jacinto
Coordinator, Marine Pollution
Monitoring and Information
Management Network

Dr. Mario Delos Reyes
Consultant

Secretariat

Ms. Socorro C. Guerrero
Head, Administration and Finance

Dr. Leticia B. Dizon
Information Officer

Ms. Eden Mandac
Programme Management Assistant

ANNEX 3

Program of Activities

12 November 1997, Wednesday

08:30-09:00 Registration

09:00-10:00 Opening Ceremony

10:00-10:30 Break

10:30-11:00 Keynote Address:
Marine Pollution Prevention and Management in the East Asian Seas: Paradigm Shift in Concept, Approach and Methodology • *Chua Thia-Eng*

Session 1: ICM Policy and Institutional Arrangements

Chair: Phasook Kullavanij
Rapporteur: Huming Yu

11:00-12:00 The Establishment and Operation of Intersectoral Mechanisms for Marine Environmental Management in Xiamen, People's Republic of China • *Zhu Yayan* and *Chen Guoqiang*

Building Consensus Among Stakeholders for Pollution Management in Batangas Bay, Philippines • *Evelyn L. Estigoy*

Legislation and Execution of the Management and Use of Xiamen's Coastal Areas • *Zhang Rensong*

13:30-15:00 Advancing ICM in Indonesia: The Pivotal Role of Partnerships • *I.M. Dutton, B. Crawford* and *J. Kunsen*

The Application of Integrated Coastal Management in Chinhae Bay, Republic of Korea: Lessons Learned • *Jihyun Lee*

Integrated Coastal Management Effort in Penang, Malaysia • *Zubir Din*

Session 2: Marine Pollution Monitoring

Chair: Piamsak Menasveta
Rapporteur: Gil Jacinto

15:00-16:00 A Site-Specific Programmatic Approach to Marine Pollution Monitoring • *Gil Jacinto*

Integrated Marine Pollution Monitoring System in Xiamen, People's Republic of China • *Xu Kuncan* and *Hong Lijuan*

Marine Environment Assessment and Monitoring in Vietnam • *Pham Van Ninh*

Session 3: Developing Financing Mechanisms

Chair: Seoung-Yong Hong
Rapporteur: S. Adrian Ross

16:15-17:45 The BCRMF and Its Role in the Environmental Management of Batangas Bay, Philippines • *Frederick Contreras*

Research on the Establishment of an Environment Foundation in Xiamen, People's Republic of China • *Dai Songruo*

Economic Valuation of Coastal Resource • *Tridoyo Kusumastanto*

Coastal Resource Damage Liability and Compensation in the Philippines • *Ma. Arlene M. Mendoza*

13 November 1997, Thursday

Session 4: Integrated Waste Management

Chair: Chou Loke Ming
Rapporteur: Rokhmin Dahuri

08:30-09:45 Implementation of Integrated Waste Management Action Plan in Batangas Bay, Philippines: Lessons Learned • *S. Adrian Ross* and *Delilah Padilla*

Waste Assessment and Management in Xiamen, People's Republic of China • *Zhang Shijian*

A Review of Waste Generation and Management in the Countries Bordering the East Asian Seas • *S. Adrian Ross*

09:45-10:00 Break

Session 5: Scientific Support Systems

Chair: Huasheng Hong
Rapporteur: Huming Yu

10:00-12:00 The Development and Adoption of Ecosystem-based Marine Functional Zoning in Xiamen, People's Republic of China • *Ruan Wuqi*

Water Use Zonation Scheme for Batangas Bay, Philippines • *Ernesto M. Serote*

Ecological and Socioeconomic Impact of Coastal Development in Xiamen, People's Republic of China • *Hong Huasheng*

Estimation of Carrying Capacity for Mariculture in Xiamen, People's Republic of China • *Chen Gang, Li Shaojing, Xu Zhenzu, Yang Shengyun* and *Lin Yuangshao*

13:30-15:00 A Hydrodynamic and Pollutant Dispersal Model of Batangas Bay, Philippines for Integrated Coastal Management Applications • *Cesar Villanoy*

Fisheries Assessment of Batangas Bay, Philippines: Management Issues and Options • *Porfirio Aliño, Arvin Dantis, Andre Jon Uychiaco* and *Maria Catalina Rañola*

Initial Risk Assessment of Pesticides in Batangas Bay, Philippines and Xiamen, People's Republic of China • *Davide Calamari* and *Mario Delos Reyes*

Session 6: Capacity Building

Chair: Kenji Hotta
Rapporteur: Jihyun Lee

15:00-16:00 An Emerging Regional ICM Training Mechanism • *Huming Yu*

Training and Education Programs Related to Integrated Coastal Management in Southeast Asia • *Chou Loke Ming*

16:00-16:15 Break

Session 7: National ICM Initiatives

Chair: Bienvenido Castillo
Rapporteur: Huming Yu

16:15-17:30 National Coastal Management Policy and Programme in Indonesia • *Rokhmin Dahuri*

Coastal and Ocean Policy and Institutional Development in the Republic of Korea • *Seoung-Yong Hong* and *Jihyun Lee*

An Analysis of the Coastal Management Projects and Programs in the Philippines • *Gil Jacinto*

14 November 1997, Friday

08:30-10:00 The Coastal Resource Management Project: Blending Traditional and Non-traditional Approaches to CRM in the Philippines • *Catherine A. Courtney, Alan T. White* and *Annabelle Cruz-Trinidad*

National Coastal and Marine Policies and Programs in the People's Republic of China • *Du Bilan*

The National Coastal Policy of Thailand • *Ampan Pintukanok*

Coastal and Marine Policy in Malaysia • *Almah Bt. Awaluddin*

10:00-10:15 Break

Session 8: Partnership and Networking (Round Table)

Chair: Chua Thia-Eng
Rapporteur: Mario Delos Reyes

10:15-12:00 Open Discussion

Networking: local government, pollution monitoring, legal aspects, training/education, socioeconomics

Partnership: donor agencies, international agencies, government, NGOs and other stakeholders

13:30-16:30

Session 9: The Next Step

Chair: Suraphol Sudara
Rapporteur: Donna Nickerson

Building Partnerships for the Protection and Management of the Marine Environment of the East Asian Seas • *Chua Thia-Eng*

Open Discussion

15 November 1997, Saturday

08:30-12:00 Field excursion: GIS Center and Institute of Marine Science, Burapha University and Waste Water Treatment Plant, Laem Chabang Industrial Estate

Marine Pollution Prevention and Management in the East Asian Seas: A Paradigm Shift in Concept, Approach and Methodology

CHUA THIA-ENG

Regional Programme Manager
GEF/UNDP/IMO Regional Programme for the Prevention and Management of Marine Pollution in the East Asian Seas
P.O. Box 2502
Quezon City 1165, Philippines

CHUA THIA-ENG. 1998. Marine pollution prevention and management in the East Asian Seas: a paradigm shift in concept, approach and methodology, p. xxvi-xxxviii. *In* **The Regional Workshop on Partnerships in the Application of Integrated Coastal Management.** 12-14 November 1997, Chonburi, Thailand. 167 p.

Abstract

The GEF/UNDP/IMO Regional Programme for the Prevention and Management of Marine Pollution in the East Asian Seas (MPP-EAS) is "to support the efforts of the participating governments to prevent and manage marine pollution on a long-term and self-reliant basis". To this end, two strategies were adopted. The first was to demonstrate how coastal and transboundary pollution problems can be more effectively resolved within a regional setting of socioeconomic, political, technological and cultural disparities. The second strategy was to develop the appropriate pollution prevention and management methodologies, approaches and typologies for application and replication in coastal and marine areas of the participating countries.

These strategies are complemented by three other component activities designed to reinforce the feasibility and sustainability of the working models: supporting governments' efforts in implementing the provisions of related international conventions, increasing the efficiency in marine pollution monitoring and finally, developing the financial mechanisms to ensure sustainability. In addition, a special effort is being made to develop a pool of national expertise to undertake the replication and extension of the above tested typologies.

The working models developed by the project demonstrate a paradigm shift in concept, approach and methodology in addressing marine pollution problems.

In terms of concept, the project views marine pollution management as the responsibility of both the public and private sectors and marine pollution management creates investment opportunities. It considers waste as a valuable resource. This concept is somewhat different from the conventional viewpoint that marine pollution management is the sole responsibility of the government and therefore increases public expenditure.

In terms of approach, this project suggests the development of a comprehensive preventive and management framework at the local level. By applying the integrated coastal management and risk assessment and risk assessment frameworks and processes, marine pollution in coastal waters and subregional seas can be more effectively addressed. This approach is different from the conventional reliance on legislative controls including compliance of EIAs and ad hoc response to pollution crisis.

With respect to methodology, the project has developed working models which integrate various administrative, scientific, legal, communication and financial tools to maximize their full impact and incremental benefits. Thus, the method adopted differs from the fragmented or loosely integrated conventional management actions which are practiced in most regions of the world.

Therefore, the project has provided an opportunity for us to develop a systematic, incremental but effective approach in minimizing marine environmental risks. It also created a challenge to policy-makers, the private sector, other stakeholders and the international community, to commit to a longer-term course of action that requires a greater investment in terms of human and financial resources in return for a cleaner coastal and marine environment.

Marine Pollution Challenges of the East Asian Seas

About 80% of the pollution loading to the oceans emanates from land-based activities and affects the most productive estuaries, bays and the nearshore areas. These areas are also threatened by physical alteration destruction of habitats which are of vital importance to ecosystem health and biodiversity. In addition to localized effects, persistent contaminants originating on land are transported through great distances by rivers, ocean currents and atmospheric processes, posing risks to human health and living resources on a regional and global scale.

For the East Asian Seas region, as in other regions of the world, most contaminants to the marine environment originate from land-based activities. With nearly 60% of the 1.8 billion people living in the coastal areas, including about 300 million living in coastal cities, there is little doubt that human activities will continue to have a major impact on the coastal waters and the resources therein. However, it is also recognized that, with the ever-increasing volume of shipping traffic into and within the region, sea-based pollution is also a source of concern, especially along heavily congested shipping routes. Oil and chemical spills from ships, either from operational activities or accidents, are clearly visible and attract wide media coverage. Shipping accidents are thus perceived by the general public to pose an immediate and serious threat to the livelihood and welfare of coastal populations in that the occurrence and effects of spills cannot be precisely predicted or controlled.

Environmental degradation in the East Asia Region is already threatening the world's richest marine biodiversity including the functional integrity of one-third of the world's coral reefs, 30% of the world's mangroves and a fisheries resource which contributes about 40% of the world catch. It also poses risk to food security, reduces employment opportunities and affects rural stability. If the situation continues, it is generally recognized that long-term remedial actions and counter measures required will rapidly offset short-term economic gains.

Responding to Challenges

The GEF/UNDP/IMO Regional Programme was approved as a pilot phase project in 1993 and became operational in 1994. The project has a funding level of US$8 million over 5 years with 11 countries of East Asia participating. It is being executed by the International Maritime Organization (IMO) which has established a Programme Development and Management Office in Manila, through which the project activities are implemented and managed.

Objectives and Strategies

In achieving the primary objective of the project, that is "to support the efforts of the participating governments to prevent and manage marine pollution on a long-term and self-reliant basis", two strategies were adopted. The first was to demonstrate how coastal and transboundary pollution problems can be more effectively resolved within a regional setting of socioeconomic, political, technological and cultural disparities. The second strategy was to develop the appropriate pollution prevention and management methodologies, approaches and typologies for application and replication in coastal and marine areas of the participating countries.

The project considers it essential to address marine pollution from both land- and sea-based sources as their impacts are closely linked. The complexity and intricacies of resource use and governance of impacts of human activities are effectively covered within an integrated

coastal management (ICM) framework. For addressing transboundary pollution problems in subregional seas, the pollution risk assessment and risk management framework helps to identify common environmental concerns which can be resolved through subregional cooperation. The project focused its effort in developing, applying and testing these two approaches in order to develop a generic framework that can be transferred to other areas in the region. Considering that the East Asian Seas have a total area of 5.9 million km^2 and a coastline of 154,000 km, it is perceived to be most cost effective to first develop and validate working models and then to replicate them in the various coastal and marine areas of the region.

The above strategies are complemented by four other component activities designed to reinforce the feasibility and sustainability of the working models. These activities support governments' efforts in implementing the provisions of related international conventions, in increasing the efficiency in marine pollution monitoring to track environmental quality changes and finally, in developing the financial mechanisms to ensure sustainability. In addition, a special effort is being made to develop a pool of national expertise to undertake the replication and extension of the above tested typologies.

Demonstrating the Viability of Integrated Coastal Management

The two demonstration projects in Xiamen (PR China) and Batangas Bay (Philippines) were established with the specific objective of testing and verifying the feasibility and effectiveness of the planning and management functions of the ICM system. Both sites used the ICM framework in addressing marine pollution in their respective areas, but each had a distinct focus. Batangas Bay is in the early phase of industrial development, hence the management strategy focused on pollution prevention. Xiamen, on the other hand, is in a stage of rapid economic growth (average 25% per year) and the management approach emphasizes pollution control and mitigation in addition to the preventive measures.

Xiamen Municipality: Reducing Pollution Impacts of Economic Development

Before the implementation of the project, Xiamen faced a number of severe environmental problems as a result of government efforts to accelerate economic development. Some of these problems are already affecting the sustainable use of the limited marine resources. The main environmental issues included:

- destruction of habitats and siltation of navigational channels due to causeway construction and land reclamation;
- depletion of some fish stocks due to overexploitation of fisheries resources;
- frequent occurrence of red tides caused by urban wastewater discharging directly into coastal waters;
- unregulated mariculture activities in the port and harbor areas threatening navigation safety;
- serious coastline erosion due to coastal sand mining;
- increased vessel traffic and port activities endangering maritime safety and posing increased risk of oil pollution;
- deteriorating environmental quality affecting tourism development and sustainability; and
- destruction of coastal and marine habitats endangering marine species such as the lancelet, the Chinese white dolphin and the egrets.

The project began by completing a coastal environmental profile of the area. This was achieved through analysis of secondary information, supplemented by primary data and the identification of information gaps, especially those relevant to policy and management interventions. On the basis of the profile, a 20-year strategic management plan was developed, approved and eventually adopted by the local government. It has created a policy environment and an institutional management framework within which the process of management intervention can be orderly undertaken while financial resources can be directed towards resolving priority areas of environmental concerns.

All relevant agencies of the local government were involved in this project as part of the government program. Thus, the project was able to mobilize local government resources to augment GEF input.

In a span of three years, the Project has accomplished the following:

1. set up an interagency management committee and the corresponding operational office;
2. developed legislation on sea space utilization and other related legislation on marine resource allocation which were approved by the People's Council;
3. developed a sea use zoning scheme approved by the local government;
4. established a functional pollution monitoring program;
5. developed a scheme on environmental trust fund;
6. established an Integrated Law Enforcement Task Force which is now operational;
7. undertook scientific investigations on management "bottlenecks" such as carrying capacity of mariculture, socioeconomic impacts of coastal development, integrated waste management and dumping of waste at sea; and
8. promoted public awareness campaigns through the mass media (radio and television); marine knowledge competitions in schools and government agencies.

The established management structure was able to solve some of the aforementioned environmental issues affecting Xiamen. The following were accomplished:

1. resolution of coastal use conflicts between eel fry gathering and maritime navigation;
2. resolution of coastal use conflicts between oyster farming and shipyard development;
3. relocation of pollutive industry in Gulangyu island;
4. ban on dumping of organic industrial waste in accordance with the requirements of the London Convention in 1972;
5. control of sand mining;
6. implementation of a functional marine zonation scheme which designated the use of marine areas based on their primary functional characteristics; and
7. protection of endangered species.

A significant achievement in environmental management in Xiamen is illustrated by the treatment of the once heavily polluted, biologically dead Yuandang lagoon. With government efforts, the lake has been cleaned up. The project was able to take advantage of the government initiatives by promoting further efforts to make Yuandang lagoon a lake garden of the Municipality. The socioeconomic benefits were best illustrated by the rising price of property and the increasing use of the lake for recreation by local and foreign visitors.

Batangas Bay: Working Together with the Private Sector to Prevent Pollution

Batangas Bay is located in an area earmarked for industrial development. The deep water bay has a fast developing port which will grow into the second largest in the Philippines. The bay is currently lined with more than 50 industrial plants ranging from oil refineries and food processing to ship building and supports the livelihood of about 1,000 fishermen. A portion of the bay contains coral reefs which attract thousands of domestic and international tourists every year.

Industrial effluents, municipal sewage and organic wastes from agriculture activities discharge into the bay. As development takes place, increased risks of environmental degradation, due to increasing pollutant loading from land-based activities and oil and chemical spills from maritime operations and accidents, are expected.

The main purpose of the demonstration project was to assist the local government to undertake the necessary preventive and other corrective measures to keep the bay clean and safe using the ICM framework.

While the project approach for the environmental management of Batangas Bay was relatively similar to that of Xiamen municipality, there are some areas where management strategies diverged because of socioeconomic, political and cultural characteristics of the country/locality concerned. Batangas Bay is much bigger geographically and the bay is lined by 5 coastal municipalities which are fully involved in the project. For this demonstration site, the project worked closely with the Provincial Government of Batangas.

Supported by the project, the Provincial Government has

- set up an interagency, multisectoral council—Batangas Bay Council for Integrated Coastal Management (BBCICM);
- set up a provincial environment office—the Environment and Natural Resources Office (ENRO);
- developed and implemented a long-term strategic management plan;
- adopted a sea use zoning scheme which was integrated into land use plans;
- approved a 5-year integrated waste management action plan; and
- established a laboratory to monitor water quality of the bay region.

A unique feature of the demonstration project was the active involvement of the private sector operating along the bay area. The private sector formed the "Batangas Coastal Resources Management Foundation" which is represented in the BBCICM and takes a proactive approach in the environment management of the bay. Over the past years, the private sector, through the Foundation, has:

- launched public awareness campaigns;
- entered into a voluntary agreement with the central and local governments on waste reduction;
- maintained oil spill equipment and conducted response exercises;
- participated in pollution management audits; and
- participated in marine pollution monitoring program.

In addition to demonstration projects, an international workshop was organized to review the successes and failures of ICM practices around the world. Based on the outputs of the workshop and the successful working models of the two demonstration sites, a general framework for ICM application was developed. Guidelines for good practices are now translated into 8 languages (Chinese, Indonesian, Korean, French, Portuguese, Swahili, Thai and Vietnamese), and are widely used in many countries outside the region.

Assessing and Managing Marine Pollution Risks in the Straits of Malacca

The Straits of Malacca is one of the world's busiest international straits with more than 270 vessels passing through it every day and another 200 fishing crafts plying the waterway. More than 50 oil spills and 70 marine casualties occurred in the last two decades. Notably in the past two months, there have been three major shipping incidents involving loss of life and pollution of the marine environment. Also, during the last 20 years, economic development has been rapid on both sides of the Straits.

The primary objective of the demonstration project was to develop a working model on comprehensive assessment of pollution risks from land- and sea-based activities and to identify and evaluate management options for avoiding or reducing risk.

Following a series of consultations with governments, the private sector and the scientists of the subregion, the project adopted the following action plan:

- strengthen the environmental knowledge base on the Straits as a whole;
- undertake a regional risk assessment based on the strengthened knowledge base;
- identify and evaluate management options with due consideration of environmental risk and socioeconomic impact; and
- propose risk management actions.

The project was able to bring together a group of national experts from the three littoral States, with the support of international experts, to undertake the above activities.

Socioeconomic and ecological information on the Straits was generally scattered among institutions in the three countries. Thus, the first step was to assemble available information from each littoral State, analyze the data to identify information gaps and develop a comprehensive knowledge base of the Straits. The experts focused on:

- compiling a Malacca Straits environmental profile;
- developing a database on marine and coastal resources and marine pollution; and
- preparing a GIS generated management atlas.

The second step was to undertake risk assessment by developing marine pollution risk indicators relating to ecosystem, human health and society. By determining the extent to which a particular pollutant exceeds a predetermined threshold value, it was possible to provide a general picture of pollution risks to habitats, marine resources (fisheries including fish

consumption) and coastal tourism and how the cumulative impacts can influence food security, employment opportunity and sustainable development of the coastal areas.

The third step, which is now underway, is to evaluate various existing national and regional management measures and to identify other management options to strengthen existing programs based on the regional risk assessment. A number of national and regional initiatives undertaken by the littoral States are useful models in resolving specific issues. Such examples are: traffic separation schemes to improve navigational safety; national oil spill contingency plans and regular oil spill exercises; the setting up and operation of the Tripartite Technical Expert Group (TTEG); stockpiling of oil spill response equipment; and the revolving fund mechanism in aid of oil spill response measures. However, recent events in the Straits have demonstrated the limitations of these mechanisms, and further enhancement is warranted to keep pace with developments in the subregion.

The final step of the project will be to come forward with a rational and practical package of risk management actions for consideration by the littoral States.

The project had a late start because of the consultation process but the activities are progressing smoothly. The Malacca Straits environmental profile has been published and initial results on risk assessment have been released. A manual on risk assessment has been prepared, a study on the Malacca Straits as a special area under the MARPOL 73/78 convention has been completed.

An important side impact of the project is the evolution of the proposal on the "Marine Electronic Highway", designed to improve navigational safety and avoid shipping accidents in the Straits. The concept was discussed during the Sustainable Financing Conference organized by the project in 1996. The project plays a direct role in enhancing the development of a pre-feasibility study which was funded by the World Bank. The concept has created great interest in the region and littoral countries are very favorable to put the concept into reality.

Increasing the Usefulness of Marine Pollution Monitoring

Marine pollution monitoring plays a very important role in the management of the marine environment. Many serious marine pollution risks and disasters can be avoided if adequate and timely monitoring actions are undertaken.

The approach and methodology adopted by the project are to closely link monitoring and management by integrating a pollution monitoring protocol into environmental management programs. The project has tested the approach in Xiamen as follows:

- adopt a common water quality standard;
- standardize sampling and analytical methods;
- use agreed standard procedures and references;
- integrate the monitoring programs of different municipal agencies into one standard monitoring program;
- shared results among agencies; and
- regularly report to the municipal marine management committee regarding any recommended management interventions.

The lessons learned from this monitoring program are:

- environmental monitoring is most effective at the local government level;

- monitoring information can be readily processed and used;
- management interventions are administered more effectively when supported by appropriate and timely monitoring data; and
- monitoring results must be authoritative.

The project also developed a similar monitoring program for Batangas Bay where the private sector contributed by analyzing selected parameters. The results are shared with the private sector, thus making them more conscientious about their discharges.

Efforts are being made to introduce this monitoring approach to other areas where coastal programs are being practiced or where new coastal programs are being initiated. A regional marine pollution monitoring network has been established to promote the concept and to develop a regional consensus on methodologies. Over time, the network will expand as more ICM sites are established. A handbook on common sampling and analytical methods has been prepared and is being used by network members.

In addition to the pollution monitoring program, this component of the project disseminated information throughout the region and beyond through:

- quarterly *Marine Pollution Updates*;
- a semi-annual international newsletter *Tropical Coasts*;
- a webpage on the Internet; and
- a directory of institutions involved in marine and coastal development and management.

Effective Use of International Instruments

The purpose of this component is to encourage participating countries in the region to ratify and implement the relevant international conventions and agreements. In 1994, the record of accession by countries in the region was rather discouraging. Most countries had ratified a limited number of conventions, but many were undecided about the need and benefit of further action

The project adopted an incremental approach to promote the ratification of international conventions and to build capacity to implement the agreements by:

- determining the causes for not ratifying international conventions as well as the problems experienced in meeting obligations of such agreements;
- developing a network of legal experts on marine pollution to promote, increase awareness and strengthen capacity in marine pollution;
- develop a legal information database on marine pollution to enable easy access to relevant information; and
- developing a model ordinance for ICM.

The component activities were further strengthened with financial support from Norway to assist the governments of Cambodia, Indonesia, Philippines and Vietnam to ratify and implement MARPOL 73/78.

The results over the last three years have been encouraging. There are more accessions reported. In 1994, there were 34 ratifications by the 11 participating countries. At present, the

number of ratifications has expanded to 62, with Malaysia and the Republic of Korea leading the way, with a combined total of 12 accessions.

Developing Financing Mechanisms to Sustain Environmental Management Actions

Everyone is interested in this topic. But we know very little about developing a financial mechanism that will work. There is no past modality that can be followed, especially with respect to marine pollution prevention and management.

In addressing this very difficult issue, the project consulted widely with economists, financial experts, the governments, the lending institutions and the private sector. The project commissioned a number of studies to develop case studies on specific financing mechanisms at ports and harbors, waste treatment through build operate transfer (BOT), privatization of waste collection and treatment, environment trust funds, etc. An international sustainable financing conference was organized in November 1996 to solicit ideas and recommendations. The output was published and a list of recommendations was generated.

Based on these recommendations, the project has developed two approaches which promote the objective of sustainable financing:

(1) identify and develop investment opportunities within the context of coastal and marine management—the "software and hardware" approach, by identifying the mitigating and preventive measures needed within a development and environmental management framework, commercial investment opportunities in the form of reception facilities, waste treatment, training and certification, information services, etc. can be identified and established; and
(2) promote public sector and private sector partnership—policy orientation of central and local government levels to encourage the greater involvement of the private sector. The private sector needs to take a greater share in the management of marine pollution and this is achieved by providing opportunities and incentives to participate in environmental management. Activities such as voluntary agreements to reduce waste discharges, involvement in pollution monitoring, developing and implementing business plans on environment projects and offering partnerships to environmental management have been proven effective in Batangas Bay.

In Batangas Bay area alone, the investment requirements for waste management amount to US$74 million. The Philippine Ports Authority has just commissioned a feasibility study for developing waste reception facilities at the Batangas Port and the Dutch Government is cooperating with the project to promote recycling of waste in Batangas Bay. The Municipal Government of Bauan in the Batangas Bay Region is investing in the development of a common regional landfill and a new UNDP initiative is underway to develop a public-private corporation to support the municipal initiatives especially in dealing with hazardous wastes.

Building Environmental Management Capacity

Capacity-building is integrated into all components of the project and are primarily based on project outputs. While over 90% of the project activities are implemented by national professionals, the incremental benefit is the development of a group of expertise available and networking in the region. In addition, the project operationalized the following program of work:

- internship;
- short-term training;
- in-service training;
- staff exchange; and
- study tour.

The internship program focuses on national professionals working in the project office to undertake a specific technical and management-oriented activities, thereby improving their knowledge and skills in project development and management, experience working with interdisciplinary teams, and interaction with fellow colleagues in the region. So far, interns from Cambodia, China, Indonesia, Thailand, DPR Korea and Vietnam have benefited from this program.

The project runs the following regional, specialized short-term training courses:

- application of integrated coastal management for marine pollution and prevention;
- oil spill response and cooperation; and
- integrated environmental impact assessment.

The ICM training program is primarily aimed at training coastal planners and managers. It is unique in that participants of the training course acquired the desired practical experience by receiving training at the demonstration sites in Batangas Bay and Xiamen. They also travel to Singapore to learn of the successful experience in river cleanup, waste disposal and port management. The course has been operational since 1994 and participants from 10 countries of the region as well as from South Asia, East Africa and Latin America have benefited. I am pleased to inform you that one of the former GEF council members from Uruguay, Mr. Fernando Gonzales Guyer, attended the ICM training course in October this year.

When enhanced technical support is required, the project provided special in-service training to Cambodia, DPR Korea and Vietnam through training courses and staff attachment to advanced laboratories in the region. Basic laboratory upgrading was also provided to these countries.

Almost all the training courses are in collaboration with local educational institutions which then use the curricula developed for national training. These institutions include the University of the Philippines, Xiamen University, National University of Singapore and City University of Hong Kong. Donor agencies such as the Swedish International Development Agency (Sida) and the International Development Research Centre (IDRC) supported participants from developing countries.

Mobilizing External and In-country Resources

Cooperative and collaborative working arrangements have been established with other United Nations agencies, donors and participating governments. For example, the project cooperated with FAO, UNEP and IOC/WESTPAC in undertaking hazardous waste assessment in Xiamen and Batangas, environmental awareness programs for the region's youth and an oil spill modelling workshop in Pusan (Republic of Korea), respectively. The project was able to mobilize external resources in support of conferences, workshops, training courses, publication of newsletters and technical reports. A total of US$7.4 million has been mobilized by the governments of PR China, the Philippines, the Republic of Korea and Norway; donor agencies

such as Sida, IDRC, the Danish Cooperation for Environment and Development (DANCED), Urban Waste Expertise Programme of the Netherlands; and UNDP/IMO. Another US$2.1 million was solicited this year.

The Challenges Ahead

Paradigm Shift in Concept, Approach and Methodology

The project has now demonstrated a workable planning and management framework for application at the local level and for management of subregional seas. The framework addresses not only marine pollution issues, but also sustainable development of coastal and marine areas of the region.

The working models developed by the project demonstrate a paradigm shift in concept, approach and methodology in addressing marine pollution problems.

In terms of concept, the project views marine pollution management as the responsibility of both the public and the private sectors and marine pollution management creates investment opportunities. It considers waste as a valuable resource. This concept is somewhat different from the conventional viewpoint that marine pollution management is the sole responsibility of the government and therefore increases public expenditure.

In terms of approach, this project suggests the development of a comprehensive preventive and management framework at the local level. By applying the integrated coastal management and risk assessment and risk management frameworks and processes, marine pollution in coastal waters and subregional seas can be more effectively addressed. This approach is different from the conventional reliance on legislative controls including compliance of EIAs and *ad hoc* response to pollution crisis.

With respect to methodology, this project has developed working models which integrate various administrative, scientific, legal, communication and financial tools to maximize their full impact and incremental benefits. Thus, the method adopted differs from the fragmented or loosely integrated conventional management actions which are practiced in most regions of the world.

The Next Step

The obvious next step is to extend the working models to other coastal areas and subregional seas. However, this is no easy task. It requires national policy and commitment to provide the necessary human and financial resources, stronger regional cooperation for addressing transboundary problems, and the necessary financial investment.

These conditions have been difficult to come by in the past. But with the recent haze and currency crisis in Southeast Asia, a general awareness that the environmental problems, be they forest fires or major oil spills, are no more isolated situations of the past but are the result of globalization of the economy and changing production and consumption patterns of today. This situation is best illustrated in the coastal and marine areas which contribute to more than 50% of the GNP of most countries in this region.

We have heard of mad-cow disease. We may face a similar mad-fish disease, if the fish we are eating come from areas increasingly contaminated with pollutants. Already, toxic algal blooms have spread far and wide in the region, marine accidents have been frequent in the East

Asian Seas, the fragile marine ecosystems are becoming less tolerant to the increasing interference of humankind. There are enough warning signals that urgently require concerted actions at national, regional and international levels before it is too late.

Therefore, the project has provided an opportunity for us to develop a systematic, incremental but effective approach in minimizing environmental risks to which our ecosystems, our own health and that of the society are increasingly exposed. It also created a challenge to policy-makers, the private sector, other stakeholders and the international community, to commit to a longer-term course of action that requires a greater investment in terms of human and financial resources in return for a cleaner coastal and marine environment.

The following are some considerations for future actions which may be taken up by GEF using the working models developed under this pilot project:

1. **accelerate capacity-building at the local level**—to plan and manage the coastal and marine areas by setting up national ICM demonstration sites, develop national capacity to address transboundary pollution issues, increase the knowledge base and skills of interest groups such as NGOs and community-based organizations for effective support of local government initiatives;

2. **create a stronger coastal and marine policy environment**—to support a holistic and integrated management approach to address pollution and sustainable development problems in the coastal and marine areas including developing long-term environmental management action programs and policies to encourage the involvement of the private sector and to implement international conventions;

3. **facilitate investment opportunity**—by developing, demonstrating and encouraging financial investment in environmental facilities/infrastructure development and services so as to ensure availability of financial resources to mitigate adverse environmental problems;

4. **provide scientific support and information services**—at various planning and management levels focusing on providing scientific-based options for policy, management and technological interventions; application of information technology to shorten the planning and information gathering processes; and

5. **foster stronger regional commitment**—for countries in the region to work together in resolving transboundary pollution problems, develop viable regional mechanisms to enable the countries to implement international conventions related to the marine environment and ensure sustainability.

Conclusion

I hope I have conveyed to you the severe environmental challenges in the East Asian Seas Region. It needs your support to translate and extend the tested working models into regular government action programs throughout the coastal areas and the subregional seas. Hopefully, this will lead to achieving a new paradigm at which marine environmental degradation has been arrested, environmental quality improved and damaged habitats restored, at least, in areas where management interventions have been in place.

However, it is important to reiterate that the process of achieving environmental improvement takes time. The integrated management framework and processes in resolving environmental issues are akin to the three dimensions of a Rubic's cube. It requires skills and patience to do the right thing at the right time similar to the efforts and patience needed to make all cells of the cube of the same color for each side. In fact, the integrated coastal management model is a blueprint to sustainable development which requires constant interventions in response to changes with time. Let me close this presentation by giving you a life example of sustainable development. In the beginning years of marriage, physical attraction, promises and sacrifices for the sake of love are usually the contributing factors to sustain the marriage. But as time goes by, these factors usually become secondary and a new set of inner values must be found. This usually takes the form of mutual respect, mutual appreciation, understanding and, more importantly, mutual trust. Thus, it is really the ability to respond to such changes that the marriage becomes sustainable.

I wish to thank you again for this opportunity and have a good day.

The Establishment and Operation of Intersectoral Mechanisms for Marine Environmental Management in Xiamen, People's Republic of China

ZHU YAYAN
Vice Mayor, Xiamen Municipal Government
Xiamen, People's Republic of China

CHEN GUOQIANG
Director, Office of Xiamen Demonstration Project
2nd Floor B1 Building
Bailuzhou, Hubinzhong Road
Xiamen 361004, People's Republic of China

ZHU YAYAN and CHEN GUOQIANG. 1998. The establishment and operation of intersectoral mechanisms for marine environmental management in Xiamen, People's Republic of China, p. 1. *In* **The Regional Workshop on Partnerships in the Application of Integrated Coastal Management.** 12-14 November 1997, Chonburi, Thailand. 167 p.

Abstract

The Xiamen Demonstration Project under the GEF/UNDP/IMO Regional Programme for the Prevention and Management of Marine Pollution in the East Asian Seas is to test a working model for application of the integrated coastal management (ICM) system for mitigating marine pollution consequent upon rapid economic development. The paper outlines the major experience of success in ICM institutional development on the local level, particularly the establishment of decision-making mechanisms through consensus building among major stakeholders. The institutional development provides a framework for, and facilitates progress in, the legislative improvement and enforcement, cross-sectoral marine pollution monitoring, developing sustainable financing options and capacity building towards ICM goals. Particular emphasis was given to interactive processes and mutual enhancement among scientific communities, public awareness and participation, and improvement of decision-making mechanisms.

Building Consensus Among Stakeholders for Pollution Management in Batangas Bay, Philippines

EVELYN ESTIGOY
Director/Officer
Provincial Government–Environment and Natural Resources Office
Capitol Site, Batangas City
Philippines

EVELYN ESTIGOY. 1998. Building consensus among stakeholders for pollution management in Batangas Bay, Philippines, p. 2-6. *In* **The Regional Workshop on Partnerships in the Application of Integrated Coastal Management.** 12-14 November 1997, Chonburi, Thailand. 167 p.

Abstract

The growth strategy of the Batangas Provincial Government in the Philippines, which consists of a balanced agro-industrial modernization within the context of a designated industrial growth corridor and an expanding Metropolitan Manila economy, paved the way for the entry of multi-sectoral stakeholders in the Batangas Bay Region (BBR). The interplay and growth of these socioeconomic players exert pressure on the environment and pose health hazards. Although certain regulatory instruments are in place to address sectoral concerns, these are not sufficient to effect sustainable development in BBR such that the application of integrated coastal management (ICM) had been adopted to demonstrate how pollution can be prevented and/or properly managed in a rapidly expanding economy.

Two institutional mechanisms were created to serve as a venue for various stakeholders and/or Bay users to meet, discuss, endeavor and reach consensus to address policy developments and/or reach corporate decisions on programs and projects intended for implementation in the Batangas Bay Region. The paper also discusses other relevant activities of the Batangas Bay Demonstration Project, that complement and actually strengthen these institutional mechanisms as well as implications of the Project, i.e., on ensuring ecological sustainability of the socioeconomic developments in Batangas, and on the quality and opportunity for successful replication of integrated coastal management in the newly identified demonstration sites in the Philippines and in the East Asian Region, as a whole.

Introduction

The Batangas Provincial Government's growth strategy of a balanced agro-industrial modernization is within the context of a designated regional industrial growth corridor and an expanding Metropolitan Manila economy. This growth corridor consisting of the five provinces of Cavite, Laguna, Batangas, Rizal and Quezon (collectively known as CALABARZON) is the fastest growing region in the Philippines in terms of industrialization. Earlier, Metro Manila had moved towards establishment of expressway extension and a modern alternate international port in Batangas Bay to accommodate the economic expansion. This development paved the way for the entry of multi-sectoral stakeholders in the so-called Batangas Bay Region (BBR) consisting of 12 municipalities and 2 cities with a population of 871,000 or about 50% of the province's total population. These stakeholders include industrial firms, commercial establishments, hospitals, schools, private and government institutions, etc. which had varied interests, opinions and levels of concern for proper management of the environment . The interplay and growth of these socioeconomic players indeed exert pressure to the environment and pose health hazards to the people.

Integrated Coastal Management (ICM) Approach

Although certain regulatory instruments are in place to address sectoral concerns, these are not sufficient to effect sustainable development in BBR such that the application of an integrated coastal management (ICM) approach had been adopted through the Batangas Bay Demonstration Project in order to illustrate how pollution can be prevented and/or properly managed in a rapidly expanding economy. ICM is characterized by the integration and coordination of all the concerns of various stakeholders in a defined coastal zone covering environmental, socioeconomic, legal and institutional aspects. ICM seeks to bring about a balance between economic development and conservation of natural resources, minimizing if not eliminating resource use conflicts, unsustainable economic activities and pollution, and at the same time improving the socioeconomic conditions of the community, protecting the environment, and ensuring the sustained utilization of the coastal and marine resources.

However, the ICM system could not be properly carried out in the absence of appropriate institutional mechanisms where consensus can be sought and achieved.

Institutional Mechanisms Established in Batangas to Implement ICM

The Batangas Bay Environmental Protection Council and the Environment and Natural Resources Office as its technical arm were, therefore, created through Provincial Ordinances to serve as the institutional mechanisms to implement ICM.

Batangas Bay Region Environmental Protection Council (BBR-EPC)

The BBR-EPC provides the venue where stakeholders in the Batangas Bay Region meets regularly and deliberate and reach consensus regarding various issues, activities, programs and projects affecting Batangas Bay

This Council was created through Provincial Ordinance No. 001 S.96 which was passed through Provincial Legislative Board Resolution No. 276 dated 20 May 1996.

Composition

The Governor of the Province of Batangas is the Chairman of the Council with the following as members: Vice Governor, Mayor of 4 coastal municipalities and 1 city around Batangas Bay, Chairman of the Committee on Environmental Protection of the Legislative Board of Batangas, Community Environment and Natural Resources Officer of the Department of Environment and Natural Resources, a representative from the Print and Broadcast Media, Chairman of the Batangas Coastal Resources Management Foundation, representatives from Philippine Coast Guard, Philippine Ports Authority and Maritime Industry Authority, and a representative from the Small-Scale Fishermen of Batangas Bay (a non-government organization).

The participation of the rest of the mayors from the nine other local government units which form part of the Batangas Bay Region (management area for the BBDP/ICM) in the Council meetings is on a need basis.

The Provincial Government–Environment and Natural Resources Office (PG–ENRO) acts as the Secretariat of the Council.

Mandates/Roles

The Council is vested with the following mandates and responsibilities:

1. To delineate policies regarding the protection and preservation of the ecological balance of the Batangas Bay Region (BBR);
2. To coordinate with government, non-government organizations and the private sector regarding issues on environmental protection within the BBR;
3. To initiate legislation that seeks to minimize the risks of pollution within the BBR;
4. To monitor compliance with national and local laws pertaining to pollution control;
5. To promote public awareness on and participation in the abatement of pollution in the BBR; and
6. To undertake projects that will encourage marine pollution reduction, prevention and risk management.

Accomplishment/Activities

Through appropriate deliberation and consensus building, the Council was able to achieve the following, among others:

1. Adopted the Strategic Environment Management Plan (SEMP) for Pollution Prevention and Management of the Batangas Bay Coastal Resources and the Integrated Waste Management Action Plan (1996-2000) for the Batangas Bay Region through Resolution Nos. 01-96 and 02-96, respectively. These two major Plans are now guiding the specific activities being implemented to address waste problems in the Region;

2. Participated in the evaluation of the proposals for the establishment of major industries in the area. Example of this is the endorsement, with appropriate conditionalities of the Camago-Malampaya natural gas piping system which would traverse Batangas Bay;

3. Served as venue for validating various outputs of the Batangas Bay Demonstration Project; and

4. Formed the Council Pollution Management Appraisal Team which would directly participate in monitoring compliance pertaining to pollution control and in sustaining waste minimization programs of industrial firms in the Bay Area

Towards strengthening of the council

One very important sub-activity under the Batangas Bay Demonstration Project (BBDP) is the formulation of provincial and municipal ordinances to further strengthen ICM system implementation in the province. The ordinances have the following objectives:

1. Consolidate and coordinate efforts, services and resources of local government units in implementing the strategic environmental management plan (SEMP), in accordance with the provisions on cooperative undertakings in Sections 3(f) and 33 of the Local Government Code;

2. Strengthen/reorganize the existing Batangas Bay Region Environmental Protection Council (BBREPC), to be renamed the Batangas Bay Integrated Coastal Management Council (BBICMC) and delegate to it some relevant functions including integrated

policy-making, development of action plans and setting guidelines for the implementation of the IEMS;

3. Provide incentives for local governments to consolidate or coordinate environmental management efforts in accordance with the IEMS and align independent initiatives with the integrated plan.

Several partnership approaches initiated under the BBDP such as the formation and training of the Council Pollution Management Appraisal Team to address compliance monitoring and sustain waste minimization programs and the institutionalization of voluntary agreements shall be vigorously pursued by the Council. Voluntary agreement is a cooperative approach initiated under the Project for pollution management and waste reduction within a specific time frame. These approaches are deemed very necessary to continuously build a consensus for pollution management among stakeholders.

Provincial Government–Environment and Natural Resources Office (PG–ENRO)

Establishment/Role/Mandates

Along with its role as technical secretariat of the Council, the PG-ENRO was created (through Provincial Ordinance No. 003-Series 1995) to serve as an institutional mechanism to strengthen and sustain ICM implementation in the BBR as espoused in the Strategic Management Plan for the period 1996-2020. The PG-ENRO is also mandated to perform other functions provided for under the local Government Code of 1991, which include the devolved functions of the Department of Environment and Natural Resources. Its general mandate includes taking the lead in coordinating the implementation of environmental management programs in the province; developing operational plans and strategies for implementation of environment and natural resources programs and projects; enforcing pollution control and environmental protection laws, rules and regulations; and coordinating the actual implementation of the integrated coastal management programs by the concerned sectors.

The PG-ENRO had been set-up as a separate department in the province to occupy equal status with other major departments. It is currently manned by 29 personnel with 6 operating units, i.e., the ENR Planning Unit, Parks/Protected Areas and Wildlife Unit, Forestry Unit, Mining and Geosciences Unit and Administrative Support Unit.

By its mandate, the PG-ENRO serves as the focal point for the coordination of the different activities relative to the implementation of the Strategic Environmental Management Plan and Integrated Waste Management Action Plan earlier adopted by the BBR-Environmental Protection Council.

Catalytic role played

In its one-and-a-half years of existence and operationalization, the PG-ENRO plays a catalytic role in bringing together the stakeholders and facilitating consensus building among them in the implementation of ICM and environmental programs and projects in the Region and the Province.

Towards strengthening of the PG–ENRO

With the provincial and municipal ordinances institutionalizing ICM hopefully passed by the Provincial Board this year, and the continuing capability-building for its personnel, ENRO expects that consensus building on specific issues, policies and activities will be carried out more expediently. Meanwhile, it shall continue to assume its role as a central force for engaging the active participation of appropriate sectors in the integrated management of the

BBR/province's environment which could be achieved through continuing IEC (information, education and communication) and public awareness programs and strengthening of partnerships, capability-building for the local government units, and facilitating implementation of the plans.

Application of Scientific and Technological Results in Management Improvement

Part of the strengthening efforts and management improvement for the two institutional mechanisms described earlier is the application of scientific and technological results achieved through the Batangas Bay Demonstration Project. These include scientific researches and studies in the fields of hydrodynamics, ships routeing/vessel traffic system, land and water use zonation scheme, geographic information systems (GIS) package, etc. Water quality testing vis-à-vis existing standards was likewise done and environmental quality monitoring program is being instituted under the project. It is expected that with these technological results in place, a corresponding information and database improvement/linkage will be effected and that these will serve as invaluable tools for decision-makers and stakeholders for sustaining ICM implementation in the BBR.

Conclusion

Success in the present undertakings in the Batangas Bay Demonstration project has two major implications: firstly, that of ensuring ecological sustainability of the socioeconomic developments in Batangas, and secondly, that of providing an opportunity for successful replication of integrated coastal management in the Philippines and in the East Asian Region as well.

Legislation and Execution of the Management and Use of Xiamen's Coastal Areas

ZHANG RENSONG
Deputy Director, Xiamen Legal Bureau
No. 61 Hubinbei Road
Xiamen 361012
People's Republic of China

ZHANG RENSONG. 1998. Legislation and execution of the management and use of Xiamen's coastal areas, p. 7. *In* **The Regional Workshop on Partnerships in the Application of Integrated Coastal Management.** 12-14 November 1997, Chonburi, Thailand. 167 p.

Abstract

As far as the use of management of coastal areas is concerned, problems include lack of understanding on coastal functions, misuse of coastal resources, insufficient protection, fragmented management and lack of organization and coordination. Sea areas are a main support to the development and prosperity of Xiamen's economy. The target of Xiamen's legislation is to set up an effective and comprehensive management and coordination mechanism and to establish a permit fee system on the use of areas. Xiamen's local regulations on the use and management of coastal areas are different from national rules on oceanic management. The main objective is to establish a cooperative and coordinating system in coastal and marine management under which each related agency or sector plays its positive role.

Advancing ICM in Indonesia: The Pivotal Role of Partnerships

IAN DUTTON, BRIAN CRAWFORD
Coastal Resources Center
University of Rhode Island: Proyek Pesisir, Indonesia
Jl. Madiun No. 3 Menteng
Jakarta 10320
Indonesia

TITAYANTO PIETER
USAID Natural Resources Management Program
Jl. Madiun No. 3 Menteng
Jakarta 10320
Indonesia

IAN DUTTON, BRIAN CRAWFORD and TITAYANTO PIETER. 1998. Advancing ICM in Indonesia: the pivotal role of partnerships, p. 8-17. *In* **The Regional Workshop on Partnerships in the Application of Integrated Coastal Management.** 12-14 November 1997, Chonburi, Thailand. 167 p.

Abstract

Since the formal recognition of the marine sector in the 1993 State Policy Guidelines (GBHN), integrated coastal management (ICM) effort in Indonesia has intensified and broadened. One of the most recent initiatives is Proyek Pesisir, the Coastal Resources Management Project (CRMP) of the USAID-BAPPENAS Natural Resources Management Program (NRMP).

Proyek Pesisir seeks to achieve measurable progress towards the NRMP strategic objective of decentralized and strengthened coastal resources management and is being implemented from 1996 to 2003. A fundamental requirement for strengthened natural resources management in Indonesia is for greater clarification of the role and responsibilities of the various stakeholders in coastal resources, especially non-government stakeholders.

In recognition of this need, Proyek Pesisir is working with government, industry, community, academic and professional partners to develop field sites for testing ICM at the local scale. Lessons learned from these sites will be promoted in both national policy and in fostering replication of best practice ICM throughout the Indonesian archipelago. The first three Proyek Pesisir learning sites specifically seek to develop and evaluate various partnership models for ICM at three 'village scale' sites in the Minahasa Regency of the Province of North Sulawesi. Lessons from these models are being correlated and compared with partnership models developed in other USAID NRMP initiatives and broader ICM programs in Indonesia, including the COREMAP initiative.

Introduction

Despite a longstanding interest in improving national capacity for development of the vast marine and coastal resources of the Indonesian archipelago (e.g., BAPPENAS/CIDA, 1987), active involvement in various pilot scale ICM initiatives (e.g., USAID-ASEAN CRMP: Chou et al., 1991; ASEAN/US CRMP, DGF, 1992) and recent investment in large-scale marine planning initiatives (e.g., ADB, 1992) ICM in Indonesia remains in its infancy. The political will for ICM exists (Sloan and Sughandy, 1994) and has been formalized in State Policy (e.g., DFIS, 1993) and National Plans (e.g., SME/UNDP, 1997). However, outside protected areas there are no implemented ICM plans and ICM capacity at the Provincial and local levels is considered weak throughout most of the archipelago (ADB, 1991). Additionally, the capacity of Provincial and local governments to develop and implement ICM and the capacity for communities and other

stakeholders to participate in ICM programs remains low, particularly when compared with other countries in the East Asian region (Chua and Garces, 1993; White et al., 1994).

In view of the pressing need for more effective management of the mega diverse and highly productive Indonesian coastal seas (Tomascik et al., 1997), USAID and the Indonesian National Development Planning Board (BAPPENAS) undertook a detailed analysis of mechanisms and options for ICM as part of the design of the USAID-assisted Natural Resources Management Program (CRC, 1995). That analysis involved extensive consultation with a range of stakeholder groups and resulted in the formulation of a coastal resources management component (known as Proyek Pesisir) within the USAID-BAPPENAS Natural Resources Management Program (NRMP). Other components of the NRMP also provide for complementary ICM initiatives in two areas:

(a) via policy and institutional strengthening support for marine parks administered by the national parks agency (PHPA); and
(b) via strengthening of Provincial and local non-government organizations (NGOs) under the Kemala program (an initiative of the World Wildlife Fund, The Nature Conservancy, World Resources Institute: BSP, 1996)

Partnerships for ICM

While there is increasing consensus that stakeholder involvement in coastal management programs is fundamental to program success (e.g., Dutton and Hotta, 1995; IWICM, 1996; Sorenson, 1997), there have been relatively few analyses of the relationships between those stakeholders and how such relationships influence ICM programs over time. Increasingly, such relationships are viewed as 'partnerships' (e.g., Ross et al., 1997), however, such terminology does not necessarily reflect or encapsulate the many dimensions and types (e.g., co-management, collaborative management, cooperative management) of relationships which may be imposed or sought between ICM stakeholders.

In the initial experience of Proyek Pesisir we have found it essential to carefully define ICM concepts and terms both for operational reasons (e.g., so that potential 'partners' know what we are proposing) and for evaluative purposes (e.g., so that we can test hypotheses and assumptions relating to particular concepts). Sorenson (1997) suggests that lack of such definition has been a source of confusion in past ICM practice over the past 25 years. For Proyek Pesisir, we have drawn from the literal source of the term partnerships. Webster's (Neufeldt and Guralink, 1991) defines 'partner' (emphasis added by authors) as:

1. *a person who takes part in some activity in common with another or others... to engage in the same business enterprise sharing in the same profits and risks... either of two persons dancing together... on the same side or team playing or competing against others;*
2. *a framework, as of timbers, for supporting a mast, etc.*

The same edition defines 'partnerships' as being:

1. *the state of being a partner; participation;*
2. *the relationship of partners; joint interest; association;*
3. *an association of two or more partners in a business enterprise... the people so associated.*

Despite the generality of such definition, it has provided a convenient basis for beginning to clarify the nature of relationships which can be implemented and tested in the context of Proyek Pesisir, particularly given the growing recognition that governments cannot be the sole instrument in the governance framework for ICM in Indonesia. A variety of international ICM studies have shown (e.g., ES&S, 1991) that the distribution of management resources, skills and local capacity as well as the temporal variability of ICM issues is such that ICM can only be achieved via partnership. However, as may be expected in a discipline as new and broad as ICM, there are, as yet, few clear guidelines on what aspects/types of partnerships are more likely to lead to program success.

Proyek Pesisir Partnerships

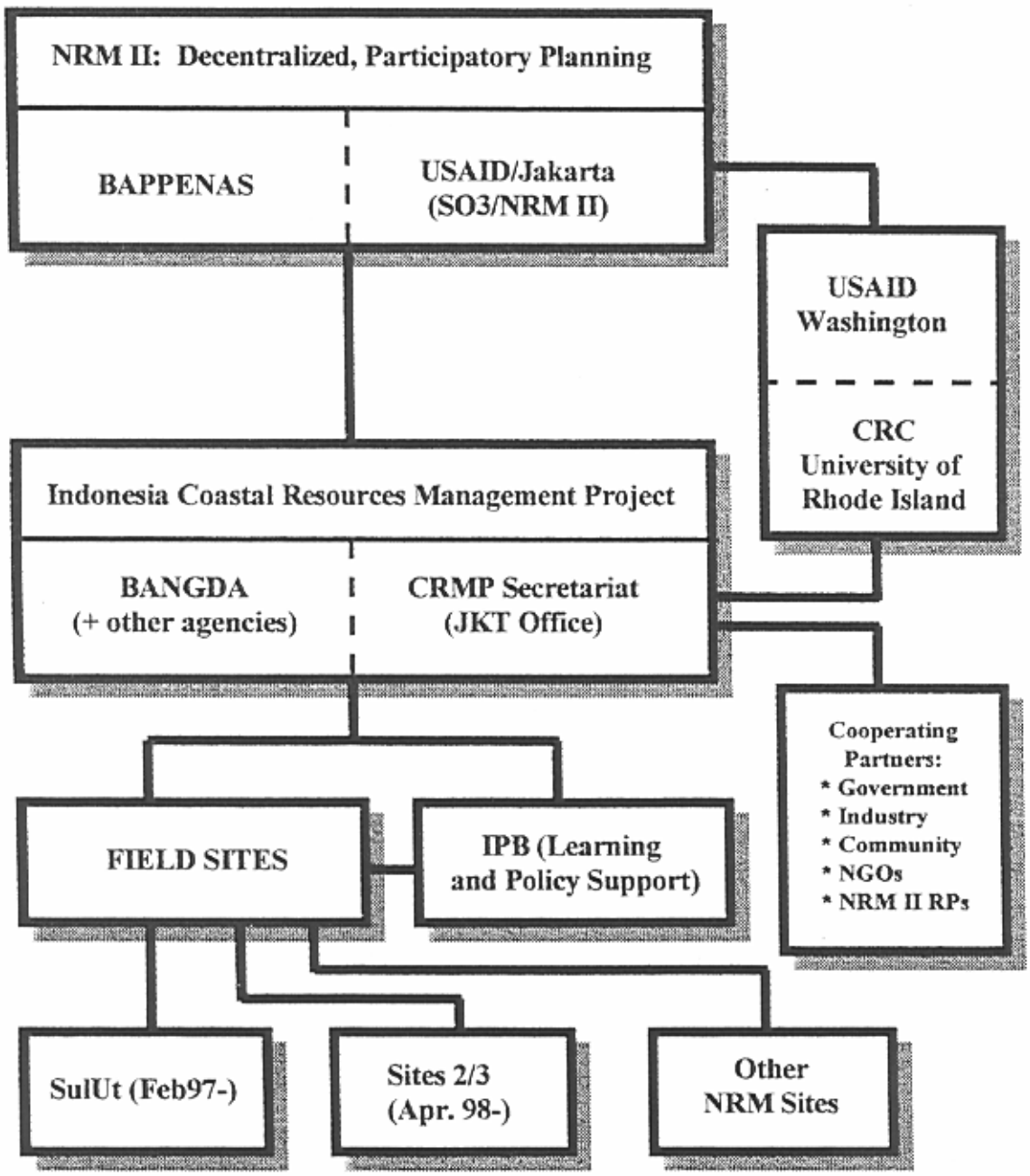
While this paper focuses primarily on the Proyek Pesisir component of the NRMP, ***Figure 1*** indicates there is a close connection between Proyek Pesisir and other NRMP ICM initiatives as well as other ICM projects in Indonesia. A key challenge identified in the design studies for Proyek Pesisir relates to the quintessential need for ICM to involve stakeholders who may not traditionally have recognized the commonality of their interest in a coastal area or resource.

From the quarter of a century of global experience in ICM (Sorensen, 1997) it is evident that the lack of cooperation between stakeholders has been a fundamental stumbling block to ICM program development (Olsen, 1993). Those ICM programs which have been demonstrably successful (e.g., Great Barrier Reef Marine Park: ES&S, 1987; Sri Lanka: White and Samarakoon, 1994; Ecuador: Robadue, 1995) typically require stakeholders to become partners in the ICM program.

As indicated in ***Figure 1***, the design of Proyek Pesisir reflects this paradigm—at an early stage of the project, key potential partners for initial establishment of project operations were identified. The project team now works closely with a range of government and university partners at both National and Provincial levels and over time will increasingly engage industry, community and non-government partners.

These project-based partnerships provide an efficient vehicle for delivery of project services to points of need and also serve as a mechanism for strengthening of links between the partners who shall continue to implement ICM programs once USAID support ceases in 2003. The initial implementation approach of Proyek Pesisir has been to work with government agencies to identify partners with whom government agencies believe they can maintain (or are willing to work towards) a harmonious and productive relationship in the longer term. While this approach carries an inherent risk of excluding potential partners who may not be well known to government at present, it is considered an efficient starting point for building the necessary trust within government that its role can be enhanced by partnership-based approaches to ICM.

Figure 1. Organizational Framework of the CRMP.



For example, the key national learning partner for Proyek Pesisir is the newly formed Centre for Coastal and Marine Resources Studies (CCMRS) at the Bogor Agricultural University (IPB). The CCMRS plays a key role in the national programs of Proyek Pesisir (Darmawan et al., in press) in monitoring the field programs, linking that information with supplementary research undertaken at broader scales and then packaging that information for use in policy arenas or in extension, training and outreach activities[1].

Proyek Pesisir is also working with a University partner (Sam Ratulangi University—UNSRAT) at the Provincial level. UNSRAT participates in the provincial working group, is conducting baseline surveys and monitoring, and will undertake management relevant technical studies to better understand issues at the provincial field sites. The aim is to direct the substantial expertise available at the university to provide support services to local government and coastal resource users.

Field Development and Testing of Partnership Models

In addition, the more general partnerships outlined in ***Figure 1*** are the partnership models being tested in the field programs of Proyek Pesisir. Those models are of fundamental importance to development of an indigenous and comprehensive ICM capacity in Indonesia as no other ICM initiative has specifically tested which types of partnerships work best under different circumstances. The reason for this is partly that previous ICM initiatives have addressed a higher (mostly government) level of ICM effort or have not specifically tested options for ICM at the field level[2].

The field programs of Proyek Pesisir began with the opening of the North Sulawesi program office in April 1997. From that base in the city of Manado in North Sulawesi (see ***Figure 2***), the Proyek Pesisir team and a Provincial Working Group (PWG—comprising representatives from some 10 government agencies and the local University, UNSRAT) decided to focus initially on Kabupaten Minahasa (a regency which is a sublevel of the Provincial administration) as the general area for initial project development.

Kabupaten Minahasa covers an area of some 4,168 km^2 and has a population of 734,223 (Kantor Statistik Minahasa, 1996). Along the 350 km^2 of coastline are some 110 villages. A rapid appraisal of a sample of 20 of those villages (Pollnac et al., 1997) provided a synthesis of issues and options which were then reviewed by the PWG in selecting the initial three field sites for inclusion in the field program of Proyek Pesisir (Crawford et al., 1997).

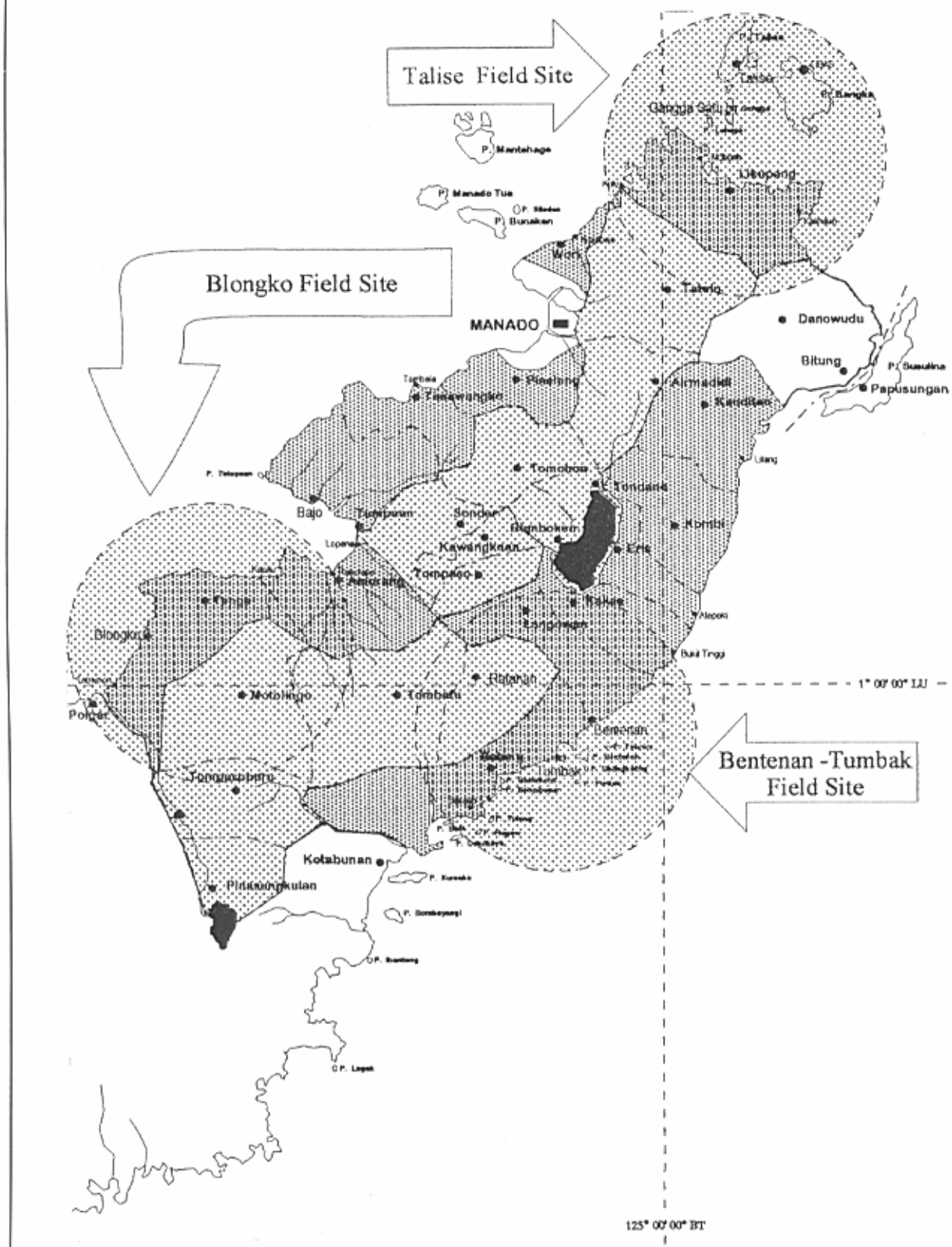
Those three field sites include the villages of (see ***Figure 2*** for location in Province):

(a) Bentenan and Tumbak (Site 1)
(b) Talise (Site 2)
(c) Blongko (Site 3)

[1]These activities are novel for a University-based center in Indonesia, but are already proving valuable in promoting the quality of policy advice available to governments (Ir. Sapta Putra, Directorate General for Regional Development, Ministry of Home Affairs, pers. comm).

[2]This point is significant in the context of the approach being taken by Proyek Pesisir. Under the global CRM II program of the Coastal Resources Center of the University of Rhode Island and USAID, there is a specific commitment to learning and innovation. That commitment carries an embodied risk of failure; however, CRC believes that much can be learned from failure—hence the emphasis on measurement in these field trials.

Figure 2. Location of Field Site in North Sulawesi.



As indicated in the rapid appraisal (Pollnac et al., 1997) each of these sites is considered representative of other coastal villages in Kabupaten Minahasa and the Province of North Sulawesi more generally. However, each also features contrasting socioeconomic and biophysical conditions. These variations form part of the basis for a different ICM development strategy in each village, part of which relates to the selection of alternative partnership models for ICM. The relevant elements of each partnership model are outlined in ***Table 1.***

While ***Table 1*** suggests that there are some notable differences between the partnership models in each village, there are also several constants at each of the three field sites:

(1) a full time field extension worker is stationed at the site to act as a facilitator between local communities and other partners (in addition to other duties such as training, education/extension, monitoring, etc.);
(2) participation of village government and other levels of local government up to the provincial level for decision-making is a process which already exists under Indonesia's multi-layered administration systems (this provides support services and funding of ICM implementation activities);
(3) participation of the community residents and other stakeholders in the identification of problems and opportunities, and for planning implementation actions occurs at all sites; and
(4) at all sites, the desired outcome of Proyek Pesisir is to establish patterns, processes and practices of sustainable coastal resources use which improves the quality of life of coastal residents while maintaining or improving the condition of those coastal resources.

Table 1. Partnership Models at Minahasa Field Sites.

Model Element	(Site 1) Bentenan-Tumbak	(Site 2) Talise	(Site 3) Blongko
Key Partners	Community, Local Government, University, Tourism Operator, Adjacent Fishing Communities *(latter - future years)*	Community, Local Government, Provincial NGO, Aquaculture (pearl farm) Operator	Community, Local Government
Initial Development Period	May 97 - March 98	August 97-March 98	October 97-June 98 *(may be extended)*
Duration of Development	1997 - 2000 *(one year extension possible)*	1997 - 2000 *(one year extension possible)*	1997- ? - to be determined *(based on community advice/results)*
Primary Data Collection Responsibility	Project team, University	NGO, Project team, University	Community *(trained/advised by project team)*
Implementation Pattern	Linked with Provincial planning cycle	Linked with development of kabupaten planning capacity	Determined by community
Level of External Assistance	Substantial	Moderate	Minimal

Learning from the Models

The overall NRM program goal is to decentralize and strengthen natural resources management in Indonesia (USAID/BAPPENAS, 1996). In order for Proyek Pesisir to contribute

meaningfully to that goal, it has been recognized (USAID, 1996) that systematic monitoring of progress towards that goal is required. A program-wide performance monitoring plan (USAID, 1996) has been established for that purpose.

That plan identifies four intermediate level program outcomes:

(a) Development of successful field sites;
(b) Strengthened and decentralized institutions;
(c) Improved policies and enabling conditions; and
(d) Dissemination of lessons learned.

For each of these outcomes, a series of indicators has been established which allow for both annual performance assessment and reporting as well as enabling comparison of progress towards each of these outcomes in the context of specific project activity. The results of Proyek Pesisir can thus be assessed relative to those of other NRM-supported programs such as the Kemala program mentioned previously. To enable those indicators to serve such a purpose has, however, meant that a level of generalization in indicator selection has been employed with a resultant loss of sensitivity at the programmatic level. For example, one of the NRM program indicators measures the area (ha) in which 'best practices' have been implemented which are appropriate to the site. Such a measure assumes that there is agreement on what are best practices (in ICM) in different locations which are relevant to particular sites and particular resource users/management partners.

The initial experience of Proyek Pesisir is that we do not yet have such a prescriptive understanding of ICM best practices and thus need to maximize learning from field programs and models which are being developed. Proyek Pesisir and CRC staff are thus actively pursuing definition of indicators which will enable the relative efficacy of field models to be assessed. This activity is occurring simultaneously with the conduct of site-based baseline (monitoring and profiling) studies which shall form the foundation for evaluation and learning of the different management treatments being applied (including the specific influence of the three partnership arrangements described above and others which shall be developed once Proyek Pesisir commences operations in new locations in 1998).

There are very few precedents for this type of monitoring—the development of measures for determining success and failure is thus difficult. However, if, as the NRM II design proposes (USAID/BAPPENAS, 1996), Proyek Pesisir and other NRM II components are to ultimately be replicated in other areas of Indonesia, then a clear understanding of what works, where and why must be established. Understanding what kinds of partnerships are appropriate to different coastal resources issues is thus pivotal to the ultimate success of the NRM program and to the development of Indonesia's ICM capability.

Conclusion

While this presentation describes a 'work in progress' and, as such, cannot yet provide clear guidance on the questions posed by this workshop, the design and initial implementation experience of Proyek Pesisir suggests that partnerships are an essential feature of ICM practice in Indonesia. Feedback from government, community, academic, industry and other stakeholder groups to date suggests that each recognizes their interdependence in establishing sustainable coastal resource management regimes.

Importantly, Proyek Pesisir is seeking to measure and document the development of a range of partnership models. Unlike many projects where success is an easily defined state (e.g., building a structure to a pre-defined engineering standard), assessing the success of ICM projects, particularly in developing countries, is a much more conditional activity. Proyek Pesisir implicitly recognizes that what works in one situation in a country as vast as Indonesia may not work in another, however, for the sake of efficiency, it is desirable to assess what aspects of an ICM regime are transferable under various circumstances.

While we have begun to implement a range of strategies for ICM at various locations, the importance of this work thus lies not just in the local success of the strategy, but rather in the extent to which the strategy process contributes to learning. Only from such learning are we likely to be able to propose ICM approaches which properly address local needs and circumstances, including the different needs/forces affecting potential partners in ICM.

Acknowledgments

The authors gratefully acknowledge the contribution of the Proyek Pesisir team and Government of Indonesia counterpart agencies to the development of concepts outlined in this paper and would like to especially recognize the contributions of Chris Rotinsulu, Meidi Kasmidi and Noni Tangkilisan, who are the resident Extension Officers in the North Sulawesi Field program sites. The comments of Lynne Hale, Associate Director of CRC/URI and Ir. Sapta Putra of the Directorate-General for Regional Development of the Ministry of Home Affairs (DirJen BANGDA) on a draft of this paper are also acknowledged.

References

ASEAN/US CRMP. DGF (Association of South East Asian Nations/United States Coastal Resources Management Project, Directorate-General of Fisheries) 1992. The integrated management plan for Segara Anakan-Cilacap, Central Java, Indonesia. ICLARM Technical Report 34. International Center for Living Aquatic Resources Management, Manila.

BAPPENAS (National Development Planning Board)/CIDA (Canadian International Development Agency) 1987. Action plan for sustainable development of Indonesia's marine and coastal resources, CIDA, Ottawa.

BSP (Biodiversity Support Program). 1996. Advancing knowledge to achieve conservation. Annual Report. BSP, Washington, D.C.

Chou, L..M., T-E. Chua, H.W. Phoo, P.E. Lim, J.N. Paw, G.T. Silvestre, M.J. Valencia, A.T. White and P.K. Wong, Editors. 1991. Towards an integrated management of tropical coastal resources. ICLARM Conference Proceedings 22. National University of Singapore, National Science and technology Board, Singapore and International Center for Living Aquatic Resources Management, Manila.

Chua, T-E. and L.R. Garces 1993. Regional efforts in the management of coastal and marine environments in the ASEAN region. Ocean and Coastal Management 19: 190-195.

CRC (Coastal Resources Center) 1995. Design for the Integrated Coastal Resources Management Project, Natural Resources Management II Program, USAID Indonesia. A Technical Report prepared for the Office of Rural Environmental Management, USAID-Indonesia, Coastal Resources Center, the University of Rhode Island.

Crawford, B.R., C. Rotinsulu, J.D. Kusen, E. Mantjoro and A. Siahainenia. 1997. A community-based coastal resources management approach: results of initial baseline surveys in the villages of Bentenan and Tumbak, North Sulawesi, Indonesia. Paper presented at the International Seminar on Maritime Communities in a Changing World, 23-26 September 1997, Manado, Indonesia.

Darmawan, R. Dahuri and I.M. Dutton. The Indonesian Coastal Resources Management Project (CRMP): a two track approach. PACON '97 Symposium on Resource Development—Environmental Issues and the Sustainable Development of Coastal Waters, 6-8 August, 1997, Hong Kong. (In press).

DFIS (Directorate of Foreign Information Services). 1993. The 1993 guidelines of state policy. Department of Information, Jakarta.

Dutton, I.M. and K. Hotta 1995. Introduction. *In* K. Hotta and I.M. Dutton (eds.) Coastal management in the Asia-Pacific region: issues and approaches. JIMSTEF, Tokyo.

ES&S (Environment Science and Services). 1987. A user-based evaluation of the zoning plan and day-to-day management in the Capricornia Section of the Great Barrier Reef Marine Park. Great Barrier Reef Marine Park Authority Research Publication, Townsville.

ES&S (Environment Science and Services). 1991. Trinity Inlet management plan. Department of Premier, Economic and Trade Development, Cairns Port Authority, Cairns City Council, Mulgrave Shire Council, Brisbane.

IWICM (the International Workshop on Integrated Coastal Management in Tropical Developing Countries: Lessons Learned from Successes and Failures). 1996. Enhancing the success of integrated coastal management: good practices in the formulation, design and implementation of integrated coastal management initiatives. MPP-EAS Technical Report 22. GEF/IMO/UNDP, Manila.

Neufeldt, V. and D.B. Guralink, Editors. 1991. Webster's new world dictionary. 3rd ed. Prentice Hall, New York.

Olsen, S. 1993. Will integrated coastal management be sustainable?: the constituency problem. Ocean and Coastal Management 21: 201-225.

Pollnac, R., C. Rotinsulu and A. Soemodinoto. 1997. Rapid assessment of coastal management issues on the coast of Minahasa. Proyek Pesisir Technical Report, Manado. (Draft)

Robadue, D., Editor. 1995. Eight years in Ecuador: the road to integrated coastal management. Coastal Resources Center, University of Rhode Island, Kingston, Rhode Island.

Ross, S.A., C.S. Tejam and R.M.P. Rosales, Editors. 1997. Sustainable financing mechanisms: public sector-private sector partnership. MPP-EAS Conference Proceedings 6. GEF/UNDP/IMO, Manila.

Sloan, N.A. and A. Sughandy. 1994. An overview of Indonesian coastal environmental management. Coastal Management 22: 215-233.

SME (State Ministry for Environment)/UNDP (United Nations Development Program). 1997. Agenda 21: national strategy for sustainable development. State Ministry for Environment, Jakarta.

Sorensen, J. 1997. National and international efforts at integrated coastal management: definitions, lessons and achievements. Coastal Management 25: 3-41.

Tomascik, T., A.J. Mah, A. Nontji and K. Moosa. 1997. The ecology of the Indonesian seas. Parts One and Two. Ecology of Indonesia Series Vols. VII and VIII, Periplus, Singapore.

USAID/BAPPENAS. 1996. Funding Approval Document for Natural Resources Management II Program. USAID, Jakarta.

USAID. 1996. Natural Resources Management II Program Performance Monitoring Plan. Office of Rural Environmental Management, Jakarta.

White, A.T., L.Z. Hale, Y. Renard and L. Cortesi. 1994. Collaborative and community-based management of coral reefs: lessons from experience. Kumarian Press, West Hartford, Connecticut.

White, A.T. and J.I. Samarakoon. 1994. Special area management for coastal resources: a first for Sri Lanka coastal management in tropical Asia. March, Coastal Resources Center, University of Rhode Island. 20-24.

The Application of Integrated Coastal Management in Chinhae Bay, Republic of Korea: Lessons Learned

JIHYUN LEE
Senior Researcher, Division of Marine Policy
Korea Maritime Institute
Samsung-Dong, Kangnam-Gu
Seoul, Korea

JIHYUN LEE. 1998. Marine water pollution assessment in Vietnam, p. 18. *In* **The Regional Workshop on Partnerships in the Application of Integrated Coastal Management.** 12-14 November 1997, Chonburi, Thailand. 167 p.

Abstract

Chinhae Bay in the south coast of Korea is the laboratory, which has been applying the challenging paradigm of integrated coastal management (ICM) since 1994. Specific goals of this pilot study were to develop an ICM model that is workable in the Korean coastal governance system and to identify area-specific solutions for the sustainable development of coastal resources.

The Korean government, directly and/or indirectly impacted by this study, established the Marine Development Basic Plan of 1996, setting national policy to establish the institutional mechanism of ICM. Specifically, the Korean government has been implementing the policy by enacting the Coastal Management Act and developing the National Coastal Management Plan. Such national efforts were strengthened by the creation of the Ministry of Maritime Affairs and Fisheries in August 1996, and by the transfer of coastal management authority from the Ministry of Construction and Transportation. The enhanced science and policy integration, which has been evolving into an adaptive management model, was the key factor leading the accelerated implementation of ICM policy development.

Developing an Integrated Marine Pollution Monitoring System in Xiamen, People's Republic of China

XU KUNCAN
Professor, Third Institute of Oceanography
State Oceanic Administration
178 Daxie Road
Xiamen 361004, People's Republic of China

HONG LIJUAN
Vice Director
Environment Monitoring Station of Xiamen Port Authority
93 Dongdu Road, Xiamen 361012
People's Republic of China

XU KUNCAN and HONG LIJUAN. 1998. Developing an Integrated marine pollution monitoring network of Xiamen, People's Republic of China, p. 19-25. *In* **The Regional Workshop on Partnerships in the Application of Integrated Coastal Management.** 12-14 November 1997, Chonburi, Thailand. 167 p.

Introduction

Marine pollution monitoring is one of the important links in the chain of environmental management. There were many isolated efforts on marine environmental monitoring in Xiamen. To improve monitoring efforts to address management needs, an integrated marine environment monitoring system has been established. The monitoring system has proven to be a vital instrument in the management framework for Xiamen marine waters with expected results.

Institutions of Marine Monitoring

The institutions for marine environmental monitoring in Xiamen are listed in ***Table 1.***

Table 1. Main Marine Monitoring Units in Xiamen.

Working Unit	Management Department	Work Area	Previous Monitoring Duty
Third Institute of Oceanography (SOA)	State Oceanic Administration (SOA)	Marine science research, monitoring technical study	1. Xiamen marine investing 2. Red tide study 3. Specific study tasks from SOA
Environmental Monitoring Station of Xiamen	Xiamen EPB	Environmental monitoring	1. Routine marine monitoring 2. Routine Nearshore monitoring 3. Xiamen seas monitoring tasks from EPB
Environmental Research Center of Xiamen University	State Education Committee	Environmental science research, education	Various tasks funded by the National Natural Science Fund
Monitoring Station of Fujian Fishery Institute	Fujian Aquaculture Department	Marine aquaculture, environmental monitoring	Routine marine aquaculture monitoring tasks from Fujian, Xiamen Aquaculture Department
Fujian Institute of Oceanography	Fujian Science and Technique Committee	Marine environmental research and study	
Monitoring Station of Xiamen Port	Xiamen Port	Port environmental monitoring	Routine port environmental monitoring (was not carried out before executing this subproject)

Past Problems

Problems in the past monitoring efforts can be summarized as:

- Since most monitoring work was funded by individual government departments, these efforts have gone in different directions. Work was not harmonized and often overlapped; human resources, finances and data exchange were inefficient.
- Monitoring was isolated from management. There was no feedback mechanism from monitoring to measures for management improvement. A part of the monitoring work failed to reach targets.
- Some data were not reliable. This problem was due to the poor awareness of quality control and lack of standard methodologies. Poor monitoring methodology also caused a low level of reliability and comparability of the data.
- There was high cost with low output of useful information.
- Monitoring data were not effectively utilized. Data were mainly provided by the researchers in the form of scientific papers, which were not suitable for use by managers and policy-makers.

Thus, a cross-sector marine monitoring was needed to overcome these problems and to meet management requirements.

The Xiamen Demonstration Project under the Regional Programme for the Prevention and Management of Marine Pollution in the East Asian Seas (MPP-EAS) has brought together the existing individual monitoring efforts, encouraged sharing of experience and information and developed a collaborative network and program under which monitoring efforts are optimized, resources are shared and methods, standards and results are exchanged.

Setting Up the Marine Monitoring Network

Network organization

Table 2 is a summary of the division of work among the network members.

Table 2. The Network of Marine Monitoring in Xiamen

Working Unit	Assignments
Third Institute of Oceanography, SOA	Routine water quality monitoring Poisonous residuals in organisms
Environmental Monitoring Station	Surface seawater quality monitoring
Environmental Research Center of Xiamen University	Sea bathing water monitoring
Monitoring Station of Fujian Fishery Institute	Aquaculture area monitoring
Fujian Institute of Oceanography	Sediment monitoring
Monitoring Station of Xiamen Port	Port environment monitoring

Each participating institution designates one coordinator. The coordinators then form a panel to guide the network activities. The terms of reference for coordinators are as follows:

- to carry out the integrated marine monitoring plan of Xiamen and to organize and coordinate the performance of the plan;
- to standardize the monitoring technique of the network;
- to organize training and interlaboratory analytical calibration;
- to supervise quality control and data examination;
- to summarize and analyze monitoring data, as well as to compile reports;
- to assess the results of environmental management and to provide suggestions for management improvement;
- to submit and exchange monitoring information; and
- to exchange data and cooperate within the Eastern Asia Marine Monitoring Network.

Incentives for participation in the network

For the first time, Xiamen has organized a cross-sectoral monitoring network. The network has shown certain advantages such as:

- Human resources and finances can be used more efficiently within an integrated monitoring plan for the network.
- Monitoring techniques and quality can be standardized. Data quality and comparability can be enhanced and the information provided can be more valuable.
- Data and information can be shared, which not only serves the integrated management of the Xiamen marine environment, but also helps address the monitoring needs of each participating sector.
- The monitoring capability and performance can be improved through cooperation, training and technical assistance among the network members.

Integrated Marine Pollution Monitoring Program

In order to successfully execute marine monitoring, a comprehensive monitoring plan and a team with high caliber technical expertise was needed.

The monitoring plan included six items:

- large-scale water quality monitoring;
- 24-hour continuous water quality monitoring at selected sites;
- monitoring of aquaculture areas and sea bathing water quality;
- port water quality monitoring;
- monitoring of poisonous residuals in organisms; and
- sediment monitoring.

Characteristics of the integrated monitoring program for the marine environment

- The monitoring program did not replace the existing sectoral monitoring plans of the participating institutions but sought coordination and standardization among them.
- The integrated monitoring program was comprehensive and systematic. For example, the monitoring of bathing water quality, continuous monitoring at selected sites, poisonous residuals in biota and sediment monitoring were included.
- Standards for data quality control were prepared and implemented. The monitoring work is under the supervision of the network, therefore data quality can be assured across the network.
- The program has taken the experiences and results from previous monitoring work. Pollution sources and hot spots, pollutant characteristics and monitoring results have been fully considered in the program.

Compilation of technical standards for marine pollution monitoring

A set of technical standards for monitoring marine pollution in Xiamen has been compiled to meet the requirements of monitoring techniques and data quality control. The standards include general monitoring protocols on sampling, sample storage, transportation and management, monitoring technique, data recording, calculation and quality control. Compared to national marine monitoring standards, the Xiamen standards are more practical.

Seawater Quality Standards in Xiamen

A basic principle that was adhered to when developing seawater quality standards in Xiamen (local standards) was that the local standard must be compatible with the national standard. Experiences from domestic and foreign standards were adopted and combined, taking into account environmental and socioeconomic conditions and the environmental management plan of Xiamen.

Local standards and national standards

Scope of application. The local standards define water quality management targets for various functional zones.

Water quality parameters. Eighteen parameters were chosen from the 34 parameters in the national standards. The selection was based on the Xiamen conditions and water use.

Standard values. Almost all the water quality standard adopted in Xiamen were the same as the national standards. However, maximum values for suspended particle material (SPM) and temperature were added.

Monitoring sea water quality. Details about monitoring parameters, sampling station, sampling type, sampling frequency and layers for each monitoring project (including routine monitoring, functional zone monitoring and emergency monitoring) were defined. Methods of sample collection, storage, transportation, analytical methods and data processing were detailed.

Capacity Building Activities

Interlaboratory analytical calibration in the monitoring network

An interlaboratory analytical calibration was conducted among the network members for the first time in Xiamen before carrying out the monitoring program. Samples included standards and real samples, e.g., water, sediment and organisms. The monitoring parameters included nutrients, petroleum and heavy trace metals. The results of the calibration were significant. Many laboratories accurately analyzed most items. However, it was also learned that a few laboratories need to improve their analytical techniques.

Workshops in marine environmental monitoring at the Xiamen demonstration site

Workshops in marine environmental monitoring were held to increase awareness of the monitoring results. The workshops addressed the following topics:

- the effective use of marine environmental monitoring in managing sea area;
- the design and illustration of the integrated marine monitoring program;
- the compilation and introduction of marine monitoring standards;
- quality control and assurance; and
- data management and reporting.

Monitoring to Address Management Needs

The following approaches were adopted for the assessment.

Pollution index

If the pollution index (the value of analytical results divided by the standard value of water quality) is less than or equal to 1, the parameter meets the requirement of water quality; otherwise the parameter does not meet the requirement of water quality.

The results of the Xiamen Sea water quality assessment showed that the concentrations of phosphorous (P) and non-ion ammonium are less than standard values, but the total nitrogen (N) apparently beyond the standard values.

Determining the ratio of N to P

In Xiamen Sea water, the ratio of N to P is higher than 16:1, especially in spring. Therefore, to avoid eutrophication, the concentration of P is a control element and an important monitoring parameter. The high ratio of N to P may change the composition of plankton communities and enhance the possibility of red tide occurrence.

Monitoring the effectiveness of management interventions

From 1980 to 1996, the GNP of Xiamen increased 20 times and the population doubled. However, these have not led to a corresponding level of deterioration in marine environmental quality due to effective management interventions.

The levelling off of nutrients is believed to be a direct result of pollution management interventions. From 1981 to 1996, the total amount of chemical oxygen demand (COD) discharges from industrial sources into Xiamen coastal waters was reduced from 25,100 tons to 3,200 tons. Nevertheless, the amount of COD from municipal sewage discharges increased from 4,900 tons to 25,000 tons. The cumulative effect was that the total amount of COD remained at the same level (see ***Figure 1***).

Within the Western Sea area of Xiamen, variations in average concentrations of nutrients have occurred over the past ten years. The average levels of nitrogen and phosphate, which are believed to trigger red tide occurrence, were 0.100 mg/l and 0.015 mg/l, respectively. Average concentrations of total nitrogen, nitrate and phosphate in 1996, although beyond the red tide thresholds, were lower than those in 1986. On balance, nutrient concentrations levelled off during the past ten years, except for a slight upward trend for ammonia which merits attention (see ***Figure 2.***). Red tide events were observed in the Western Sea of Xiamen in 1986 and 1987, but not after 1990.

Figure 1. COD discharges in Xiamen coastal waters, 1981-1996.

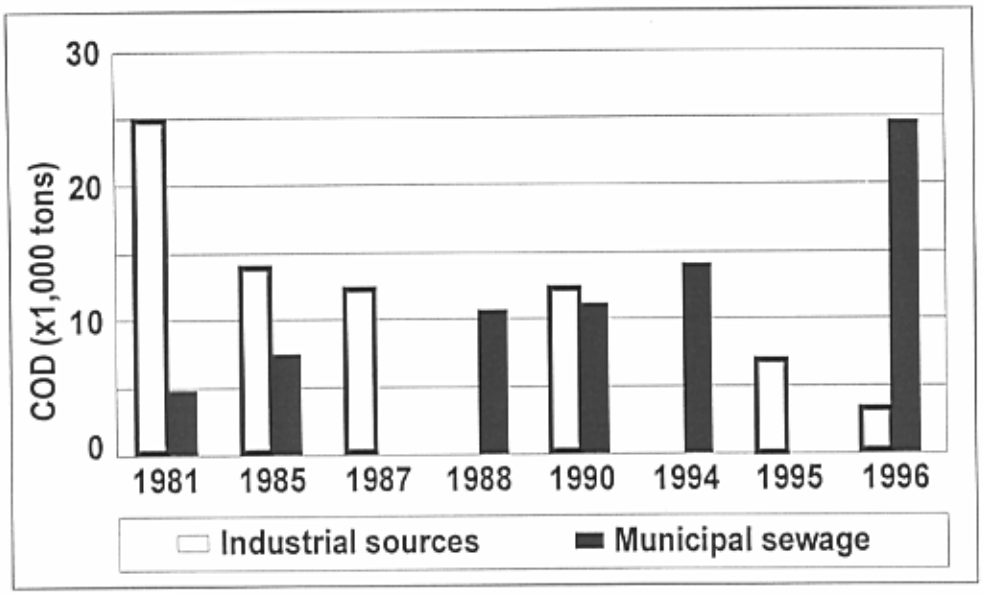
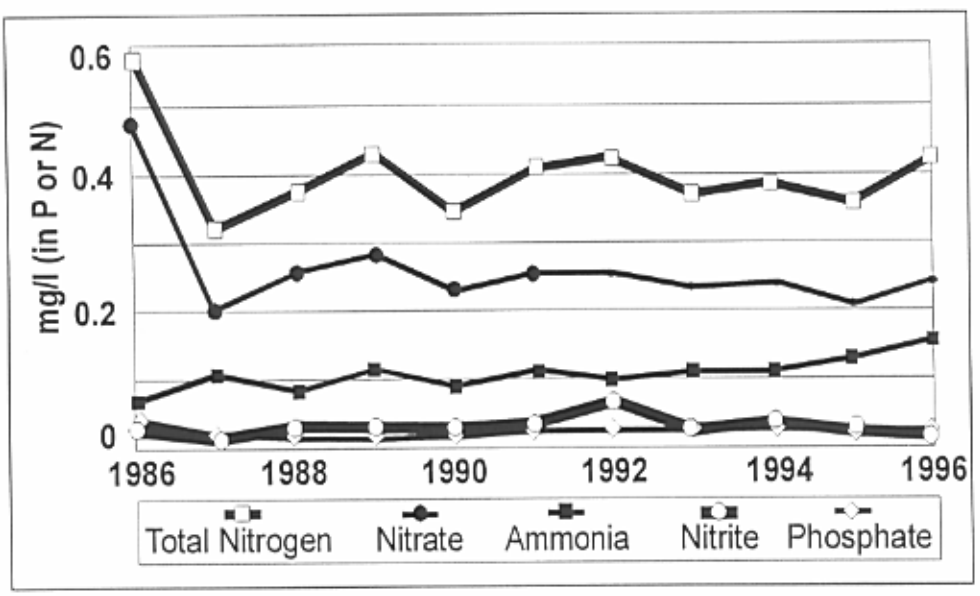


Figure 2. Average nutrient levels in western coastal waters of Xiamen, 1986-1996.



Marine Water Pollution Assessment in Vietnam

Pham Van Ninh
Director
Center for Marine Environment Survey Research and Consultation
244 Dai Can, Hanoi, Vietnam

PHAM VAN NINH. 1998. Marine water pollution assessment in Vietnam, p. 26-39. *In* **The Regional Workshop on Partnerships in the Application of Integrated Coastal Management.** 12-14 November 1997, Chonburi, Thailand. 167 p.

Abstract

This paper is a review of the results from marine water quality assessments and environmental impact assessments for a number of projects of the oil and gas industry, ports and transportation, coastal tourism, and in a number of scientific and environmental protection projects carried out in various Vietnamese marine areas. Results of monitoring activities for 15 sites along the coast are reported.

Some aspects of the marine environment status assessment and monitoring, such as ongoing projects, programs, data processing and analysis, the linkage of assessment and monitoring activities with coastal and marine management, capacity-building, the role of international assistance including Sida/CMC/IMO, are also discussed.

Introduction

Vietnam has over 3,200 km of coastline and a claimed Exclusive Economic Zone of about 1 million km^2. The marine areas play a more and more important role in the socioeconomic development of the country. Together with the development process, Vietnam is facing serious environmental issues, among which the potential pollution of its marine waters must be one of highest interest. For the past years, marine water quality assessment was provided in the framework of a number of environmental and scientific projects, of the marine zone monitoring network and of the EIA carried out for oil and gas, other industrial, tourism, transportation and port building projects

This paper presents a general pollution status of the marine areas surrounding Vietnam and some aspects related to marine water pollution assessment in Vietnam such as ongoing projects, programs, data processing and analysis, the linkage of assessment including monitoring activities with coastal marine management, capacity-building, the role of the international assistance including the Sida/CMC/IMO Project.

Information Sources

As noted above, only marine water pollution assessment will be presented here. The information sources are as follows:

- *Environmental and Scientific Projects*

    - Assessment of riverine pollution input into the sea, state project KT.03.07, 1991–1995.
    - Status assessment of the marine oil pollution, state project, KT.03.21, 1991–1995.

- The Cuu Long Project on the Mekong Delta, pilot phase, state project, 1996–1997.
- Natural conditions at the entrance of the Gulf of Tonkin, state project, 1995–1997.
- Natural conditions around the Con Dao Island, Ministerial project 1994–1995.
- Halong Bay Pollution Study, state project, 1996–1997.
- Environmental studies for the Cai Lan Port (Quang Ninh province), Vung Ang (Ha Tinh province), Chan May (Thua Thien Hue province), Dung Quat (Quang Nam province), Van Phong (Khanh Hoa province), for the tourism planning of Vung Tau (Ba Ria province), Nha Trang (Khanh Hoa province), Sam Son (Thanh Hoa province), Cat Ba-Do Son (Hai Phong city) 1994–1997.

Many earlier studies on hydrometeorology covering very large marine areas have been conducted in the framework of Vietnam-USSR cooperation, within which marine water chemistry was one of the principal items, state project 1992–1995.

- *Reports on Marine Water Monitoring, 1996*
- *EIA Reports for Oil and Gas Exploration and Exploitation Projects*
- *EIA Reports for Other Industrial Projects*

Apart from the listed information sources in this paper, the water quality consideration conducted for various other industrial projects has been also used.

- *Parameters of Assessment*

In general the following parameters are of interest in coastal and marine water quality consideration:

- Wind, air temperature and water speed
- Ordinary hydrochemical parameters: T, S, pH, DO, COD, BOD, SS and TY
- Nutrients: PO_4^{-3}, NO_2^-, NO_3^-, NH_4^+ and SiO_2
- Heavy metals: Cu, Zn, Pb, Hg, As and Cd
- Hydrocarbon
- Coliform
- Pesticides

Methodologies

The methodologies for sampling, preservation, handling, sample analysis and data processing are given in Vietnamese state standards: Coastal water quality standard TCVN 5943–1995 together with its related guidelines.

The concentration of allowed values of contaminants is given in ***Table 1.***

Table 1. Coastal Water Quality Allowed Values (in mg/l).

Contaminant	KT.03.07 Project			Coastal water standard 1995		
	Swimming	Aquaculture	Other	Swimming	Aquaculture	Other
pH	6.5÷8.5	6.5÷8.5	6.5÷8.5	6.5÷8.5	6.5÷8.5	6.5÷8.5
DO	> 4	> 5	> 4	> 4	> 5	> 4
BOD	< 20	< 10	< 20	< 20	< 10	< 20
SS	< 20	< 50	< 200	25	50	200
COD	< 40	< 30	< 40			
NO_3^-	0.5	0.5	3			
NO_2^-	0.001	0.002	0.002			
NH_4^+	0.1	0.5	0.5	0.1	0.5	0.5
PO_4^-	0.65	0.1	0.1			
SiO_2	3	3	3			
Oil	0.03	0.03	0.05	0	0	0.3
As	0.05	0.01	0.05	0.05	0.01	0.05
Cd	0.005	0.005	0.01	0.005	0.005	0.01
Pb	0.1	0.05	0.1	0.1	0.05	0.1
Cu	0.02	0.01	0.02	0.02	0.01	0.02
Zn	0.1	0.01	0.1	0.1	0.01	0.1
Hg	0.005	0.005	0.01	0.005	0.005	0.01
Ni	0.01	0.002	0.01			
Co	0.0005	0.0005	0.0005			
Mn	0.1	0.1	0.1	0.1	0.1	0.1
Fe	0.1	0.1	0.3	0.1	0.1	0.3

Riverine Pollution Input Assessment

Vietnam is rich in rivers. There are more than 2,500 rivers, each >10 km long. The total area of watersheds in the Vietnamese territory is 230.000 km² or 70% of the Vietnamese land. The river density is 0.6 km/km² and for 3/4 Vietnamese land it is 1.0–1.5 km/km². On average, there is a river mouth in a 20 km length of the coast. In total, there are 8 big river systems. The water quality and assessment of the river pollution input has been made for 6 of them.

Thai Binh River System

The yearly gross fluxes of contaminants transported by the Thai Binh River are presented in ***Table 2***.

Table 2. Yearly Gross Fluxes (tons/year) of Contaminants Transported by the Thai Binh River.

Contaminant	Cu	Pb	Cd	Zn	Co	Ni	As	Hg	NO_3^-	PO_4^{-3}
Gross flux	3,974.2	1,54.3	1,63.9	3,352.0	19.8	1,11.0	32.5	16.5	10,466.3	9,887.5

The average concentration of contaminants for the Thai Binh River are shown in ***Table 3.***

Table 3. Average Concentration (10^{-3} mg/l) of Contaminants in the Thai Binh River.

River	Area	Cu	Zn	Cd	Ni	Co	Pb	Hg	As	NO_3^-	PO_4^{-3}
Kinh	River	84.0	76.0	3.8	1.8	0.5	3.1	0.3	6.9	212.0	220.0
Thay	Mouth	71.0	57.9	3.2	2.1	0.7	2.7	0.4	8.2	490.0	210.0
River	Marine	54.6	54.7	2.0	2.0	0.3	2.3	0.4	8.1	98.4	171.0
Thai	River	81.0	63.0	3.1	1.9	0.3	3.3	0.4	7.4	221.0	211.0
Binh	Mouth	80.8	56.7	3.1	2.3	0.8	2.7	0.4	6.5	250.3	260.5
River	Marine	66.0	40.8	4.3	1.8	0.5	2.2	0.4	5.7	177.5	112.0

Compared with the allowed values from Table 1, it can be said that the river mouth and marine area of the Thai Binh River are polluted already by Cu, Zn and PO_4^{-3}.

Hong River System

The Hong River is the second biggest river system in Vietnam. Results of the assessment on this river can be seen in ***Tables 4*** and ***5***, which show that water in the mouth and marine area of the Hong River has a concentration of Cu, Zn higher than allowed and a PO_4^- in the river mouth area higher than allowed for aquaculture use.

Table 4. Yearly Gross Fluxes (tons/year) of Contaminants Transported by the Hong River.

Contaminant	Cu	Pb	Cd	Zn	Co	Ni	As	Hg	NO_3^-	PO_4^{-3}	NH_4^+	DDT
Gross flux	2,817	730	118	2,015	254	142	448	11	14,860	24,602	352	400

Table 5. Average Concentration (10^{-3} mg/l) of Contaminants for the Hong River.

Contaminant	Area	Cu	Zn	Cd	Ni	Co	Pb	Hg	As	PO_4^{-3}	NO_3^-
Dry season	River	36.7	35.6	2.8	2.3	5.6	17.0	0.075	9.4	120	307
	Mouth	37.2	47.6	3.3	2.7	8.2	8.1	0.504	21.3	70	144
	Marine	5.7	22.8	2.9	2.6	7.1	5.5	0.02	20.4	30	90
Wet season	River	63.0	75.0	4.6	3.4	9.6	10.7	0.24	12.7	448	728
	Mouth	43.0	55.0	4.2	4.0	9.6	12.5	0.32	7.7	224	121
	Marine	19.2	53.3	4.1	2.3	8.7	8.1	0.25	6.5	77	85

Han River

Results of the assessment for the Han River are shown in ***Table 6***, which show that water in this river is polluted by Fe, Zn and NO_3^-.

Table 6. Contaminant Concentration (10^{-3} mg/l) and Gross Fluxes (tons/year) for the Han River.

Cont.	SS	COD	NO_3-N	PO_4-P	SiO_3-Si	N orga.	P orga.	Fe	Mn	Cu	Pb	As	Zn
Conc.	26,300	910	434	8.3	2,576	1,003	49.5	341	30.8	6.5	2.0	1.4	10.1
Gr flux	194,136	3,236	2,475	36.3	6,204	4,127	26	1,782	126	37	16	28	79

Thu Bon River

For the Thu Bon River, results of the assessment are found in ***Table 7***, showing that NO_3, Fe, As and Zn are higher than allowed.

Table 7. Gross Fluxes (ton/year) of Contaminants Transported by the Thu Bon River.

Contaminant	Si	N	P	Fe	Zn	Cu	Pb
Gross flux	10,910	8613	265	2849	192	62	16

Sai Gon–Dong Nai River

For this river, results of the assessment are found in ***Table 8***.

Table 8. Gross Fluxes (ton/day) of Contaminants Transported by the Sai Gon-Dong Nai River.

Contaminant	SS	NO3	PO4	SiO2	Pb	Zn	Hg
Gross flux	57.00	218.00	28.00	6.90	0.28	211.00	0.07

Table 9. Contaminant Concentration (10^{-3} mg/l) in the Ganh Rai–Soai Rap Bay.

Contaminant	Cd	As	Ni	Co	Hg	Zn
Concentration	1.0-4.2	2.2-6	1.0-2.7	0.3-1.2	0.01-0.02	0.001-0.01

The river mouth region is polluted by organic and nitrogen contaminants. NT is 0.5–1.9 mg/l; BOD is 4–5 mg/l.

The Tieu and Dai Rivers of the Mekong River System

In the framework of the KT.03.07 Project, research has been conducted only for two north branches: Tieu and Dai Rivers. Results of the assessment are in ***Table 10***.

Table 10. Gross Fluxes (ton/day) and Contaminant Concentrations (mg/l).

Contaminant	Dry season		Wet season	
	Concentration	Flux	Concentration	Flux
SS	270.000	5,249.00	310.0000	104,190.00
NH_4-N	0.040	0.80	0.0100	3.40
NO_3-N	0.110	2.10	0.4500	151.00
PO_4-P	0.070	1.40	0.0200	6.80
SiO_2	4.500	87.00	5.5000	1,848.00
COD	24.000	466.60	5.0000	1,680.00
Org.Chlorine			trace	
Pb	0.002	0.04	0.0030	1.00
Zn			0.0210	7.00
Cu			0.0300	10.00
Cd			0.0020	0.70
As			0.0160	5.40
Hg			< 0.0002	< 0.07

It can be said that the water in the marine coastal zone of the Mekong delta is still clean (with exception of hydrocarbon which is a problem for the all other river mouth regions). The most recent results obtained during the EU Cuu Long Project confirm this conclusion.

Apart from the above assessments, in the framework of the KT.03.07 Project the assessment of the marine water region affected by contaminants transported by river flows has been also conducted using remote sensing techniques and mathematical modelling (Ninh and Vinh 1995).

Assessment for the Whole Country

Extrapolation has been made from the results obtained for the studied 6 river networks to the whole country. Results are shown in ***Table 11***.

Table 11. Gross Fluxes (ton/year) for the Whole Country.

Region	Cu	Pb	Cd	Zn	Co	Ni	As	Hg	PO_4^-	NO_3^-
North	6,791	885	282	5,367	274	253	790	28	24,748	35,068
Central	293	76		676			44		1,253	4.013
South	11,000	1,102	800	15,696	230	270	1,600	105	28,220	191,570
Country	18,084	2,063	1,082	21,739	503	523	2,407	134	54,221	230,710

It is estimated that yearly the rivers of Vietnam discharge 200–250 million tons of alluvia, 900 billion m^3 water.

It should be concluded that the concentration of hydrocarbon in general is higher than allowed in almost all of the river mouths and adjacent regions.

Oil Pollution Assessment

The state project KT.03.21 "Status assessment of the marine oil pollution" 1991–1995 in the framework of the National Programme for Marine Research has been conducted with the coordinating role of the Institute of Hydrometeorology. Based on the field surveys carried out jointly by Vietnam and USSR, as well as a number of fieldwork carried out within this project, a general oil pollution picture in the sea surrounding Vietnam has been obtained (Minh 1995). Following the Project's report, the studied marine areas are divided into 7 regions:

Region 1 is in the north of the Gulf of Tonkin
Region 2 is in the south of the Gulf of Tonkin
Region 3 is the area from Da Nang to Vung Tau
Region 4 is the area around the Parracels (Hoang Sa Islands)
Region 5 is the area from Vung Tau to Ca Mau
Region 6 is the area around the Spratlys (Truong Sa Islands) and the international oceanic lines
Region 7 is the area of the Gulf of Thai Lan.

It can be said the Gulf of Tonkin (Regions 1 and 2) and the area surrounding the Spratlys (Region 6) are of the highest oil concentration values due to the semi-enclosed character of the first area and to the active international oceanic lines in the second one. For most of the Vietnamese continental shelf, the oil concentration does not exceed 0.03 mg/l. Results obtained during the field surveys jointly organized by Vietnam and USSR in 1992–1995 showed an oil concentration average value less than 0.025 mg/l. The overall assessment can be presented in ***Table 12***.

Table 12. Average Oil Concentration (mg/l) for 7 Regions in Summer and Winter.

Region	Summer	Winter
1	0.021	0.045
2	0.022	0.033
3	0.012	0.020
4	not clear	not clear
5	0.016	0.025
6	0.034	0.029
7		0.020

For the river mouth region and the coastal zone, oil concentration can exceed 0.05 mg/l. The findings in the framework of the KT.03.07 Project (Ninh et al. 1995) show the same conclusion.

Figures 1 and ***2*** show the oil concentration in summer and winter, respectively.

The EIA for a number of EIA and other industrial projects shows that various coastal areas, especially those located near river mouths, urban areas or cities are polluted by oil and grease. It is true for the port development projects at Ki Ha in Da Nang (Hac Beo Ltd. 1996), (Old Ship and Metal Ltd. 1995), Chan May in Thua Thien province (Hoi 1997), Vung Ang in Ha Tinh province (Ninh 1996a), Dung Quat (Ninh 1996b), as well as for other projects at Vung Tau, Sam Son, Red River delta coastal zone (Ninh et al. 1996a, 1996b, 1996c). Hoi (1997b) says that generally the coastal zone of Vietnam is slightly polluted by oil. Oil pollution

is observed in earlier reports on Vietnam's environmental status (MOSTE 1994, 1995, 1996). There is an increasing tendency of oil concentration in coastal waters for the past years.

Oil pollution is of great concern in Vietnam. Oil pollution, including oil spills, is one of the first marine environment issues Vietnam is facing. From 1989 to 1996, there were 12 reported oil spills, among them the *Catlai* accident discharged 1,700 tons of oil into the coastal zone water (Thang 1996).

A risk assessment of oil slick reaching the coast has been made showing the distribution of its possible monthly distribution along the coast of the south from Binh Thuan province to the Ca Mau Cap, where the marine oil and gas industry, transportation, storage, processing and other marine activities are most dynamic in the whole country. This assessment is based on simulation of the movement of an oil slick from accidents assumed to occur at oceanic lines and actual drilling oil and gas blocks with the wind drift and tidal currents taken into account.

According to this assessment the distribution of this kind of risk is as follows (Ninh and Vinh 1995):

Yearly Distribution (in %) of Oil Slick Landing Risk by Province.

Minh Hai	Soc Trang	Tra Vinh	Ben Tre	Tien Giang	TP. HCM	BaRia-VTau	Binh Thuan	Ninh Thuan	Con Dao	Phu Quy
11.56	11.97	10.56	3.52	2.11	2.82	9.15	14.79	0	16.20	18.31

Monthly Distribution (in %) of Oil Slick Landing Risk.

Jan.	Feb.	Mar.	Apr.	May	Jun	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
14.79	14.79	12.68	9.85	3.52	4.42	4.42	4.42	2.81	5.63	10.56	12.67

Monitoring Results

A Marine Environmental Monitoring Network has been established by the Ministry of Science, Technology and Environment (MOSTE) since 1996, involving 4 institutions: Hai Phong Branch Institute of Oceanography (HIO), Center for Marine Environment Research, Survey, Consultation (CMERSC), Institute of Oceanography (IO) and an Environmental Center of the Navy (ECN). They are responsible for monitoring the marine environment of the coastal zone of the Gulf of Tonkin from Quang Ninh to Ha Tinh; Central Vietnam from Quang Binh to Phu Yen; and South Vietnam from Khanh Hoa to Kien Giang and some parts of the open sea.

Indeed, HIO has started the monitoring activities since 1975. Within this network there are 18 acting stations in 1997 given in the ***Table 13***.

Figure 1. Oil Concentration Distribution in Summer (10^{-3} mg/l).

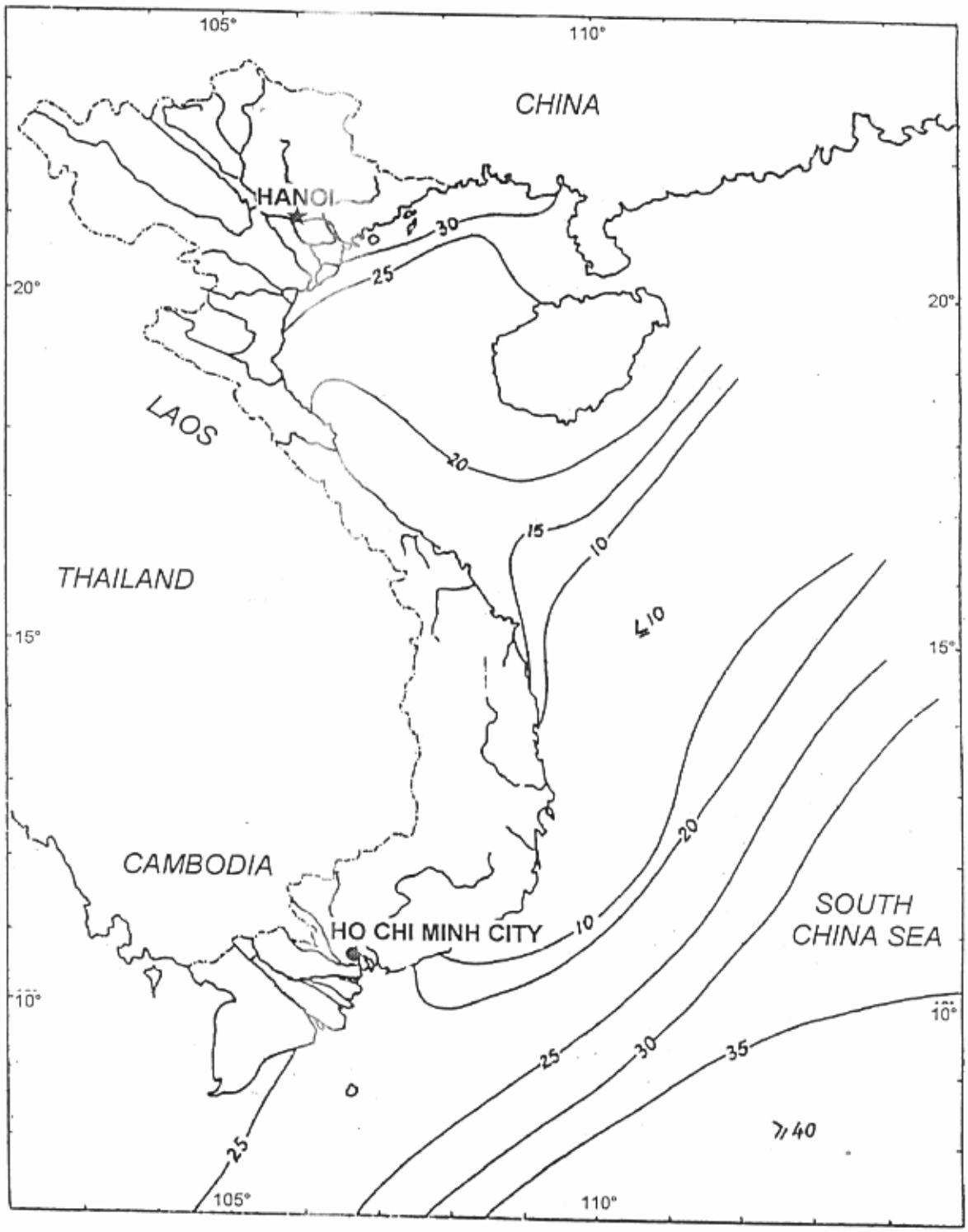


Figure 2. Oil Concentration Distribution in Winter (10^{-3} mg/l).

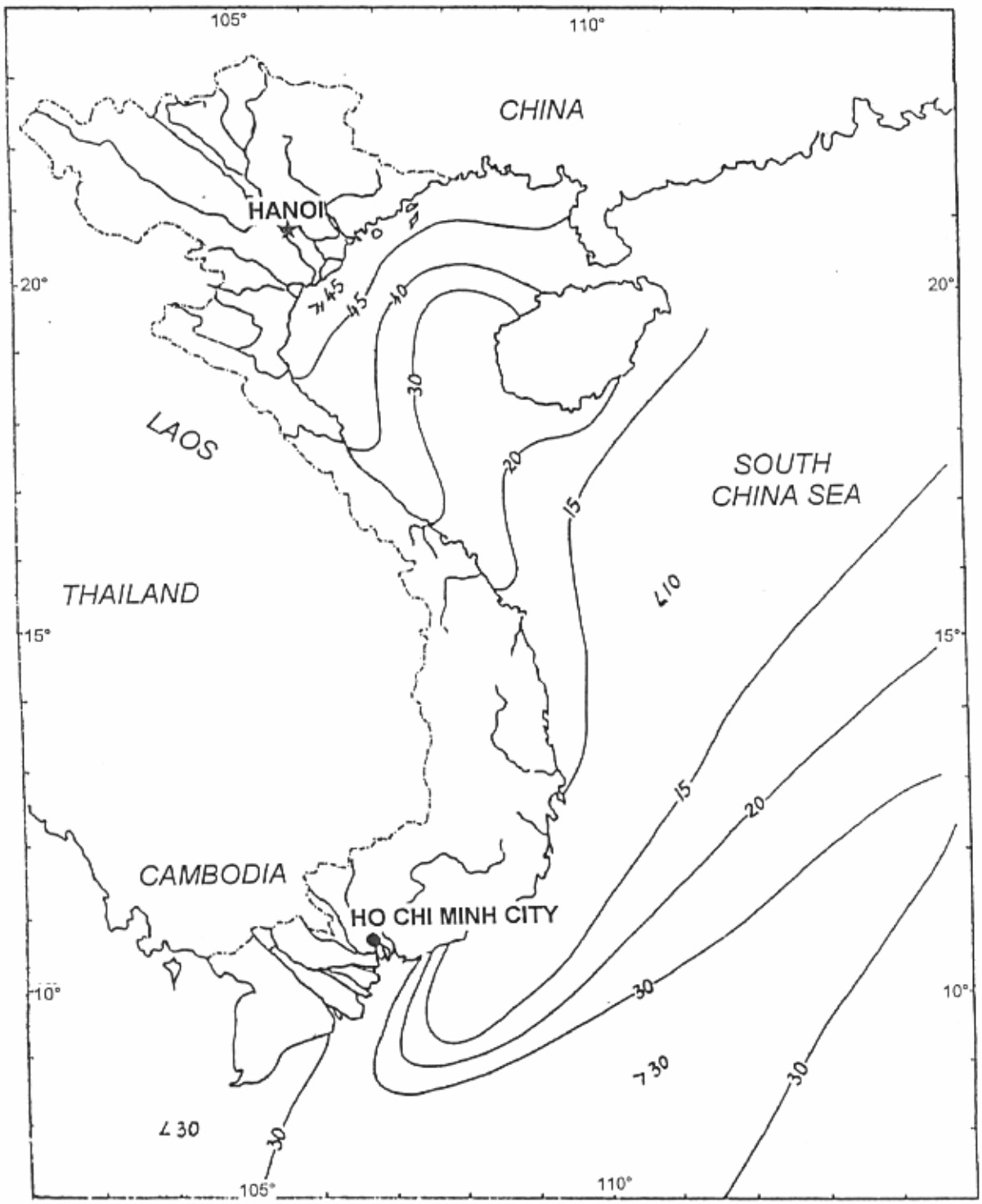


Table 13. Marine Environmental Monitoring Station, 1975.

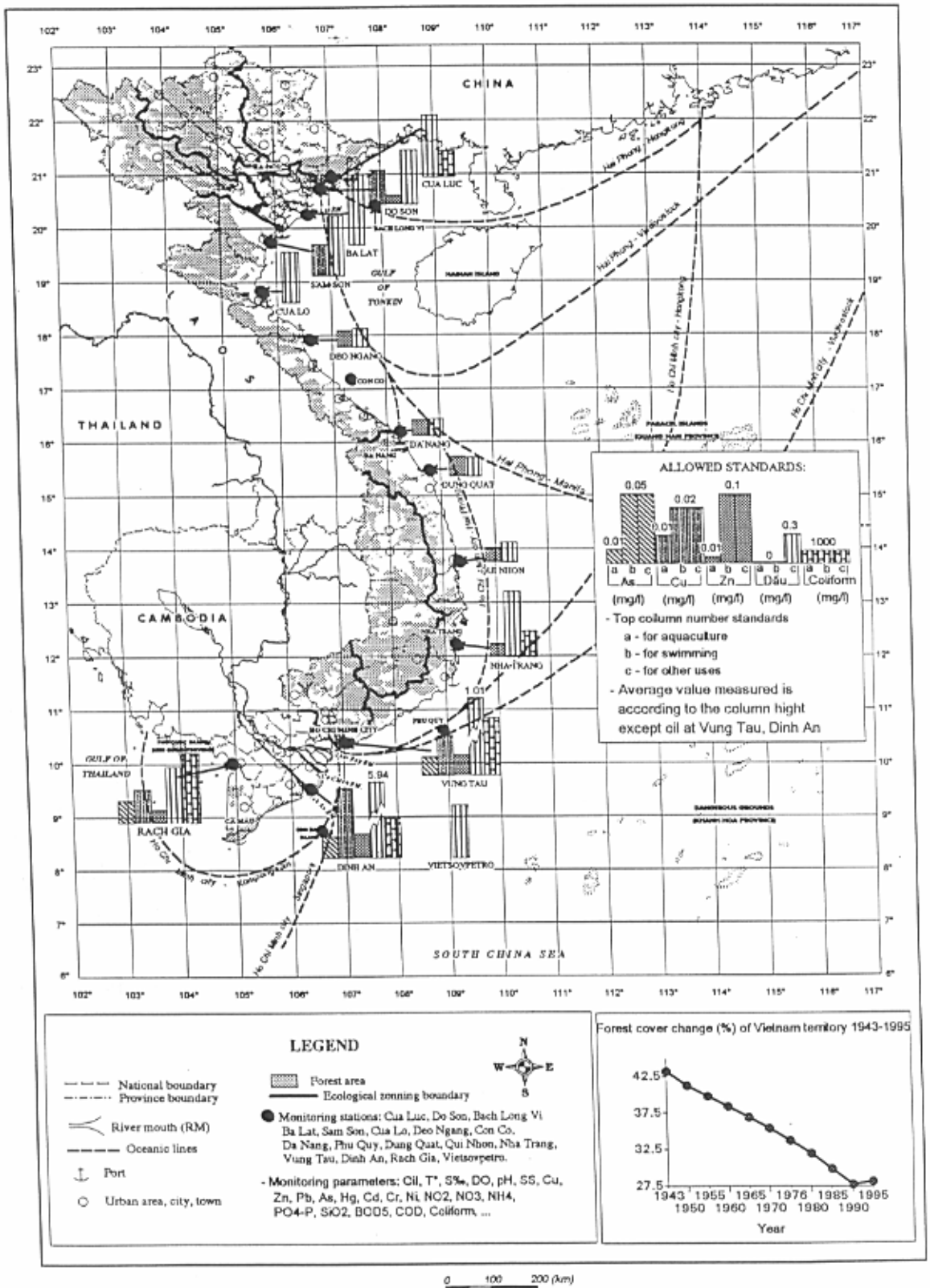
N	Station name	Coordinates	Province	Station type
	HIO			
1	Cua Luc	20°57'00" N, 107°03'30" E	Quang Ninh	
2	Bach Long Vi	20°08' N, 107°43' E	Quang Ninh	Baseline
3	Do Son	20°43'00" N, 106°50'00" E	Hai Phong	
4	Ba Lat	20°15'00" N, 106°36'30" E	Nam Dinh	
5	Sam Son	19°43'42" N, 105°53'57" E	Thanh Hoa	
6	Cua Lo	18°44'36" N, 105°43'00" E	Nghe An	
	CMESRC			
7	Deo Ngang	17°54'42" N, 106°34'30" E	Quang Binh	
8	Con Co	17°05'00" N, 107°20'00" E	Quang Binh	Baseline
9	Da Nang	16°11'54" N, 108°15'00" E	Quang Nam	
10	Dung Quat	15o28'7" N, 108o47'25" E	Quang Ngai	
11	Qui Nhon	13°45'24" N, 109°18'90" E	Binh Dinh	
	IO			
12	Nha Trang	12°12'45" N, 109°13'12" E	Khanh Hoa	
13	Vung Tau	10°23'27" N, 107°01'05" E	Ba Ria-Vung Tau	
14	Dinh An	9°31'51" N, 106°20'54" E		
15	Rach Gia	10°00'26" N, 104°56'20" E	Kien Giang	
16	Phu Quoc	10°33'00" N, 108°56'42" E	Binh Thuan	Baseline
	NAVY			
17	Vietsovpetro	9°33'- 9°51 N, 107°49 - 108°12' E	Ba Ria-Vung Tau	
18	Con Dao	8°34'- 8°44' N, 106°31' - 106°45' E	Ba Ria-Vung Tau	

It can be said that the marine water quality assessment conducted within the MOSTE network is best organized in Vietnam. All things like monitoring parameters, time, frequency, methodology for sampling, preservation, handling and analysis of samples, the format of data and synthesis reporting are determined by guidelines of the MOSTE National Environment Agency.

Apart from the parameters in the Information Sources section, other parameters are been being examined during each monitoring. They are sediment sampling for nutrient, hydrocarbon and heavy metal analysis, sampling for zoo- and phytoplankton species and biomass determination, observation of the phenomena which can affect the quality of monitoring and can provide additional information for assessment of the marine environment at the monitoring sites, such as oil slicks, mangroves and coral reef changes, socioeconomic projects, etc.

The pollution parameters in ***Figure 3*** show that oil, Zn, Cu, As and coliform are the alarming contaminants of the sea surrounding Vietnam.

Figure 3. Marine Water Pollution Assessment from Monitoring Stations.



Results of the EIA for other projects including ports and tourism development show that in many small areas of the coastal zone the polluting parameters can also be Fe, Cu, Zn, COD, coliform (Hoi 1997 in MOSTE 1997). For example:

- The Con Dao marine water (Ninh 1995) has PO_4 in a range of 0.01–0.12 mg/l, Zn of 0.05 mg/l, Cu of 0.025 mg/l.
- The Vung Tau area water (Ninh 1996a) has BOD of 2.0–3.2 mg/l at Bai Truoc; COD of 6–48 mg/l at Bai Truoc, 8 mg/l at the oil and gas port; NO_3-N of 0.05–0.87; and NH_4-N of 0.03–0.076 mg/l.
- Ki Hoa–Da Nang is seriously polluted by Pb, Xn and Hg
- The Dung Quat area is polluted by Fe, Cu, Pb and coliform.

Overview of Pollution Assessment Capacity and Needs

It can be estimated that, in general, the Vietnamese marine waters are still clean except in some river mouths and sea ports, where oil, coliform, Cu, Zn and some nutrients are higher than allowed values. Oil pollution is most common in the coastal waters of Vietnam.

As described above, marine water pollution assessment is of high attention in Vietnam. Results obtained in the accomplishment of scientific and environment projects, in the preparation of EIA for marine industrial and economic projects and in carrying out monitoring activities can already give a general view of the pollution status of the waters surrounding Vietnam. Results of the pollution assessment are used in the yearly report on the environment status submitted by MOSTE to the National Assembly, in raising the awareness of the people on environmental issues and in some cases it can affect decisions on investment or development planning. However it should be noted that the role of a such assessment is still quite modest and should be strengthened.

In the future, all of these information sources will still be useful and necessary for marine pollution assessment.

As required by the environmental protection law, every significant project needs an EIA approved by MOSTE or by the Provincial Department of Science, Technology and Environment (DOSTE). Together with the country's economic development, many similar projects will be conducted in coastal and marine waters and they can serve as baseline data on the status of the marine environment. Furthermore, each EIA has to have a monitoring program which must be realized after the EIA is approved. This can make an significant contribution to the whole country marine environment assessment.

The environment component is considered in almost every marine scientific project and program in Vietnam. Such projects and programs include the:

- National Programme for Marine Research 1996–2000
- EU Cuu Long Project
- Ha Long Bay, Van Phong Tourism Projects 1997–1998
- Vietnam Philippines Joint Cruise II 1998
- ASEAN-Canada Marine Cooperative Programme expansion of phase II, 1997-1998.
- ASEAN-Australia Cooperative Programme. 1997-1998, and the marine environmental projects undertaken by National Environment Agency, MOSTE.

It is hoped that the role of the marine environment monitoring network will be improved. This can be done through the expansion of more stations, cross sections included in monitoring with much higher frequency and many other indicators not only for water pollution assessment but also for marine environment assessment.

It is still difficult to make any quality assurance/quality control (QA/QC) for the marine environment/pollution assessment in Vietnam, and it is necessary to enhance the monitoring capacity of the institutions dealing with this.

It can be realized through staff skills training and supply of necessary equipment. Technology transfer is needed for all stages of the monitoring procedure, from the choice of monitoring parameters, place of sampling, handling and analysis of samples. The Government of Vietnam should pay more attention to this. And, in connection with this, international assistance is desired. Canada, through some projects, is offering assistance in criteria formulation, red tide and toxicity testing and some aspects of monitoring techniques.

The Hai Phong Branch Institute of Oceanography and the Institute of Oceanography in Nha Trang have been supported by the Sida/CMC/IMO Project, which is concentrated mostly in increasing the monitoring capacity of these institutions. After many training courses and significant equipment supply, HIO and IO can now provide better monitoring and can make a much more essential contribution to marine environment monitoring in particular and to marine environment assessment in general.

References

Hac Beo Ltd. 1996. EIA for Ki Ha port development. Ministry of Science, Technology and Environment.

Hai Phong DOSTE. 1994. Environmental status of Hai Phong City, Hai Phong Department of Science, Technology and Environment.

Hoi, N.C. 1997a. Environmental protection measures in Chan May Port development planning. Ministry of Science, Technology and Environment.

Hoi, N.C, 1997b. Vietnam environment status 1997.

Minh, T.D. 1995. Oil pollution in the sea surrounding Vietnam, state project KT.03.21, National programme for marine research 1991-1995, final report. Ministry of Science, Technology and Environment.

MOSTE. 1994. Vietnam environment present status 1994. Ministry of Science, Technology and Environment.

MOSTE. 1995. Vietnam environment present status 1995. Ministry of Science, Technology and Environment.

MOSTE. 1996. Vietnam environment present status 1996. Ministry of Science, Technology and Environment.

MOSTE. 1997. Vietnam environment present status 1997. Ministry of Science, Technology and Environment.

Ninh, P.V. et al. 1995. Riverine pollution input assessment. State project KT.03.07, National programme for marine research 1991-1995. Final report. Ministry of Science, Technology and Environment.

Ninh, P.V. and P.N. Vinh. 1995. Assessment of oil slick landing the coast of the South Vietnam. State project, final report.

Ninh, P.V. 1996a. Environmental protection measures in Vung Ang Port development planning. Ministry of Science, Technology and Environment.

Ninh, P.V. 1996b. EIA for Dung Quat port development planning. Ministry of Science, Technology and Environment.

Ninh, P.V. et al. 1996a. EIA for Vung Tau tourism development. Ministry of Science, Technology and Environment.

Ninh, P.V. et al. 1996b. Environmental protection measures for the north economic zone of economy development. Ministry of Science, Technology and Environment.

Ninh, P.V. et al. 1996c. EIA for Sam Son tourism development. Ministry of Science, Technology and Environment.

Old Ship and Metal Ltd. 1996. 1995 EIA for Ki Ha port development. Ministry of Science, Technology and Environment.

Thang, H.C. 1996. Oil spills and oil pollution in Vietnam report. Ministry of Science, Technology and Environment.

The BCRMF and Its Role in the Environmental Management of Batangas Bay, Philippines

FREDERICK CONTRERAS
BCRMF Secretary
Environmental and Quality Management Technologist
Shell-Philippines
Tabangao, Batangas City
Philippines

FREDERICK CONTRERAS. 1998. The BCRMF and its role in the environmental management of Batangas Bay, Philippines, p. 40-44. *In* **The Regional Workshop on Partnerships in the Application of Integrated Coastal Management**. 12-14 November 1997, Chonburi, Thailand. 167 p.

Abstract

The paper gives an activity overview of the Batangas Coastal Resources Management Foundation (BCRMF), a group of private companies established in 1991 working for the sustainable development of Batangas Bay, in a cooperative effort with the Batangas Bay Demonstration Project (BBDP) of the Global Environment Facility (GEF)/United Nations Development Programme (UNDP)/International Maritime Organization (IMO), Batangas Provincial Government-Environment and Natural Resources Office (PG-ENRO), and the Department of Environment and Natural Resources (DENR) in the Philippines.

Also presented are the BCRMF's role in the BBDP especially in relation to the Integrated Waste Management Action Plan (IWMAP); its achievements in 1996-97, e.g. sharing of experiences on waste management among its members, finalization of the Strategic Environmental Management Plan (SEMP), coordinating the signing of a Memorandum of Agreement (MOA) on the IWMAP, monitoring the status of submission of waste inventories and target-setting of waste reduction among members; its short-term and long-term plans; and lessons learned.

Overview of the BCRMF

The Batangas Coastal Resources Management Foundation is a non-profit, non-government organization operating in the Batangas Bay area. The Foundation was established in 1991 through the initiatives of the Batangas Governor and five private companies namely, Pilipinas Shell Petroleum Corporation, Caltex Philippines Inc., Chemphil-LMG Philippines Inc., Union Carbide Philippines, Inc. and General Milling Corporation.

As the name of the Foundation implies, its main objective is to take care of the coastal resources of Batangas Bay while operating companies in a profitable yet responsible way. The Foundation endeavors to protect water quality, marine life and beaches of the bay in cooperation with the local government units (LGUs), community leaders and the GEF/UNDP/IMO.

During its second year, the BCRMF slowed down because of the absence of a concrete and clear framework on how to achieve its objectives as member companies became very busy with their own projects and initiatives. The officers of the Foundation were also faced with the problem of consolidating its plans into a common vision or direction.

In 1993, Batangas Bay was selected as one of the two demonstration sites of the GEF/UNDP/IMO. The latter developed a Regional Programme on Marine Pollution Prevention and Management in the East Asian Seas to support the efforts of governments in the prevention

and management of marine pollution at the national and provincial levels on a long-term and self-reliant basis.

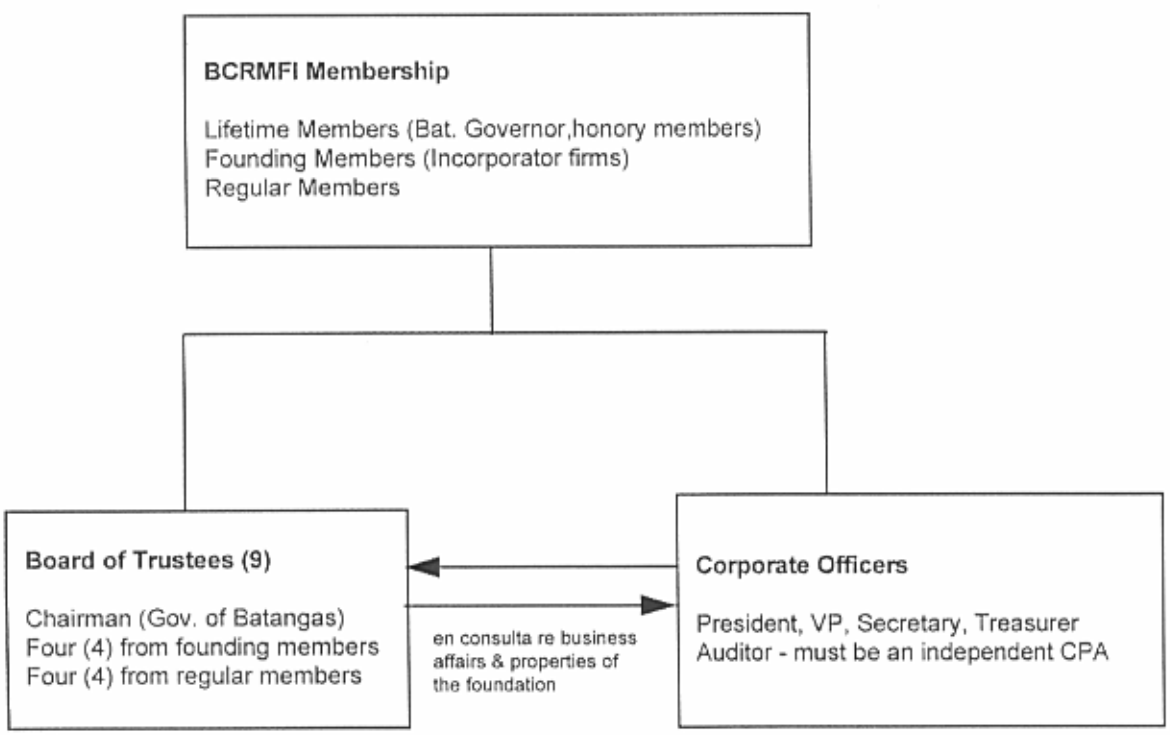
In February 1994, the Foundation launched the Kilos Kabayan para sa Kalikasan (KKK) Movement, designed to develop the community's awareness and to contribute towards the environmental protection of the bay area.

In April 1994, a Memorandum of Agreement (MOA) was signed among the industry members, the Batangas Governor, GEF/UNDP/IMO, DENR, and the City and Municipal Mayors of Batangas City, San Pascual, Mabini and Bauan. The MOA defines the respective roles and responsibilities in addressing the environmental problems and issues in Batangas Bay, and in the protection and conservation of the coastal environment of the province.

In late 1995, the new BCRMF president took the initiative to revitalize the Foundation and give its full support to the Batangas Bay Demonstration Project (BBDP). The BBDP gave the Foundation an opportunity to pursue its objectives within the framework of the project.

The BCRMF is composed of three classes of members, namely, the *lifetime* members, the *founding* members, and the *regular* members. The lifetime members are the present and future Governors of the Batangas province. After their term of office, they will continue to be members—as honorary individual members. The founding members are the companies which are represented by the incorporators (Shell, Caltex, Chemphil-LMG, Union Carbide and General Milling). The regular members are the companies which possess the necessary qualifications for membership, favorably recommended by the BOT and elected by the members.

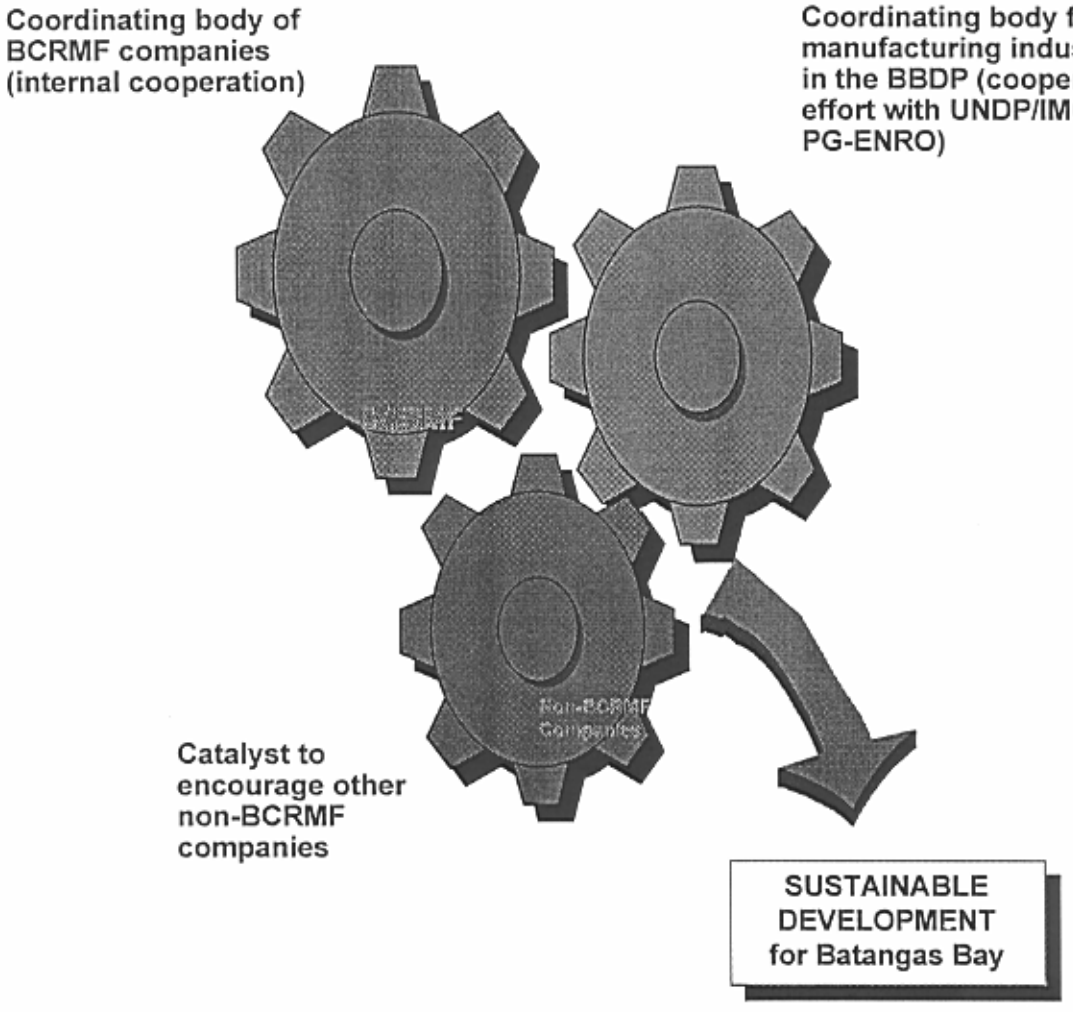
The diagram below shows the BCRMF corporate organogram which summarizes the working structure within the Foundation:



At present, there are nine members of the BCRMF Board of Trustees (BOT). The Batangas Governor sits as the Chairman, four seats are allotted to the five founding members, and they agree among themselves who will take the four slots. The remaining four seats are allotted to the other regular members and are filled up through election by a majority vote of the members. The BCRMF also elects a set of corporate officers, which serves as the working force behind the organization. The core group is composed of the President, Vice-President, Secretary, Treasurer, Auditor and such other officers as may be deemed necessary by the BOT and/or the members.

Achievements of the BCRMF

The BCRMF played a big role in the different projects and initiatives covered by the BBDP, and the diagram below summarizes the major roles:



Cooperative Effort with the GEF/UNDP/IMO, PG-ENRO and DENR

The BCRMF helped in finalizing the Strategic Environmental Management Plan (SEMP) for the Batangas Bay Region. The SEMP's central theme is "sustainable development for the region, ensuring compatibility of management actions between the overall development of the

region and within the framework of integrated coastal management (ICM)". The SEMP aims "to mobilize and strengthen the capability and partnerships among the local government units, national service agencies, the private sector, non-government organizations, volunteer groups, social organizations, and coastal community organizations and residents.

The BCRMF shared its views and gave inputs to the provincial ordinance (Resolution No. 276, Series of 1996) which established the Batangas Bay Integrated Coastal Management Council (BBICMC). The Council is chaired by the Batangas Governor and is composed of several key officials from the local government units, representatives from the Print and Broadcast Media, Philippine Coast Guard, Philippine Ports Authority, Maritime Industry Authority (MARINA), fisheries sector, and from the BCRMF.

The BCRMF prepared, reviewed, and arranged the signing of the MOA on the Integrated Waste Management Action Plan. The proposals in the action plans, in which the Foundation serves as the implementing agency include the following:

- Inventory of hazardous waste generators, transporters, storage, treatment, recycling and disposal facilities in the Batangas Bay Region;
- Development of a pool of expertise among industries through training on pollution management appraisals (PMAs);
- Implementation of an industrial hazardous waste minimization program through voluntary agreement in the conduct of PMAs;
- Identification and evaluation of transitional technologies, practices and facilities for off-site hazardous waste processing and disposal; and
- Preparation of a proposal concerning a hazardous waste storage, treatment, and disposal facility for the Region and, eventually, joint ventures for these facilities and services.

Strengthening of Internal Cooperation Among Members

Through the conduct of more regular meetings and discussions, the members of the Foundation were able to come up with a clear focus on what to do in the short and long term. The Foundation has also encouraged sharing of experiences on waste management and technical know-how on environmental matters. It served as a venue for raising environmental concerns and sharing of best practices amongst member companies.

Reaching Out to Other Non-member Companies

Non-member companies within the Region were invited to attend the past few meetings of the BCRMF to encourage them to join and be part of the Foundation. From the previous eleven (11) members, the membership has doubled to 23 since the start of these initiatives. The by-laws (constitution) of the Foundation was also reviewed, revised, and approved by the Board of Trustees to encourage more non-member companies to come in.

Short- and Long-term Plans

The BCRMF has identified and differentiated its short-term and long-term plans to be able to plan its course of action in the coming years. One of the short-term goals is to complete the waste inventory and reduction commitments within 1997. Another plan is to set up a reporting and monitoring system to be able to identify those companies which are having problems or difficulties in complying with government laws or standards. The bigger and more advanced companies can easily extend technical support and help to smaller companies. The

general direction is to encourage most, if not all, of the companies/industries within the Batangas Bay Region to join the BCRMF. There are also ongoing and future training courses related to pollution management appraisals (PMAs), wherein representatives from member companies are trained in waste minimization initiatives and options. It is also the plan of the Foundation to hire a full-time Coordinator who will facilitate the various activities of the BCRMF.

For the long-term plans, there are several projects being considered by the Foundation. Among these are common environmental treatment facilities (waste water, hazardous waste landfills, etc.) that can be most effectively pursued in a cooperative effort among the member companies. Another long-term goal is further improvement of technical know-how of member companies on environmental and waste management. The Foundation will also continue to support and assist the PG-ENRO, BBICMC and GEF/UNDP/IMO.

Lessons Learned

In summary, there are a number of learning points from the BCRMF. It can be concluded that the BCRMF is an effective venue for companies to have closer coordination with government and non-government agencies like the PG-ENRO, DENR, BBICMC, GEF/UNDP/IMO, etc. The BBDP's strategy was successful in getting the commitment of companies by giving them an opportunity, through the BCRMF, to give their input in preparing the environmental masterplan of Batangas Bay. Another learning point is the voluntary agreement on waste reduction which has been successful in generating concrete actions from the signatories.

Lastly, the BCRMF became an effective means for sharing experiences, knowledge and best practices on environmental issues among member companies.

Establishment of the Xiamen Marine Environmental Protection and Management Foundation and Fund

DAI SONGRUO
Lecturer
Economics Institute of Xiamen Planning Commission
Zhenye Building, Hubinbei Road
361012, People's Republic of China

DAI SONGRUO. 1998. Establishment of the Xiamen marine environmental protection and management foundation and fund, p. 45-54. *In* **The Regional Workshop on Partnerships in the Application of Integrated Coastal Management.** 12-14 November 1997, Chonburi, Thailand. 167 p.

Abstract

During 1996-2000, environment investment would account for 3% of the GNP in Xiamen. As Xiamen's economy increases 20% annually, financial revenue amounts to over RMB 200 million each year. This offers a financial basis for creating a foundation. Based on current practices of reform in the country and specific conditions of Xiamen, possible funding sources for the foundation may include: collection of fees from exclusive use of marine area/resources; fees from land-based sewage discharges; fees from sewage discharges from vessels; government contribution; donations from overseas Chinese, individuals and enterprises; and financial aid given by international organizations and foreign governments. The use of the foundation should contribute to the research on marine environmental protection, rational use of marine resources and integrated management of marine development.

Introduction

Xiamen, a seaport city, relies greatly on the sea for its existence, development and growth. The development of the economy and the rising standard of living is closely associated with the condition of the marine environment. However, with the development of the economy during the last two decades, the degradation and the pollution of Xiamen's coastal and marine environments have become more and more serious. Even though the municipal government of Xiamen has attached great importance to a comprehensive management of the coastal and marine environments and has invested numerous material resources and money, the outcome is yet far from satisfactory. One of the main reasons is that, at present, management of the coastal environment is still confined to government, instead of being a concern of society. Concerning the investment and the utilization of capital in marine environmental management, a fine cycle of operational mechanism has not yet been established. Therefore, a serious study on the establishment, operation and management of such a system becomes very important for the comprehensive management of Xiamen coastal areas.

Necessities of Establishing the Fund

Ever since the reform and the opening of China to the world, greater attention has been paid to environmental protection in Xiamen and the city's investment in this field has steadily increased. During the first half of the 1990s (the eighth Five-Year Plan), investments amounted to RMB1,205.258 million. These consisted of RMB194.658 million for investments on 534 projects that tackle industrial pollution; RMB674 million for investments on new projects for environmental protection, which amount to 2.06% of the total investments on new projects;

and RMB336.6 million for investments on public environmental protection facilities, which include RMB250 million for the dredging of Yuandang Lake.

In 1996, investments on environmental protection amounted to 1.87% of the city's GDP, which is among the leading in China. During the last half of the 1990s (the ninth Five-Year Plan), the focal point of development of the society and of environmental protection shifted from land to the sea. In 1996, the Leading Group for the Coordination of Marine Management and Group of Marine Experts, as well as its office, were set up by the municipal government of Xiamen. The main leaders of the municipal government hold concurrent posts of leaders of this Leading Group, and the leaders of the concerned committees of the government are concurrent members. The group is responsible for the planning, constructing, managing and environmental protection of maritime space under the high tide mark and of the islands.

The Leading Group coordinates with the concerned government committees so that the sea is administered and managed by laws and a comprehensive development and management of the maritime space is ensured. It also ensures that the strategic plans of marine environmental pollution prevention and comprehensive management of the Xiamen model area are successfully implemented. However, at this crucial moment for a coordinated development of the society and the environment, many difficulties and problems are faced, urging an effective and sustainable fund supporting system. The reasons are the following:

1. A reliable capital input is an important assurance for successful marine environmental protection and comprehensive management. The strategic plan of Maritime Space Managing and Pollution Prevention implemented in Xiamen is wide in scope and systematic. It contains over ten important tasks in establishing comprehensive management organizations, to perfect laws on marine management, to define marine functional areas, to make up plans for marine pollution prevention, to amplify the marine environment supervision system, to strengthen awareness on environmental protection and to construct a marine information system. Without reliable capital, it is not possible to implement such a wide-ranging and systematic plan.

2. In marine environmental protection and comprehensive management, business is just starting and there is great insufficiency of capital. An investigation on the capital requirement for marine environmental protection and management was made. It shows that the running expenditures on this field (including expenditures for personnel, equipment and routine expenses) are RMB31.643 million annually. The forty-six projects on this field, which are now under construction or will be constructed in the very near future, require total investments of RMB417.988 million with an annual average of RMB280 million. The running expenditures and requirements for the projects amount to a total annual requirement of over RMB300 million. Such a big amount is without doubt a great burden on the municipal government. Therefore, the Marine Environmental Protection and Management Fund is urgently needed to be established to support marine environmental protection and management.

3. The disadvantages of the present operation of capital in environmental protection necessitate reforms. Up to now, the main source of environmental protection comes from the municipal government, and it is operated in the way of government allocation. The following are the disadvantages of the present operation:

a. Government is the only one source of capital; capital from society has not been used;
b. The capital is not effectively utilized and parts are dissipated during the allocation;
c. A virtuous circle of the utilization of the capital has not been set up and no earnings are made from the money invested.

Such a situation forces the establishment of a new capital supporting system with a different perspective.

4. The present system makes it difficult for capital to be put in this field comprehensively and a new system of funds is needed. At present, there are 12 marine administrative organizations in Xiamen under the direct leadership of the concerned departments of the state, the provincial government and the municipal government. They develop or administer the sea or supply services according to laws or government decrees or under the direction of their higher authorities. Investigation shows that in 1996 the total earnings from projects concerning marine administration and environmental protection are RMB89.059 million. Of the earnings, 63.01% came from service charges and 36.99% from administrative charges. The service charges are authorized to be kept by the concerned units as compensation for the services they have supplied, while the administrative charges, according to government regulations, are to be handed to the municipal government, the provincial government, or the state accordingly. But the present situation is that most is actually returned to the departments or units that have implemented the administration. In this case, the capital for marine environmental protection and management is mostly dispersed to different departments and units, leaving only a small amount from the municipal government. Therefore, a fund that can be focused on marine environmental protection and administration should be established to improve situation.

In short, all the factors mentioned above require a new operational mechanism with a self sustainable fund that can be used effectively. The consciousness in ocean and environmental protection has thus been rooted in people's minds. Meanwhile, the government has also realized that the sea is very important for the city's development, and that environmental protection is interwoven with economic development. The government has worked out plans for development of the corresponding laws and government regulations and has taken actions to improve the environmental situation. The plans, laws and regulations formulated so far include Plans of the Development of Ocean Economy of Xiamen, Regulations on Maritime Space Administration and Regulations of with Change Utilization of Maritime Space. A comprehensive law enforcement effort on marine affairs has been strengthened and more effort has been made to publicize the regulations concerned. A series of studies on marine environmental protection have also been made. The municipal government has urged the people to work hard to make the city a national model city in environmental protection. A regulation has been made by the government that during the ninth Five-Year Plan, the capital to be invested in environmental protection should amount to 3% of the GDP. These are a good start in the establishment of the Fund.

1. The development in the reform and the opening of the Xiamen Special Economic Zone to the world has made possible the establishment and operation of the Fund in an innovative way, which requires not only good social consciousness but also

an appropriate social mechanism as well. With the reform of the last two decades, the economic system of Xiamen is now gradually transformed to a market economy. The economic activities of the society are based more and more upon the market rules and the government is paying more and more attention to efficiency and competition. All of these make it possible to device and to operate the Fund on the basis of market economy rules. At the same time, after over ten years of opening to the world, the Xiamen Special Economic Zone has set up very close relationships with foreign countries. On devicing and operating of the Fund, opinions from foreign experts and the experiences of foreign countries can also be drawn for reference. The factors mentioned ensure a good structural condition in establishing the Fund.

2. The rapid economic development of the Special Economic Zone can offer a reliable source for the Fund. Since the last two decades of reform and opening to the world, Xiamen's economy has increased at an average annual rate of 20%. The financial capacity of the government has also increased at a rapid rate. The present annual financial capacity of the city is as much as over RMB2 billion and the government could allocate a certain amount for the Fund. Meanwhile, the social financial capacity has also been greatly increased. Under such a situation, certain taxes or charges to be levied on environmental protection will be quite acceptable for the society. Some personages might also donate or invest. All of these can be reliable capital sources for the Fund. An analysis of the sources of the Fund will be dealt with separately later.

In short, there is not only a necessity but also a possibility to set up the Fund. And it can be safely concluded that it is feasible to set up and to operate a fund for marine environmental protection and management.

Nature and Functions of the Fund

The purposes of the establishment of Xiamen Marine Environmental Management Foundation and Fund are to carry on a strategy of sustainable development, to collect funds, with a modality of market operation, from all aspects of the society and to support the protection of marine and coastal ecological environments, the exploitation of marine resources, and the comprehensive management of the marine and coastal areas of Xiamen.

At present, Xiamen is experiencing a transformation from the traditional planned economic system to the market economy system, so the practical operation of the Fund will require a different nature and different operational modalities under different economic conditions at different periods of time.

By the end of the century, since the new market economy system is not yet fully established, the nature of Marine Fund should be a nonbusiness professional fund with funds from the government and under the management of the government. Its operation should be under the financial administrative system of the government so that the Fund will have a stable capital source. Its functions should be mainly to support relevant expenditures in marine and coastal environmental protection, exploitation and comprehensive management, and relevant scientific studies, as well as feasibility studies of projects applying for the funds, paying deducted interests of loans to relevant projects, and expenditures in comprehensive management to marine and coastal areas of Xiamen. This paper will expound mainly on the transition modalities of the Fund.

In the 21st century, when the new market economy system has been gradually established, and the operational mechanism and its environment have been improved, the Fund shall then be transferred to a nongovernment institution, which will still be under the supervision of the government. Accordingly, in operation, it will be separated gradually from the government as a financial administrative system and will be operated under the market operation system, and its function will be transferred basically to investing in and supporting the industries concerning ecological environmental protection and marine resource exploitation. The utilization of marine resources shall be charged and the income of which shall be an important basis for the running of the Fund.

Sources and Raising of the Fund

Considering the present policies of the country and the situation in Xiamen, the sources of the Fund will consist of two parts: regular income and irregular income.

1. Regular Sources

a. Income from marine resources use fees. This includes mainly the transfer fee and the rent on utilization of marine and tidal areas, and charges for special local product taxes on marine resources, etc. So far, regulations and the criteria for the charges mentioned have been formulated in Xiamen but the actual levy has not started. According to the regulations of Marine Functional Areas of Xiamen and Criterions of Charges for the Utilization of the Sea, the gross annual charge will be RMB414.25 million, on the basis that all the maritime spaces are utilized. But this is only a maximum number by theory because at present not all of the maritime spaces are utilized and the full utilization can only be made gradually. Therefore, at the beginning, the total income from this will be approximately RMB110 million. Supposed that most of it is to be used by the government in other areas concerned with exploitation of the sea and 20% of it be allocated to the Fund, the Fund can get an annual income of RMB21.54million (see ***Table 1***). It will be the major source of the Fund during its starting period.

Table 1. Estimation of Xiamen Maritime Space Use Fees.

	1996	1997	1998	1999	2000	2005	2010
Proportion of maritime space exploited	25	26	27	28	30	45	65
Charges on the maritime space exploited (10 thousand yuan)	10,356.0	10,770.5	11,184.8	11,599.0	12,427.5	18,641.3	26,926.3
Allocation to the Fund	1,071.2	2,154.0	2,485.5	3,728.3	5,385.3	3,728.3	5,385.3

*This supposes that the allocation to the Fund is 20% of charges on the maritime space exploited.

b. Income from charges on sewage discharges from land. This can be levied through additional charges on water for sewage treatment and for sewage draining. The charges for sewage treatment are managed and utilized by the Environment Protection Bureau, while those for sewage draining are to be allocated to the Fund. The latter will be 20% of the former, that is, the charge for sewage draining is 0.05 yuan/ton for industrial water and 0.03 yuan/ton for living water.

Taking present water consumption as the reference for the calculation, the annual charge is RMB7.28 million (see ***Table 2*** for reference).

Table 2. Estimation of Additional Charges on Sewage Draining of Xiamen.

	1996	1997	1998	1999	2000	2005	2010
Total water consumption (10 thousand tons)	14,292	18,250	22,757	28,943	35,000	46,000	57,000
Living water consumption (10 thousand tons)	5,073	5,475	6,405	7,686	9,800	12,000	14,000
Industrial water consumption (10 thousand tons)	9,219	12,775	16,352	21,275	25,200	34,000	43,000
Total charges (10 thousand yuan)	613.2	728	1,009.6	1,293.4	1,554	2,060	2,570
Charges on living water (10 thousand yuan)	152.2	164.2	192	230.6	294	360	420
Charges on industrial water (10 thousand yuan)	461	563.8	817.6	1,062.8	1,260	1,700	2,150

*The additional charges on sewage draining is 0.03 yuan/ton for living water and 0.05 yuan/ton for industrial water.

c. ***Income from charges on disposal of ship wastes***. A charge of 0.1 yuan/ton registered on disposal of ship wastes can be levied on ships entering Xiamen Port. According to the Xiamen Port Office statistics, considering that registered tonnage is 4.5 times of incoming and outgoing freight, the gross registered tonnage of Xiamen Port is around 76.5 million tons and the income on this charge will be RMB7.65 million (***Table 3***).

Table 3. Estimation of Charges on Disposal of Ship Wastes in Xiamen Port.

	1996	1997	1998	1999	2000	2005	2010
Amount of incoming and outgoing freight	1,553	1,700	1,955	2,300	3,500	5,000	8,000
Registered tonnage that enter Xiamen Port (10 thousand yuan)	6,988.5	7,650	8,797.5	10,350	15,750	22,500	36,000
Charges (10 thousand yuan)	700	765	880	1,035	1,575	2,250	3,600

*This supposes registered tonnage is 4.5 times of the amount of incoming and outgoing freight.

The incomes mentioned are reliable regular sources for the Fund at the beginning and the present total of the three is RMB36.47 million. As for other regular sources, charges may also be levied on the utilization of coastal areas in the future and it will be one of the major sources of the Fund after the year 2000. Income from this is estimated to be over RMB20 million. The four major sources together will make a total income of over RMB100 million for the Fund after 2005 (***Table 4***).

Table 4. Estimation of Capital Sources of Xiamen Marine Environmental Management Foundation and Fund.

	1996	1997	1998	1999	2000	2005	2010
Charges on sewage draining	613.2	728	1,009.6	1,293.4	1,554	2,060	2,570
Charges on disposal of ships	700	765	880	1,035	1,578	2,250	3,600
Charges on the utilization of maritime space (total %)	2,071.2	2,154.1	2,237	2,320	2,485.5	3,728.3	5,385.3
Charges on the utilization of coastal areas	--	--	--	--	--	2,000	5,000
Miscellaneous income	--	--	--	--	--	261.7	4,444.7
Total	3,884.4	3,647.1	4,126.6	4,648.4	5,617.5	10,300	21,000

*This supposes that charges on the utilization of maritime space for the Fund is 20% of the total amount of the charge.

2. Irregular Sources

Irregular sources refer to those incomes to be raised from different approaches. The four potential sources that can be foreseen at present are as follows:

a. Capital from the municipal government for environmental protection and management. This refers mainly to allocations from the municipal government (as well as those from the provincial government and from the state) for expenditures on personnel and equipment of the Fund and the expenditures on scientific studies and administrative activities on environmental protection. Since there are uncertain factors that might affect the allocations, we cannot make an estimation now and so we take it as one of the irregular sources.

b. Environmental protection donation from overseas Chinese, local people and enterprises. There are many overseas Chinese who, or whose ancestors, are from Xiamen and they love their hometown very much. With the rise in living standard, local people who are more and more conscious of the importance of environmental protection might give a donation. On 5 June 1997, Day of World Environment Protection, an environment protection activity was held in Xiamen and the amount of RMB70,000 was donated by local people in only one day. Enterprises such as the Road & Bridge Construction Corporation and the Post and Telecommunications Office have also offered donations for environmental protection. Even some Japanese friends have donated toward its development in Xiamen. While the amount is still small, if enough mobilization and propaganda are made, and when proper operational ways are adopted (for example, the donors are given honor by the government, or they get some preferential policies), such donation can be important sources of the Fund.

c. Support from international organizations and foreign governments. Since the United Nations Conference on Environment and Development in 1992, environmental protection has become internationally mutual actions. A few international organizations and governments of some developed countries have specific allocations to support environmental protection in developing countries. Such capital support to Xiamen (including low interest loans) is over US$5 million, which include US$4.37 million in donations and soft loans from the World Bank for the development of Xiamen Port and US$0.92 million in support from the United Nations Development Programme for the project "Xiamen Model Area of East Asia

Maritime Space". Besides, the World Bank is now projecting a low interest loan of US$8 million for Xiamen's environmental protection. The Xiamen Marine Fund can strive to get such type of fund as important sources in the future.

d. Profit from the Fund and the replenishment of its capital. In the future, this is necessary for the Fund so that it can be capable of participation in marine environmental protection and marine resource exploitation industries. Income from the Fund mainly comes from profit from its investment in industries, as well as the overdue capital and their interest reclaimed. The reclamation of capital comes mainly from the utilization of projects with or partly with charge. This part of income, the profit from investment of the Fund itself, will be an important basis for its long-term development.

In brief, capital sources of Xiamen Marine Fund will mainly be from allocations of government, incomes from the fees and donations from the public, etc.

Scope and Means of Fund Use

The scope and means to use the Fund will be as follows:

1. To support scientific studies on marine environmental protection, marine resource exploitation and comprehensive marine management, as well as related studies. Since most of these are not directly profitable, such scientific studies shall be free of charge and thus need the support.
2. To support feasibility studies on projects on marine environmental protection, the sustainable exploitation of marine resources and comprehensive marine management, as well as related projects. Some of the feasibility studies may profit after the projects are set up, some will not be directly profitable and the Marine Fund can support them, depending on actual situations, partly with charge and partly without charge.
3. To pay for deducted interests for loans on projects on marine environmental protection, the sustainable exploitation of marine resources and comprehensive marine management. By paying for deducted interests for loans, more nongovernment capital will be attracted to invest in marine environmental protection and management. Such deducted interests may also, depending on the actual profits after the projects are fulfilled, be with charge, partly with charge or free of charge.
4. To support government departments relevant to marine environmental protection and comprehensive marine management. Such support includes routine expenditures of departments and the capital for them to purchase important equipment in order to support the development of marine environmental protection and management. Still, such support will be partly with charge or free of charge.

After operating for a period of time and after accumulating, the Fund can start investing directly in projects in marine environmental protection and resource exploitation. Benefits from projects should be an important consideration in such direct investments. Xiamen's preponderance for opening to the world should also used and advanced technology and capital abroad should be imported in the forms of joint venture or partnership.

Procedures and Principles of the Management of the Fund

The use of the Fund shall follow the following principles:

1. Application for Fund

The applicant can be a municipal institution or a state owned or collective enterprise, or a state or provincial scientific institute or academic institution in Xiamen. The fund will not support any other applicants not in the list. The applicant should fill out the forms and submit to the Fund relevant application documents and materials, such as plan of the utilization of the fund, plan of the implementation of the project, the proceedings of the project and the sources of capital, etc. The Fund will not support those projects whose utilization of the Fund is not within the scope of the fund. Meanwhile, when the application is approved, the undertaker of the project will submit regularly to the Fund balance sheet of the utilization of the capital, so that the Fund is aware of the situation of the utilization of the capital at any time and to supervise it.

2. Approval of fund uses

The procedure is as follows: First, the Examining Department of the Fund will examine whether the applicant and the project are within the scope of the utilization of the Fund; whether the application formalities, and the relevant documents and materials are complete; whether the utilization of the Fund accords with the nature of the project; and whether the amount and the time allotted are proper, etc. Based on the examination, the Examining Department will give its opinions on the nature and the amount and the allotted time of the Fund, and the opinions will be submitted to the Board of Directors for approval. Finally, the Financial Department of the Fund, together with the designated financial organizations, will implement the issuance of the Fund to the project.

3. Issuance and replenishment of the Fund

All the moneys of the Fund will be deposited in designated financial organizations, which will also be trusted to deal with the issuance and replenishment of the Fund, and who will report monthly to the Fund the situation of the entrusted accounts. When the application of the utilization of a Fund is approved, a Fund Issuing Notice will be issued by the designated financial organization, after it has signed a contract with the Fund utilizer, about the its utilization. The financial organization will then undertake the corresponding rights and business. The issuance of the fund, except for some special cases, will be by installment.

For the projects that the funds are utilized with or partly with charge, the Fund shall be reclaimed at the allotted time, and the issuing department of the Fund will supervise and urge the designated financial organization and the utilizer of the Fund to replenish to the Fund the overdue capital. For the unreclaimed overdue capital, interests will be charged according to the regulations of the designated organization, and, when necessary, a fine accumulated from the allotted time shall also be charged.

Supervision and Evaluation of the Funds

The projects supported by the Fund will be supervised and evaluated in order that the Fund is used properly and effectively. Major measures of supervision and evaluation are the following:

1. To report to the Fund regularly

After the Fund is issued, the unit that will use it shall report to the Fund regularly (monthly or quarterly, depending on the amount and the allotted time by the Fund). The progress of the project, the use of the Fund and its achievement shall be included in the report. For the units that don not report regularly as required, the Fund can stop issuance of the remainder of the capital, or even cancel the project and reclaim the fund that has been issued.

2. *To make following track examinations*

A supervision Department will be set in the Fund to supervise the projects supported by the Fund. The examination will include whether the unit funded is using the Fund according to its stipulations; whether the phased plans have been fulfilled as required in the contract; whether the Fund been extravagantly used and whether it is used effectively, etc. The institutions using the Fund will be required to take corrective action when situations against the contract and the stipulations and ineffective use of the fund are found. Suggestions on corrective action will also be put forward by the Fund. When the unit that uses the Fund does not correct them as is demanded and suggested, the Fund can stop the rest of the installments, or even appeal to the court for a solution.

3. *To evaluate achievement*

The Fund shall organize in time relevant departments and experts to evaluate the achievement of projects funded. Successful experiences in using the Fund and lessons to be drawn from each projects will be put forward and an evaluation to the achievement of the project will be made. The Fund shall study the projects and then set up targeting social effectiveness and economic effectiveness systems for the projects.

4. *To propagate and to spread successful experiences*

The successful experiences shall be adopted and spread to following projects. Promotion should also be made through the mass media so that other districts and other departments can learn from experiences; lessons should be drawn for future projects to learn from, so as to improve the effectiveness of the Fund.

Economic Valuation of Mangrove Resources in Subang, West Java, Indonesia

TRIDOYO KUSUMASTANTO
MEI MEI MEILANI
Center for Coastal and Marine Resources Studies (CCMRS)
Bogor Agricultural University
Kampus IPB Darmaga
Bogor, Indonesia

TRIDOYO KUSUMASTANTO and MEI MEI MEILANI. 1998. Economic valuation of mangrove resources in Subang, West Java, Indonesia, p. 55-67. *In* **The Regional Workshop on Partnerships in the Application of Integrated Coastal Management.** 12-14 November 1997, Chonburi, Thailand, 167 p.

Introduction

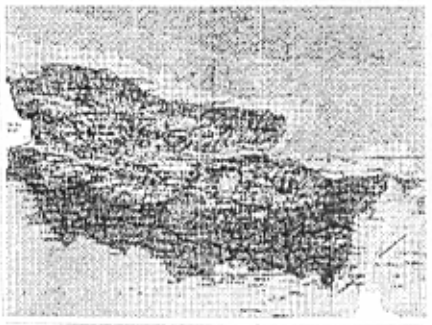
The depletion and degradation of an ecosystem's capacity to supply human needs and support development have been encouraging countries to apply a new development paradigm—sustainable development. In Indonesia, the concept has been adopted since the fourth "Five Year Development Plan" (1983/1984). Lessons learned from the First Indonesia Long Term Development Plan (1967-1992) indicated that development activities have threatened the sustainable capacity of the ecosystem and its resources in supporting future development in Indonesia.

One of the threatened resources in the coastal zone is the mangrove ecosystem. Mangroves are forest ecosystems formed by halophytic, woody, seed-bearing plants which range in size from tall trees to small shrubs. They have the ability to grow along sheltered, intertidal coastlines on sediments that are saline, often aerobic and sometime acidic. Mangroves are highly productive ecosystems with various important economic, social and environmental functions.

In Indonesia, the direct use value of mangroves has been tapped for wood, charcoal, tannins, construction materials, household equipment, medicines and raw material for pulp and paper industries. The indirect use value of mangroves ecosystem is in the form of vital ecological functions including control of coastal erosion, stabilization of sediment, protection of adjacent coral reefs from suspended solids, protection of coastal land uses from storms, prevention of salt intrusion, natural purification of coastal water from pollution, supply of organic detritus and nutrients to adjacent coastal waters, and the provision of feeding, nursery and breeding areas for economically important fish, crustaceans and wild life.

Mangroves in Subang, West Java have been under intense pressure from competing resource uses. From 1988 to 1995, the Subang coastal zone area has been increasingly converted to "*tambak*" (brackishwater aquaculture) at 33.02% per year, triggered by increasing price of shrimp of 12.27% per year (Kusumastanto et al., 1997) (see ***Figure 1***). The conversion of coastal wetlands to other uses affects habitats of critically important valuable marine species. Convincing evidence exists that mangroves serve as critically important habitats for shrimp in the post-larvae and juvenile stages of their life cycle (Bailey, 1988). Many scientists argue that the long-term fisheries value of mangrove habitats is greater than its value for any other use, including coastal aquaculture. Therefore, careful management of these resources provides

Figure 1. Coastal Area of Subang District, West Java Province, Indonesia.



numerous benefits to a variety of users. Government, profit maximizing producers and utility maximizing consumers in traditional markets should allocate scarce coastal resources and environmental uses in an economically efficient manner. Coastal zone management must address resource allocation in an economically efficient manner by providing information on value of coastal resources. The information from resource valuation will help guide decision-makers to more objectively consider management options in allocating scarce coastal resources efficiently.

The general objective of this study is to valuate mangrove resources and to contribute to a mangrove management approach especially for sylvofisheries in Mayangan village, Subang District, West Java, Indonesia.

Economic Values and Valuation Methods

There are basically two broad approaches to valuation, each comprising a number of techniques. These are the direct and indirect approaches. The direct approach looks at techniques which attempt to elicit preferences directly through the use of survey and experimental techniques, such as contingent valuation and contingent ranking methods. People are asked directly to state or reveal their strength of preference for a proposed resource. In contrast, the indirect approach is a technique which seeks to elicit preferences from actual, observed market-based information.

In this study, the total economic value was used. The total economic value of a resource can be desegregated in two components which are use value (UV) and nonuse value (NUV). Use value includes direct use value (DUV), indirect use value (IUV) and option value (OV). Nonuse value, on the other hand, has proved to be both difficult to define and measure. Nonuse value can be subdivided into existence value (XV) which measures willingness to pay for some moral, altruistic or other reason and unrelated to use or option value and bequest value (BV) which measure an individual's willingness to pay to ensure that his/her heirs will use the resource in the future. The total economic value can be expressed by:

$$TEV = UV + NUV = (DUV + IUV + OV) + (XV + BV)$$

Figure 2 illustrates the concept of total economic value of mangroves.

The economic valuation of a coastal resource can be carried out through two stages:

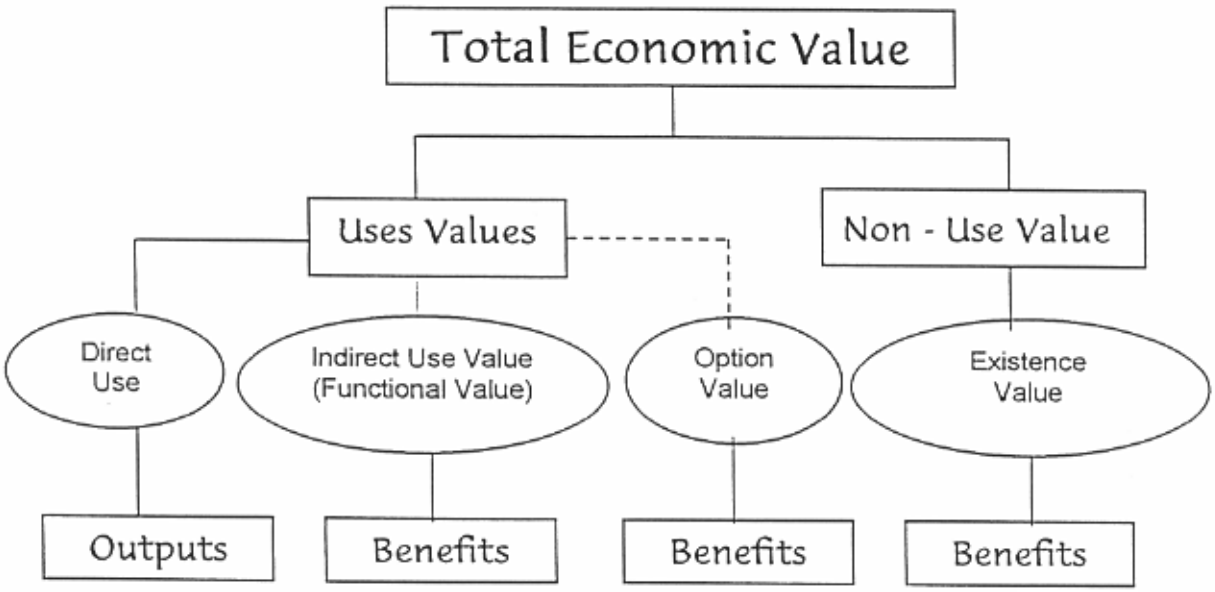
Identification stage

This is an important stage to know the benefits and functions of a coastal resource, especially the function in relationship with the other components in an ecosystem. The identified benefits include:

(1) ***Direct use value (DUV)***. This is defined as use which is directly obtained from using a mangrove ecosystem, such as the use of mangrove for fuelwood, timber and fishing, etc. The total direct use from a mangrove ecosystem can be formulated in a simple equation:

Direct use (mangrove) = fuelwood use + timber use + fishing, etc.

Figure 2. Total Economic Value of Mangrove.



- ✓ Fish
- ✓ fuelwood
- ✓ recreation
- ✓ transport/
- ✓ navigation

Valuation Methods
Market Analysis:
Other no-market valuation methods
(TCM, CVM, HPM)
(IOC); (IS);
(Replacement cost)

- ✓ flood control
- ✓ storm protection
- ✓ nutrient cycling
- ✓ waste assimilation
- ✓ sedimentation
- ✓ habitats loss reduction
- ✓ groundwater protection

Valuation Methods
Damage cost avoided;
Preventive expenditures;
Value of changes in productity:
(Relocation cost);
(Replacement cost);

- ✓ insurance value of preserving options for future

Valuation methods
CVM

- ✓ values derived from just knowing a species or system is conserved
- ✓ value of passing on natural assets 'intact' to future generations
- ✓ 'moral resources' value motivation

Valuation methods
CVM

Source : Adapted from Munasinghe and Lutz (1993) and Spurgeon (1992)

(2) ***Indirect use value (IUV)***. An indirect use is defined as use which is indirectly derived from a mangrove ecosystem such as spawning ground, nursery ground, feeding ground and beach protection from waves.

(3) ***Option value (OV)***. The concept of option value can be interpreted as the potential future direct and indirect uses of a natural system. If the uncertainty regarding future use is measurable in the form of probability for a certain outcome, the option value can be interpreted as the risk premium paid to avoid the outcome of reversible destruction. In other words, the individual is willing to pay an amount in addition to the actual price today in order to keep the use option for later. Therefore, total use value can be defined as the sum of current total direct and indirect use values and this risk premium.

(4) ***Existence value (EV)***. An existence value is interpreted as a value humans gain from simply knowing that an ecosystem or species exists, independent of whether an individual uses it or not. The existence value of an ecosystem can be approached by using the contingent valuation method through a survey of selected respondents.

(5) ***Bequest value***. A bequest value is related to preserving the natural heritage for the coming generations. Its value is derived today from knowing that the natural heritage will exist and will be used by the future generation.

Based on the above, the total economic value (TEV) is a sum of direct use value (DUV), indirect use value (IUV), option value (OP), existence value (EV) and bequest value (BV).

Quantification stage

A quantification stage is the accounting of the total use and function of an ecosystem in monetary terms. There are a lot of quantification methods which are often used, some of which are:

(1) ***Market price***. The market price approach is used to account for a marketable component of a natural system, such as fuelwood and fish from a mangrove forest. The approach is used to value a direct use.
(2) ***Indirect price***. An indirect price can be used to account for the nonmarketable component of a natural system. This method is very suitable to valuate a physical and biological use.
(3) ***Contingent valuation method***. Contingent valuation method is a very popular approach which is most used in valuating an environmental component, especially for a nonmarketable one. In general, this method is carried out through a survey by asking the selected respondents about the existence of a certain component of a natural system. In relation with this research, the contingent valuation method is used to valuate the existence component of the coastal ecosystem.

Methodology

Sampling technique and number of samples

This research was carried out in Mayangan village, Subang district covering a total area of 489.1 ha. Stratified random sampling was used for *tambak* farmers and communities, and purposive sampling for forest harvest collectors. The number of samples taken from the population is shown in ***Table I***.

Table 1. The Population and Sample in this Study.

Subpopulation	Population	Sample	%
Forest harvest collectors	130	45	34.61
Tambak farmers	166	37	22.29
Communities	821	78	9.50

Data and Information

In general, the data collected in this study are divided into primary data (PD) and secondary data (SD). ***Table 2*** shows the kind of data, unit and its source.

Table 2. Data and Information Collected in this Study.

Items	Unit	Source
Area of mangrove	ha	SD
Area of *tambak*	ha	SD
Population	people	SD
People's occupation	people	SD
Mangrove products	m^3/ha/year	PD/SD
Charcoal/firewood	m^3/ha/year	PD
Fauna	kg/ha/year	PD
Fisheries	kg/ha/year	PD
Existence value	Rp./ha/year	PD
Tambak product	Kg/ha/year	PD
Input for *tambak*	Rp./ha/year	PD

Data analysis

Total Valuation of Mangrove Resources

$$TEV = DUV + IUV + OV + EV$$

where

TEV = Total economic value
DUV = Direct use value
IUV = Indirect use value
OV = Option value
EV = Existence value

In order to determine the alternative of resource management option in the Subang coastal zone, the cost-benefit analysis (NPV criterion) was used.

$$NPV = \sum_{t=1}^{n} (Bt - Ct) / (1 + r)^t$$

where

Bt	=	Benefit from using coastal resources (Rp.)
Ct	=	Cost of using coastal resources (Rp.)
T	=	Time horizon (year; 10 years)
R	=	Discount rate (15%)

Results and Discussion

The are two substantive results in this research. First is the value of mangrove resources which will be important in allocating the resource. Second is selecting the management option for sylvofisheries: tilapia aquaculture and shrimp aquaculture.

Valuation of mangrove resources

Appendix 1 provides a complete summary of mangrove valuation.

a) ***Direct use value***. There are 14 productive identified uses for the mangrove ecosystem in Mayangan village varying from timber, fuelwood, fisheries and other uses. The economic value of this direct use value is Rp. 935,865 million (US$292,457).

b) ***Indirect use value***. Two indirect use values are considered—nutrient for shrimp and storm protection with economic value of Rp.780.029 million (US$243,759).

c) ***Option value***. Biodiversity has come to refer to the different types of biological diversity habitats or traits which exist in any given system. The biodiversity value is Rp.1,689 million (US$527,812).

d) ***Existence value***. Existence value is interpreted as value humans gain from simply knowing that an ecosystem or species exists, independent of whether an individual uses it or not. By using the contingent valuation method, the communities valuate the mangrove resources at Rp.2,164 million (US$ 676,250).

It can be concluded that the total economic value of 489.1 ha of mangroves in Mayangan village is Rp.5,569 million (US$1,740,312) or Rp.11,386 million/ha (US$3,558/ha).

Management options for sylvofisheries

The procedure for selecting management options will often rely on some judgement about technical and economic feasibility. In this research, the mangrove management options selected are sylvofisheries—tilapia aquaculture and sylvofisheries—shrimp aquaculture. Using the benefit-cost analysis framework, the analysis showed that by allocating 80% for mangroves and 20% for aquaculture, tilapia aquaculture resulted in lower NPV (Rp.25,869 million) compared to sustainable mangrove forest management (Rp.27,608 million). The management option for sylvofisheries-shrimp aquaculture resulted in a higher NPV (Rp.37,988 million) compared to sustainable mangrove forests.

References

Bailey, C. 1988. The social consequences of tropical shrimp mariculture development. Ocean Shoreline Manage. 11: 31-44.

Barton, D.N. 1994. Economic factors and valuation of tropical coastal resources. SMR-Report 14/94. Centre for Studies of Environment and Resources. University of Bergen, Norway.

Kusumastanto, T., A. Fahrudin and L. Adrianto. 1997. Economic analysis of mangrove habitat conservation at Subang Coastal Zone Management, West Java Province. A cost-benefit approach. Working paper presented at Valuation 1: Benefit-Cost Analysis and Framework in the Malacca Straits, Methodology Development Workshop, 19-21 September 1997, Kuala Lumpur.

Munasinghe, M. and E. Lutz. 1992. Environmental economics and valuation in development decision making. World Bank Environmental Working Paper 51.

Ruitenbeek, H.J. 1992. Mangrove management: an economic analysis of management options with a focus on Bintuni Bay, Irian Jaya. Environmental Management Development in Indonesia Project (EMDI). EMDI Environmental Report No. 8.

Spurgeon, J.P.G. 1992. The economic valuation of coral reefs. Mar. Pollut. Bull. 24: 529-536.

Appendix 1. Summary of Cost-Benefit Analysis for Total economic Valuation of Mangrove Resource (489,1 ha) in Mayangan Villlage, Subang, West Java.

1.000 Ruplah

YEAR	0	1	2	3	4	5	6	7	8	9	10
ITEM											
DIRECT BENEFIT											
1 Potensi Kayu	0	398665.07	429233.82	459802.57	490371.32	520940.07	551508.82	582077.57	612646.32	643215.07	673783.82
2 Ranting Kayu	0	16999.25	16999.25	16999.25	16999.25	16999.25	16999.25	16999.25	16999.25	16999.25	16999.25
3 Udang	0	136830.62	136830.62	136830.62	136830.62	136830.62	136830.62	136830.62	136830.62	136830.62	136830.62
4 Benur	0	21249.06	21249.06	21249.06	21249.06	21249.06	21249.06	21249.06	21249.06	21249.06	21249.06
5 Nener	0	4047.08	4047.08	4047.08	4047.08	4047.08	4047.08	4047.08	4047.08	4047.08	4047.08
6 Kepiting	0	125331.88	125331.88	125331.88	125331.88	125331.88	125331.88	125331.88	125331.88	125331.88	125331.88
7 Wideng	0	130629.48	130629.48	130629.48	130629.48	130629.48	130629.48	130629.48	130629.48	130629.48	130629.48
8 Ular	0	14874.34	14874.34	14874.34	14874.34	14874.34	14874.34	14874.34	14874.34	14874.34	14874.34
9 Kerang	0	31873.59	31873.59	31873.59	31873.59	31873.59	31873.59	31873.59	31873.59	31873.59	31873.59
10 Belut	0	10251.54	10251.54	10251.54	10251.54	10251.54	10251.54	10251.54	10251.54	10251.54	10251.54
11 Ikan	0	40904.44	40904.44	40904.44	40904.44	40904.44	40904.44	40904.44	40904.44	40904.44	40904.44
12 Burung	0	150.49	150.49	150.49	150.49	150.49	150.49	150.49	150.49	150.49	150.49
13 Alur	0	3901.47	3901.47	3901.47	3901.47	3901.47	3901.47	3901.47	3901.47	3901.47	3901.47
14 Bibit bakau	0	156.76	156.76	156.76	156.76	156.76	156.76	156.76	156.76	156.76	156.76
SUB TOTAL DIRECT BENEFIT	0	935865.07	966433.82	997002.57	1027571.32	1058140.07	1088708.82	1119277.57	1149846.32	1180415.07	1210983.82
INDIRECT BENEFIT											
1. Penyediaan Pakan	0	29.63	29.63	29.63	29.63	29.63	29.63	29.63	29.63	29.63	29.63
2. Penahan Abrasi	0	780000.00	780000.00	780000.00	780000.00	780000.00	780000.00	780000.00	780000.00	780000.00	780000.00
SUB TOTAL INDIRECT BENEFIT	0	780029.63	780029.63	780029.63	780029.63	780029.63	780029.63	780029.63	780029.63	780029.63	780029.63
OPTION VALUE											
Biodiversity	0	1689595.50	1689595.50	1689595.50	1689595.50	1689595.50	1689595.50	1689595.50	1689595.50	1689595.50	1689595.50
SUB TOTAL OPTION VALUE	0	1689595.50	1689595.50	1689595.50	1689595.50	1689595.50	1689595.50	1689595.50	1689595.50	1689595.50	1689595.50
EXISTENCE VALUE											
Existence	0	2164062.08	2164062.08	2164062.08	2164062.08	2164062.08	2164062.08	2164062.08	2164062.08	2164062.08	2164062.08
SUB TOTAL EXISTENCE VALUE	0	2164062.08	2164062.08	2164062.08	2164062.08	2164062.08	2164062.08	2164062.08	2164062.08	2164062.08	2164062.08
SALVAGE VALUE											4746.79
TOTAL BENEFIT	0	5569552.28	5600121.03	5630689.78	5661258.53	5691827.28	5722396.03	5752964.78	5783533.53	5814102.28	5849417.81
COST											
1 Ranting Kayu	55.74	12,805.17	12,805.17	12,805.17	12,805.17	12,805.17	12,805.17	12,805.17	12,805.17	12,805.17	12,805.17
2 Udang	836.03	9,335.65	9,335.65	9,335.65	9,335.65	9,335.65	9,335.65	9,335.65	9,335.65	9,335.65	9,335.65
3 Benur	743.14	12,075.97	12,075.97	12,075.97	12,075.97	12,075.97	12,075.97	12,075.97	12,075.97	12,075.97	12,075.97
4 Nener	743.14	12,075.97	12,075.97	12,075.97	12,075.97	12,075.97	12,075.97	12,075.97	12,075.97	12,075.97	12,075.97
5 Kepiting	390.15	44,978.34	44,978.34	44,978.34	44,978.34	44,978.34	44,978.34	44,978.34	44,978.34	44,978.34	44,978.34
6 Wideng	342.54	29,951.89	29,951.89	29,951.89	29,951.89	29,951.89	29,951.89	29,951.89	29,951.89	29,951.89	29,951.89
7 Ular	348.35	21,597.41	21,597.41	21,597.41	21,597.41	21,597.41	21,597.41	21,597.41	21,597.41	21,597.41	21,597.41
8 Kerang	83.60	10,708.13	10,708.13	10,708.13	10,708.13	10,708.13	10,708.13	10,708.13	10,708.13	10,708.13	10,708.13
9 Belut	29.03	13,309.69	13,309.69	13,309.69	13,309.69	13,309.69	13,309.69	13,309.69	13,309.69	13,309.69	13,309.69
10 Ikan	603.80	12,113.71	12,113.71	12,113.71	12,113.71	12,113.71	12,113.71	12,113.71	12,113.71	12,113.71	12,113.71
11 Burung	487.68	801.19	801.19	801.19	801.19	801.19	801.19	801.19	801.19	801.19	801.19
12 Alur	83.60	919.63	919.63	919.63	919.63	919.63	919.63	919.63	919.63	919.63	919.63
13 Bibit bakau	0.00	2,798.37	2,798.37	2,798.37	2,798.37	2,798.37	2,798.37	2,798.37	2,798.37	2,798.37	2,798.37
TOTAL COST	4,746.80	183,471.12	183,471.12	183,471.12	183,471.12	183,471.12	183,471.12	183,471.12	183,471.12	183,471.12	183,471.12
NET BENEFIT	(4,746.80)	5,386,081.16	5,416,649.91	5,447,218.66	5,477,787.41	5,508,356.16	5,538,924.91	5,569,493.66	5,600,062.41	5,630,631.16	5,665,946.69
DF (DR=15%)	1.00	0.87	0.76	0.66	0.57	0.50	0.43	0.38	0.33	0.28	0.25
NPV	(4,746.80)	4,685,890.61	4,116,653.93	3,595,164.32	3,122,338.82	2,754,178.08	2,381,737.71	2,116,407.59	1,848,020.60	1,576,576.72	1,416,486.67
TOTAL ECONOMIC VALUE	55,236,405.31										
TOTAL NPV	27,608,708.30										

Appendix 2. Summary of Benefit-Cost Analysis on Sylvofisheries (80% area mangrove forest and 20% Tilapia Aquaculture) Management Option.

1.000 Rupiah

YEAR / ITEM	0	1	2	3	4	5	6	7	8	9	10
DIRECT BENEFIT											
1 Potensi Kayu	0	318932.05	343387.05	367842.05	392297.05	441207.05	490117.05	465662.05	490117.05	514572.05	539027.05
2 Bunting Kayu	0	13599.40	13599.40	13599.40	13599.40	13599.40	13599.40	13599.40	13599.40	13599.40	13599.40
3 Tambak Mujair	0	878430.45	878430.45	878430.45	878430.45	878430.45	878430.45	878430.45	878430.45	878430.45	878430.45
4 Udang	0	109464.49	109464.49	109464.49	109464.49	109464.49	109464.49	109464.49	109464.49	109464.49	109464.49
5 Bandeng	0	16999.25	16999.25	16999.25	16999.25	16999.25	16999.25	16999.25	16999.25	16999.25	16999.25
6 Nener	0	3237.66	3237.66	3237.66	3237.66	3237.66	3237.66	3237.66	3237.66	3237.66	3237.66
7 Kepiting	0	100265.30	100265.30	100265.30	100265.30	100265.30	100265.30	100265.30	100265.30	100265.30	100265.30
8 Wideng	0	104303.58	104303.58	104303.58	104303.58	104303.58	104303.58	104303.58	104303.58	104303.58	104303.58
9 Ular	0	11899.47	11899.47	11899.47	11899.47	11899.47	11899.47	11899.47	11899.47	11899.47	11899.47
10 Kerang	0	25498.87	25498.87	25498.87	25498.87	25498.87	25498.87	25498.87	25498.87	25498.87	25498.87
11 Belut	0	8201.23	8201.23	8201.23	8201.23	8201.23	8201.23	8201.23	8201.23	8201.23	8201.23
12 Bas	0	32723.56	32723.56	32723.56	32723.56	32723.56	32723.56	32723.56	32723.56	32723.56	32723.56
13 Burung	0	120.39	120.39	120.39	120.39	120.39	120.39	120.39	120.39	120.39	120.39
14 Aher	0	3121.17	3121.17	3121.17	3121.17	3121.17	3121.17	3121.17	3121.17	3121.17	3121.17
15 Bibit Bakau	0	125.40	125.40	125.40	125.40	125.40	125.40	125.40	125.40	125.40	125.40
SUB TOTAL DIRECT BENEFIT	0	1627122.470	1651577.470	1676032.470	1700487.470	1749397.470	1798307.470	1773852.470	1798307.470	1822762.470	1847217.470
INDIRECT BENEFIT											
1 Penyedia Pakan	0	29.58	29.58	29.58	29.58	29.58	29.58	29.58	29.58	29.58	29.58
2 Penalan sbrsl	0	780000.00	780000.00	780000.00	780000.00	780000.00	780000.00	780000.00	780000.00	780000.00	780000.00
SUB TOTAL INDIRECT BENEFIT	0	780029.58	780029.58	780029.58	780029.58	780029.58	780029.58	780029.58	780029.58	780029.58	780029.58
OPTION VALUE											
Biodyversity	0	1351678.78	1351678.78	1351678.78	1351678.78	1351678.78	1351678.78	1351678.78	1351678.78	1351678.78	1351678.78
SUB TOTAL OPTION VALUE	0	1351678.78	1351678.78	1351678.78	1351678.78	1351678.78	1351678.78	1351678.78	1351678.78	1351678.78	1351678.78
EXISTENCE VALUE											
Keberadaan	0	2164063.69	2164063.69	2164063.69	2164063.69	2164063.69	2164063.69	2164063.69	2164063.69	2164063.69	2164063.69
SUB TOTAL EXISTENCE VALUE	0	2164063.69	2164063.69	2164063.69	2164063.69	2164063.69	2164063.69	2164063.69	2164063.69	2164063.69	2164063.69
SALVAGE VALUE											105180.35
TOTAL BENEFIT	0	5922892.480	5947347.480	5971802.480	5996257.480	6045167.480	6094077.480	6069622.480	6094077.480	6118532.480	6248167.830

Appendix 2. Continued.

1.000 Rupiah

YEAR	0	1	2	3	4	5	6	7	8	9	10
ITEM											
DIRECT COST											
1 Ranting Kayu	44.59	10,244.14	10,244.14	10,244.14	10,244.14	10,244.14	10,244.14	10,244.14	10,244.14	10,244.14	10,244.14
2 Tambak Mujair	101,382.92	364,223.97	364,223.97	364,223.97	364,223.97	364,223.97	364,223.97	364,223.97	364,223.97	364,223.97	364,223.97
3 Udang	668.82	7,468.52	7,468.52	7,468.52	7,468.52	7,468.52	7,468.52	7,468.52	7,468.52	7,468.52	7,468.52
4 Benur	594.51	9,660.78	9,660.78	9,660.78	9,660.78	9,660.78	9,660.78	9,660.78	9,660.78	9,660.78	9,660.78
5 Nener	594.51	9,660.78	9,660.78	9,660.78	9,660.78	9,660.78	9,660.78	9,660.78	9,660.78	9,660.78	9,660.78
6 Kepiting	312.12	35,982.67	35,982.67	35,982.67	35,982.67	35,982.67	35,982.67	35,982.67	35,982.67	35,982.67	35,982.67
7 Wideng	274.03	23,961.51	23,961.51	23,961.51	23,961.51	23,961.51	23,961.51	23,961.51	23,961.51	23,961.51	23,961.51
8 Ular	278.64	17,277.93	17,277.93	17,277.93	17,277.93	17,277.93	17,277.93	17,277.93	17,277.93	17,277.93	17,277.93
9 Kerang	66.88	8,566.51	8,566.51	8,566.51	8,566.51	8,566.51	8,566.51	8,566.51	8,566.51	8,566.51	8,566.51
10 Bekil	23.22	10,647.75	10,647.75	10,647.75	10,647.75	10,647.75	10,647.75	10,647.75	10,647.75	10,647.75	10,647.75
11 Ikan	483.04	9,690.97	9,690.97	9,690.97	9,690.97	9,690.97	9,690.97	9,690.97	9,690.97	9,690.97	9,690.97
12 Burung	390.15	640.96	640.96	640.96	640.96	640.96	640.96	640.96	640.96	640.96	640.96
13 Alur	66.88	735.71	735.71	735.71	735.71	735.71	735.71	735.71	735.71	735.71	735.71
14 Bibit bakau	0.00	223.70	223.70	223.70	223.70	223.70	223.70	223.70	223.70	223.70	223.70
SUB TOTAL DIRECT COST	105,180.35	508,985.90	508,985.90	508,985.90	508,985.90	508,985.90	508,985.90	508,985.90	508,985.90	508,985.90	508,985.90
LOSS OF BENEFIT											
1 Indirect Benefit	0	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
2 Option Value	0	337,918.74	337,918.74	337,918.74	337,918.74	337,918.74	337,918.74	337,918.74	337,918.74	337,918.74	337,918.74
SUB TOTAL LOSS OF BENEFIT	0	337,918.81	337,918.81	337,918.81	337,918.81	337,918.81	337,918.81	337,918.81	337,918.81	337,918.81	337,918.81
TOTAL COST	107,075.35	846,904.71	846,904.71	846,904.71	846,904.71	846,904.71	846,904.71	846,904.71	846,904.71	846,904.71	846,904.71
NET BENEFIT	-105180.35	5075887.79	5100442.79	5124897.79	5149352.79	5173807.79	5198262.79	5222717.79	5247172.79	5271627.79	5401263.13
DF (DR=15%)	1.00	0.87	0.76	0.66	0.57	0.50	0.43	0.38	0.33	0.28	0.25
NPV	-105180.35	4416109.38	3876336.52	3382432.54	2935131.09	2588903.90	2235253.00	1984632.76	1731507.02	1476055.78	1350315.78
TOTAL NET BENEFIT	51860352.88										
TOTAL NPV	25869337.4										

Appendix 3. Summary of Benefit-Cost Analysis on Sylvofisheries (80% area mangrove forest and 20% Shrimp Aquaculture) Management Option.

1.000 Ruplah

YEAR / ITEM	0	1	2	3	4	5	6	7	8	9	10
DIRECT BENEFIT											
1 Potensi Kayu	0	318932.05	343387.05	367842.05	392297.05	441207.05	490117.05	465662.05	490117.05	514572.05	539027.05
2 Bunting Kayu	0	13599.40	13599.40	13599.40	13599.40	13599.40	13599.40	13599.40	13599.40	13599.40	13599.40
3 Tambak Udang	0	3201697.51	3201697.51	3201697.51	3201697.51	3201697.51	3201697.51	3201697.51	3201697.51	3201697.51	3201697.51
4 Udang	0	109464.49	109464.49	109464.49	109464.49	109464.49	109464.49	109464.49	109464.49	109464.49	109464.49
5 Benur	0	16999.25	16999.25	16999.25	16999.25	16999.25	16999.25	16999.25	16999.25	16999.25	16999.25
6 Nener	0	3237.66	3237.66	3237.66	3237.66	3237.66	3237.66	3237.66	3237.66	3237.66	3237.66
7 Kepiting	0	100265.50	100265.50	100265.50	100265.50	100265.50	100265.50	100265.50	100265.50	100265.50	100265.50
8 Wideng	0	104503.58	104503.58	104503.58	104503.58	104503.58	104503.58	104503.58	104503.58	104503.58	104503.58
9 Ular	0	11899.47	11899.47	11899.47	11899.47	11899.47	11899.47	11899.47	11899.47	11899.47	11899.47
10 Kerang	0	25498.87	25498.87	25498.87	25498.87	25498.87	25498.87	25498.87	25498.87	25498.87	25498.87
11 Belut	0	8201.23	8201.23	8201.23	8201.23	8201.23	8201.23	8201.23	8201.23	8201.23	8201.23
12 Ikan	0	32723.56	32723.56	32723.56	32723.56	32723.56	32723.56	32723.56	32723.56	32723.56	32723.56
13 Burung	0	120.39	120.39	120.39	120.39	120.39	120.39	120.39	120.39	120.39	120.39
14 Alur	0	3121.17	3121.17	3121.17	3121.17	3121.17	3121.17	3121.17	3121.17	3121.17	3121.17
15 Bibit Bakau	0	125.40	125.40	125.40	125.40	125.40	125.40	125.40	125.40	125.40	125.40
SUB TOTAL DIRECT BENEFIT	0	3950369.53	3974844.53	3999299.53	4023754.53	4072664.53	4121574.53	4097119.53	4121574.53	4146029.53	4170484.53
INDIRECT BENEFIT											
1 Penyedia Pakan	0	29.56	29.56	29.56	29.56	29.56	29.56	29.56	29.56	29.56	29.56
2 Penahan abrasi	0	780000.00	780000.00	780000.00	780000.00	780000.00	780000.00	780000.00	780000.00	780000.00	780000.00
SUB TOTAL INDIRECT BENEFIT	0	780029.56	780029.56	780029.56	780029.56	780029.56	780029.56	780029.56	780029.56	780029.56	780029.56
OPTION VALUE											
Biodyversity	0	1351676.76	1351676.76	1351676.76	1351676.76	1351676.76	1351676.76	1351676.76	1351676.76	1351676.76	1351676.76
SUB TOTAL OPTION VALUE	0	1351676.76	1351676.76	1351676.76	1351676.76	1351676.76	1351676.76	1351676.76	1351676.76	1351676.76	1351676.76
EXISTENCE VALUE											
Keberadaan	0	2164063.69	2164063.69	2164063.69	2164063.69	2164063.69	2164063.69	2164063.69	2164063.69	2164063.69	2164063.69
SUB TOTAL EXISTENCE VALUE	0	2164063.69	2164063.69	2164063.69	2164063.69	2164063.69	2164063.69	2164063.69	2164063.69	2164063.69	2164063.69
SALVAGE VALUE											90583.77
TOTAL BENEFIT	0	8246159.540	8270614.540	8295069.540	8319524.540	8368434.540	8417344.540	8392889.540	8417344.540	8441799.540	8556918.310

Appendix 3. Continued.

1.000 Ruplah

YEAR / ITEM	0	1	2	3	4	5	6	7	8	9	10
DIRECT COST											
1 Ranting Kayu	44.59	10244.14	10244.14	10244.14	10244.14	10244.14	10244.14	10244.14	10244.14	10244.14	10244.14
2 Tumbuk udang	86766.34	268852.62	268852.62	268852.62	268852.62	268852.62	268852.62	268852.62	268852.62	268852.62	333558.37
3 Udang	668.82	7468.52	7468.52	7468.52	7468.52	7468.52	7468.52	7468.52	7468.52	7468.52	7468.52
4 Benur	594.51	9660.78	9660.78	9660.78	9660.78	9660.78	9660.78	9660.78	9660.78	9660.78	9660.78
5 Nener	594.51	9660.78	9660.78	9660.78	9660.78	9660.78	9660.78	9660.78	9660.78	9660.78	9660.78
6 Kepiting	312.12	35982.67	35982.67	35982.67	35982.67	35982.67	35982.67	35982.67	35982.67	35982.67	35982.67
7 Wideng (Kepiting Hitam)	274.03	23961.51	23961.51	23961.51	23961.51	23961.51	23961.51	23961.51	23961.51	23961.51	23961.51
8 Ular	278.68	17277.93	17277.93	17277.93	17277.93	17277.93	17277.93	17277.93	17277.93	17277.93	17277.93
9 Kerang	66.88	8566.51	8566.51	8566.51	8566.51	8566.51	8566.51	8566.51	8566.51	8566.51	8566.51
10 Belut	23.22	10647.75	10647.75	10647.75	10647.75	10647.75	10647.75	10647.75	10647.75	10647.75	10647.75
11 Ikan	483.04	9690.97	9690.97	9690.97	9690.97	9690.97	9690.97	9690.97	9690.97	9690.97	9690.97
12 Burung	390.15	640.96	640.96	640.96	640.96	640.96	640.96	640.96	640.96	640.96	640.96
13 Alur (Sayuran)	66.88	735.71	735.71	735.71	735.71	735.71	735.71	735.71	735.71	735.71	735.71
14 Bibit Bakau	0.00	2238.70	2238.70	2238.70	2238.70	2238.70	2238.70	2238.70	2238.70	2238.70	2238.70
SUB TOTAL DIRECT COST	90563.77	415629.55	415629.55	415629.55	415629.55	415629.55	415629.55	415629.55	415629.55	415629.55	480335.30
LOSS OF BENEFIT											
1 Indirect Benefit	0	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
2 Option Value	0	337918.74	337918.74	337918.74	337918.74	337918.74	337918.74	337918.74	337918.74	337918.74	337918.74
SUB TOTAL LOSS OF BENEFIT	0	337918.81	337918.81	337918.81	337918.81	337918.81	337918.81	337918.81	337918.81	337918.81	337918.81
TOTAL COST	90563.77	753548.36	753548.36	753548.36	753548.36	753548.36	753548.36	753548.36	753548.36	753548.36	818254.11
NET BENEFIT	(90563.77)	7492711.19	7517166.19	7541621.19	7566076.19	7590725.45	7614986.19	7639441.19	7663896.19	7688351.19	7738584.22
DR = 15%	1.00	0.87	0.76	0.66	0.57	0.5	0.43	0.38	0.33	0.28	0.25
NPV	(90563.77)	6518658.74	6713046.31	4977489.99	4312661.43	3762862.72	3274444.06	2902987.65	2529085.74	2152738.33	1934841.06
TOTAL NET BENEFIT	75897975.45										
TOTAL NPV	37988034.30										

Coastal Resource Damage Liability and Compensation in the Philippines

MA. ARLENE MENDOZA
Office of the Undersecretary for Legal and Legislative Affairs and Attached Agencies
Department of Environment and Natural Resources
Quezon City, Philippines

MA. ARLENE MENDOZA. 1998. Coastal resource damage liability and compensation in the Philippines, p 68-69. *In* **The Regional Workshop on Partnerships in the Application of Integrated Coastal Management.** 12-14 November 1997, Chonburi, Thailand. 167 p.

Abstract

The marine resources of the Philippines have been recognized as the highest biodiversity area in the world. It is no wonder that utilization of these resources is foremost in the developing Philippine economy.

Development, however, has brought with it severe consequences that spelled destruction on the marine and coastal environment of the country. Thus, the need for adequate legislation on marine and coastal environment in the Philippines cannot be overemphasized.

Legal adequacy in terms of judicial and extra-judicial remedies and in meting out the proper penalties is imperative. The Marcopper, Bolinao and Boracay incidents have brought to light two important messages regarding the adequacy of Philippine environmental law in resolving pollution issues.

One, there is a high degree of scientific uncertainty in most marine and coastal pollution problems. It is difficult to gather evidence that would substantiate pollution claims. The question of delimiting this inquiry into a certain scale in the realm of science poses real problems both in the theoretical and operational aspects of the law. Unresponsiveness of suggested solutions requires further research. Were all factors considered? What is the probability of system failure in the future? What is the allowable margin of error in these cases? Consultation must not be limited to the proponents alone but to all stakeholders within the area. What are the factors to be considered during the consultation process? What are the standard procedures?

Second, the impact of marine and coastal pollution laws as *adequate* is very significant in the process of eradicating or at least minimizing the problem of marine and coastal environmental destruction. The relevant laws and regulations must be plotted in a customized Philippine environment-adequate scale. This scale will measure the impact of such legislation and will necessarily register the present requirement on a case-by-case basis. Is there a need for improving the monitoring system? For increasing the legal mechanism? Is it responsive to specific conditions?

A discussion of the economic penalties in case of violation is crucial vis-a-vis the incentives offered in order to induce the idea of conservation of resources or the abatement of pollution. Is the legal guarantee for such incentives practical? An analysis of the three cases will demonstrate Philippine experience regarding this.

Based on the foregoing, recommendations are given considering the market-based strategy, in the light of national measures on pollution such as cleanup and rehabilitation, notices of violation, social acceptability mechanisms, pertinent national laws and rules and regulations, and international conventions and protocol.

Implementation of Integrated Waste Management Action Plan in Batangas Bay, Philippines: Lessons Learned

S. ADRIAN ROSS
Senior Programme Officer

DELILAH PADILLA
Research Assistant

GEF/UNDP/IMO Regional Programme for the Prevention and Management of Marine Pollution in the East Asian Seas
P.O. Box 2502, Quezon City 1165
Philippines

S. ADRIAN ROSS and DELILAH PADILLA. 1998. Implementation of integrated waste management action plan in Batangas Bay, Philippines: lessons learned, p. 70. *In* **The Regional Workshop on Partnerships in the Application of Integrated Coastal Management.** 12-14 November 1997, Chonburi, Thailand. 167 p.

Abstract

Batangas is one of the 75 provinces of the Philippine archipelago, situated at the southwestern tip of Luzon Island opposite the South China Sea. The project site, with an estimated land area of 871.1 km^2 and a coastline of 470 km, is located at the southern part of the Province. The Batangas Bay Region (BBR) includes 5 coastal municipalities, 88 coastal barangays bordering the Batangas Bay and 9 interior municipalities with catchment areas that drain into the bay. With a population growth rate of 2.25%, the bay region is projected to support a total of 937,757 individuals by the year 2000.

The paper has the following objectives: to explain the methodology/approach to developing an Integrated Waste Management Action Plan; to demonstrate the value/benefits of the methodology through results achieved in Batangas; and to gain public support/willingness to support improved waste management.

The paper is subdivided into 2 major topics: (1) The regional context of environmental management issues in the Batangas Bay Region focusing mainly on the prevailing condition of waste management in the bay area vis-à-vis BBR's legal, enforcement, facilities and practices on waste management; and (2) The development of the Integrated Waste Management Action Plan with emphasis on the development stages and basic components of the Action Plan, the key components of plan development and the measures of success during the implementation of the Action Plan.

Waste Assessment and Management in Xiamen, People's Republic of China

ZHUANG SHIJIAN
Senior Engineer
Environmental Monitoring Station of Xiamen
56 Hubinnan Road, Xiamen 361004
People's Republic of China

ZHUANG SHIJIAN. 1998. Waste assessment and management in Xiamen, People's Republic of China, p. 71. *In* **The Regional Workshop on Partnerships in the Application of Integrated Coastal Management.** 12-14 November 1997, Chonburi, Thailand. 167 p.

Abstract

Sources, types and quantities of wastes and their changes over time in Xiamen are characterized. Major environmental impacts of wastes by land- and sea-based sources are assessed. Further, framework and program areas for integrated waste management actions are outlined, including management mechanisms, approaches to total waste quantity control, source control, compliance and enforcement, waste minimization, contingency planning, sustainable financing, research and monitoring, as well as the development of an information system applying relevant international guidelines, those of the Global Waste Survey in particular. The need to improve cross-agency consultation and coordination for developing an integrated waste management system in Xiamen is highlighted.

A Review of Waste Generation and Management in the Countries Bordering the East Asian Seas

S. ADRIAN ROSS
Senior Programme Officer
GEF/UNDP/IMO Regional Programme for the Prevention and Management of Marine Pollution in the East Asian Seas
P.O. Box 2502, Quezon City 1165
Philippines

S. ADRIAN ROSS. 1998. A review of waste generation and management in the countries bordering the East Asian Seas, p. 72. *In* **The Regional Workshop on Partnerships in the Application of Integrated Coastal Management.** 12-14 November 1997, Chonburi, Thailand. 167 p.

Abstract

The East Asian Seas border the most populated region of the world with an estimated 1.8 billion people living on a land mass that is roughly two-thirds the size of North America. The very existence of a population of such magnitude, coupled with the fact that several countries in the region are undergoing economic development at a double-digit pace, gives one cause to ponder the capacity of countries to control and manage the ever-increasing volumes and varieties of waste that are being generated, and the potential impact on the marine and coastal waters of the East Asian Seas.

This paper examines the sources, volumes and characteristics of waste generated in the East Asia Region, and the management systems that have been put in place in the respective countries to collect, process and dispose of unwanted by-products of human activity. The data are based on information contained in documents entitled, "National Profiles on Marine Pollution Prevention and Management" which have been prepared for 11 countries in the region. In addition, rapid assessment procedures are employed to fill existing data gaps in order to develop a region-wide estimate of waste loadings to the East Asian Seas.

Regional progress and trends in the development of national waste management systems are reviewed, and a comparison of the current status and timeline of development among newly developed countries and countries involved in the same journey is provided. Conclusions are made on the approaches to waste management that have been, or appear to have been, adopted and a projection is offered on the evolution of waste management programs.

The Development and Adoption of Ecosystem-based Marine Functional Zoning in Xiamen, People's Republic of China

RUAN WUQI
Professor
Fujian Institute of Oceanography
22-40 Haishan Road
Xiamen 361012, People's Republic of China

RUAN WUQI. 1998. The development and adoption of ecosystem-based marine functional zoning in Xiamen, People's Republic of China, p. 73. *In* **The Regional Workshop on Partnerships in the Application of Integrated Coastal Management.** 12-14 November 1997, Chonburi, Thailand. 167 p.

Abstract

Marine functional zoning in Xiamen, People's Republic of China, is an application of experience gained in land use planning. The vitality of this approach is based on the use of best available scientific information on natural environment, resources and socioeconomic features for resolving multiple use conflicts. The rationale, principles and classification scheme of marine zoning in Xiamen are discussed. Emphasis is given to the zoning practices and experience gained in the Western Sea of Xiamen to tackle conflicts among shipping/port development, mariculture, tourism and the protection of endangered species. Constraints and future improvements are also discussed.

Water Use Zonation Scheme for Batangas Bay, Philippines

ERNESTO SEROTE
Professor
School of Urban and Regional Planning
University of the Philippines
Diliman, Quezon City 1101
Philippines

ERNESTO SEROTE. 1998. Water use zonation scheme for Batangas Bay, Philippines, p. 74. *In* **The Regional Workshop on Partnerships in the Application of Integrated Coastal Management.** 12-14 November 1997, Chonburi, Thailand. 167 p.

Abstract

This study covers a long-neglected aspect of natural resource management in an archipelagic state like the Philippines. Focusing on the water and on the coastal zone, it analyzes the issues arising from the multi-layered claims over, and multiple uses of the Batangas Bay. Batangas Bay is located on the southern part of the main island of Luzon, Philippines, facing the South China Sea.

At the base of the multi-layered claims is the overlapping jurisdiction of five coastal municipalities whose authority to dispense territorial use rights for fisheries has been extended lately to 15 kilometers from the shoreline under the new Local Government Code. The topmost layer represents the claim of the national government over the bay as a major port of entry and an important area for shipping and navigation. Sandwiched between these two layers are the numerous private users of the bay water for fisheries, recreation, transport, residential and industrial purposes.

The paper builds the rationale for water use zonation upon the need to address these issues and to avert their possible escalation into open conflicts, or worse, into disasters. The proposed zonation scheme designates three categories of use zones: restricted use, exclusive use and multiple use zones. The restricted use zone is assigned for activities that cannot tolerate the presence of other uses of the bay water. Exclusive use zones are reserved for activities the viability of which depends on continued unhampered access to the water. The multiple use zone accommodates activities that tolerate other activities through time sharing.

The water use zonation scheme also has developmental functions particularly as it impinges on the content and context of plans and policies on the land side of the coastal zone. In this connection, the paper offers a liberal helping of ideas on how to improve the quality of existing land use plans of the coastal municipalities specifically as regards the use of their waterfront areas.

Whether it is used as an instrument for regulation or to spur development in the right places, the water use zonation scheme seeks to strike a balance among the three objectives of economic growth, social equity and environmental stability.

Finally, the alternative institutional arrangements for implementing the scheme consistent with the principles of local autonomy and people empowerment are explored.

Ecological and Socioeconomic Impact Assessment of Coastal Economic Development in Xiamen, China

HONG HUASHENG and XUE XIONGZHI

The Research Laboratory of SEDC of Marine Ecological Environment
College of Oceanography and Environmental Science
Xiamen University, Xiamen 361012
People's Republic of China

HONG HUASHENG and XUE XIONGZHI. 1998. Ecological and socioeconomic impact assessment of coastal economic development in Xiamen, China, p. 75-80. *In* **The Regional Workshop on Partnerships in the Application of Integrated Coastal Management.** 12-14 November 1997, Chonburi, Thailand. 167 p.

Abstract

A methodological framework of integrated ecological and socioeconomic impact assessment was established. The first and secondary environmental, economic and social information was integrated and provided the baseline information on the interactions between the coastal environment and the rapid economic development with emphasis on marine pollution in the Xiamen coastal area. The ecological impact was measured using general indicators such as physical, chemical parameters and the local special biological indicators. The social and economic impact was assessed in terms of population pattern, human health, food security, employment and equity.

The integrated environmental impact assessment enables us to identify the function and major issues for each area, providing the sound scientific base for the marine functional zonation scheme. Policy guidelines and management strategies for the priority issues were also suggested. Results show the cumulative impacts in the Xiamen Western Sea water and sediment due to the project by project coastal construction and long-term pollutant discharge. The economic loss caused by coastal environmental problems is roughly estimated to show the feedback of the environment to the socioeconomic system. An analytical framework combining the socioeconomic impact assessment and cost-benefit analysis of the planned integrated treatment project in the Xiamen Western Sea was made for further action. A two-dimensional numerical model with the application of GIS was established. The prediction of the water quality change in the next 5 years gives the early warning of the organic pollution problem in Tong'an Bay. A management-oriented research was developed and supported by the government for solving the contradiction between the future industrial development and intensive agriculture in Tong'an Bay.

By controlling direct sewage discharge into the bathing beach and strengthening the cleaning and management efforts, Xiamen University beach was restored and became a nice recreation site for the public again. In the process of ICM in Xiamen, a scientific expert committee comprised of top scientists and experts from the institutions and government sectors was appointed by the municipal government in March 1996. The infrastructure for activity facilitating scientific inputs into management and institutional cooperation was established. Furthermore, Xiamen Coastal Sustainable Training Center was established in January 1997 for continuing scientific education and promoting capacity building with emphasis on policy-makers and managers.

Introduction

Xiamen is known for its beautiful subtropical scenery and is one of the earliest international ports (formerly known as Amoy) in China after the Opium War (1840). Located in the southeast coast of China, Xiamen has a coastline of 134 km and a sea area of 334 km^2. Its economy is highly dependent on the sea as evidenced by the construction of ports, coastal infrastructure, tourism, aquaculture, industry and development. Xiamen is one of the five special economic zones of China.

Because of rapid socioeconomic growth and the expanding use of coastal resources, Xiamen is now under increasing environmental pressure. Xiamen's population has increased rapidly due to a high demand in manpower needed for the growing economy. Already more than half of the mangrove resources have been destroyed. Sea reclamation has reduced tideland and accelerated sedimentation, while sewage and other forms of wastes are being discharged into the sea, thus, increasing eutrophication.

To ensure Xiamen's sustainable development, the environmental problems have to be identified and solved. For this to happen, an integrated impact assessment of the economic development along the coastal zone was needed.

Impact Assessment for Management Improvement

In March 1996, the municipal government of Xiamen appointed a Scientific Expert Committee made up of top scientists and experts. This put into place the infrastructure which made scientific inputs into management possible. Management-oriented research was organized. The results were readily usable for environmental impact assessment and provided a basis for the development of the Marine Functional Zonation Scheme and the Marine Economic Development Programme.

Methodological Framework

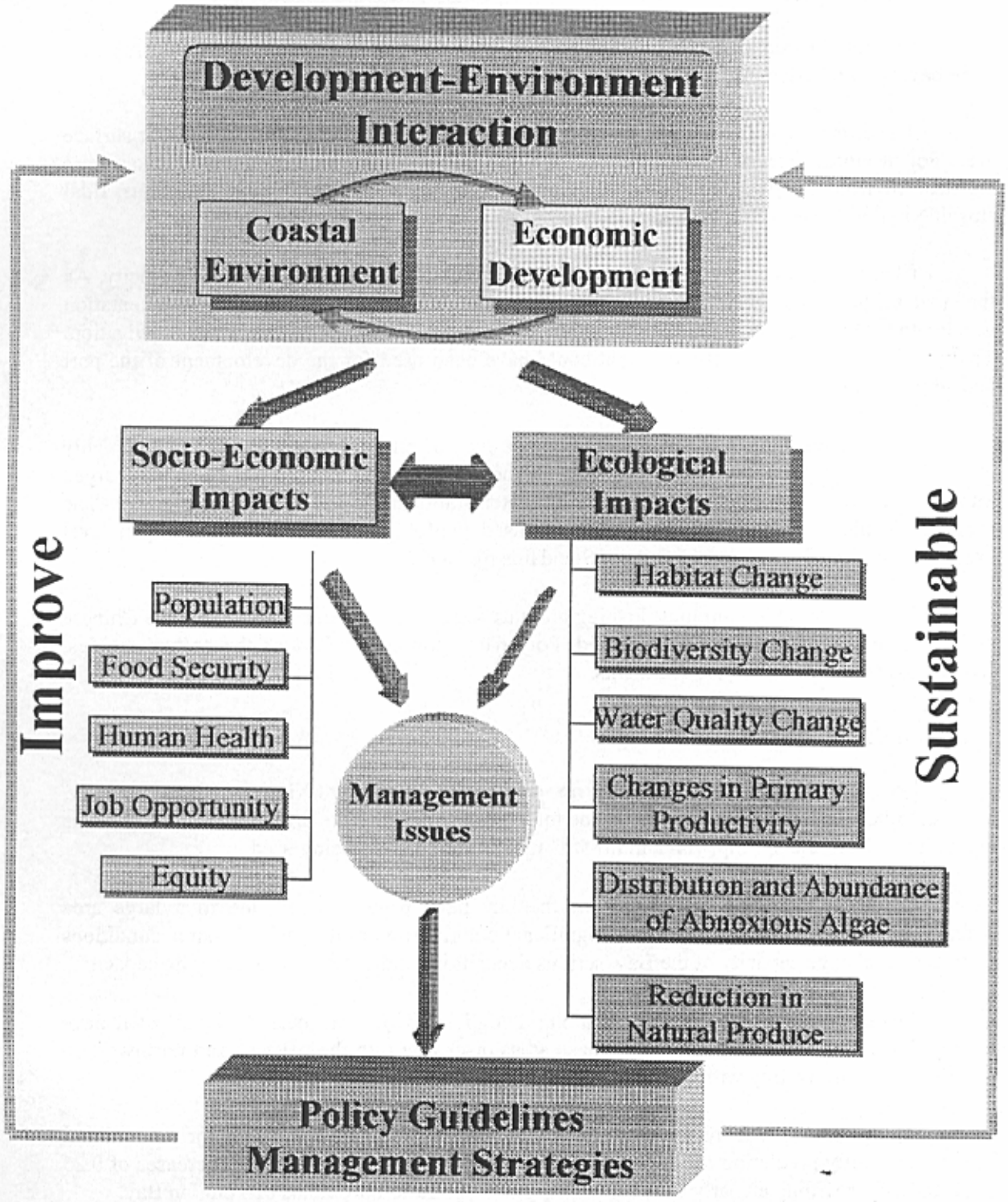
In the conduct of impact assessment, a methodological framework was developed integrating ecological and socioeconomic assessment (see ***Figure 1***). For ecological impacts, various indicators were used as shown in ***Table 1***. The social and economic impacts were assessed in terms of population patterns, human health, food security, employment and equity.

Table 1. Classification of Ecological Evaluation Index Factor in Xiamen City

Normal Index Factors	Special Index Factors
Chemical factors (water quality, sediment, organism)	Chinese white dolphin (*Sousa chinensis*)
Vegetation	Egret
Benthic fauna	Lancelet
Phytoplankton	Mangrove

The framework looks into the nature and extent of impacts on the ecosystem by coastal economic activities, quantifies economic loss associated with the adverse ecosystem changes, and defines direction and measures for improving management. A multi-disciplinary team was organized; sharing of ideas occurred among various team members through meetings held during the implementation of the project to work out the linkages and improve understanding of the results from the disciplinary studies. Primary and secondary data on various environmental and socioeconomic aspects of coastal activities in Xiamen were consolidated as baseline information.

Figure 1. Assessing Ecological and Socioeconomic Impacts of Economic Development.



Ecosystem Impacts

The assessment framework was applied to three representative areas in Xiamen, which brought to light numerous problems that threaten the Xiamen coastal zone.

The Western Sea

Results showed that coastal construction projects and long-term pollutant discharges were having cumulative impacts in the Western Sea water and sediment.

The direct impacts were the change in geomorphology and the reduction of water surface area. For instance, to meet the requirements for transportation and land use, several dikes were constructed from 1950 to the 1970s and large area reclamation was carried out. Thus, tidal flushing in the Western Sea was reduced by 69.4%.

Changes also occurred in the hydrological circulation pattern and siltation velocity. As the tidal influx volume was reduced, the tidal flushing capacity weakened and sedimentation accelerated. Dredging activities increased just to maintain an acceptable depth for navigation. These activities consumed resources that could have been used for the development of the port and shipping industry in Xiamen.

The Western Sea is the recipient of about 80% of all land-based wastes on this highly industrialized and populated area. Only 40% of the wastes are treated before being discharged into the sea. With tidal flushing reduced, the deterioration of water quality accelerated. The average chemical oxygen demand (COD) increased twofold in five years and nitrogen level exceeded the State Marine Water Quality Standards by 100%.

The effects were enormous. Fishing grounds were destroyed and sightings of the Chinese white dolphin (*Sousa chinensis*) decreased. Polychaete dominated 50% of the bottom species, indicating contamination of the sediments.

Tong'an Bay

Tong'an Bay is earmarked as an aquaculture area for Xiamen City. Presently, aquaculture comprises 44 km^2 or 51% of the total suitable aquaculture area. The cultured species are mainly oyster and shrimp with a multi-structure culture pattern being used.

Culture waters and tidal prism of the bay have been reduced due to a large area reclamation project. This has resulted in significant deterioration of the hydrodynamic conditions and water exchange capacity of the Bay, serious depositions and a decrease in carrying capacity.

In recent years, industrial areas along Tongji Highway and near Tong'an town have rapidly developed and wastewater from these areas discharge into the western and northwestern inner bay of Tong'an Bay with only partial treatment.

It is predicted that by the year 2000, Tong'an Bay will be unsuitable for aquaculture. The water quality prediction for the next five years indicates incremental COD increases of 0.25 mg/l (mean), providing an early warning of the organic pollution problems of Tong'an Bay.

Eastern coastline

The eastern coastline (from Xiamen University in the south to Wutong in the north) is the longest and widest white sand beach and fishing area in Xiamen Island. Regarded as the best tourist spot in Xiamen, there has been an increase in tourist visits. This has resulted in degradation of the coastal area, including destruction of trees, wastewater discharging directly through the beach and beach litter.

Environmental Cost

Estimates of environmental cost associated with coastal development have been calculated (***Table 2***).

Table 2. Environmental Cost Estimates of Adverse Ecosystem Changes

Issues	Cost (million yuan/year)
Aquaculture loss from pollution accidents	0.66
Fishery loss from inappropriate fishing methods such as the use of explosives, poisons, electricity	0.25
Cost for removing sea floating refuse	1.00
Cost for dredging navigation/port area	1.72
Cost for Yuandang Lagoon treatment	35.00
Cost for establishing/maintaining Egret Nature Conservation Zone	0.20
Cost for establishing/maintaining *Branchiostoma belcheri* Gray Nature Conservation Zone	0.10
Economic loss from sand beach erosion	➢ 0.30
Economic loss from coastal bank erosion	16.00
Ecological loss from oil spills/discharges	difficult to count

Due to information limitation and uncertainties, experts believed that the numbers given in the table could be underestimates, as most of the values used in the analysis are direct and tangible economic losses, and the costs of chronic and cumulative effects were not considered. The economic analysis provides the basis for a benefit-cost appraisal of proposed management interventions.

Models of the Western Sea suggest that opening the Maluan Dam will increase the capacity of tidal influxes, thus accelerating the rate of flow of the whole Western Sea. The increased flow rate would reduce marine siltation in navigation channels which would in turn benefit the shipping industry.

A project on preliminary treatment of Xiamen University Beach, conducted in 1995 , enhanced control over direct sewage discharges, strengthened the cleaning and management of the beach area. As a result, Xiamen University Beach has now been restored and has become a beautiful public recreation site once again

The government has paid much attention to the advice provided by the Scientific Expert Committee. The management-oriented research is addressing existing and potential conflicts between future development and the ecosystem of the Xiamen Sea.

References

Hong Huasheng et al. 1996. The ecological and socioeconomic impact of economic development in Xiamen demonstration site with emphasis on marine pollution. A report for Regional Programme for the Prevention and Management of Marine Pollution in the East Asian Seas—Xiamen Demonstration Site subactivities 1.2.5.1-2.

GESAMP. 1996. The contributions of science to integrated coastal management. GESAMP Report and Studies No. 61.

Estimation of Carrying Capacity for Mariculture Development in Xiamen, People's Republic of China

Chen Gang
Li Shaojing
Lin Yuanshao
Yang Shengyun
Xu Zhenzu
Department of Oceanography
Xiamen University
Xiamen 31005, People's Republic of China

CHEN GANG, LI SHAOJING, LIN YUANSHAO, YANG SHENGYUN AND XU ZHENZU. 1998. Estimation of carrying capacity for mariculture development in Xiamen, People's Republic of China, p. 81-90. *In* **The Regional Workshop on Partnerships in the Application of Integrated Coastal Management.** 12-14 November 1997, Chonburi, Thailand. 167 p.

Abstract

Since 1990, unregulated expansion of mariculture along the Xiamen coast has given rise to many environment problems which in turn adversely affect its development. Abatement and management of aquaculture pollution have to be placed on the agenda. To establish a scientific aquaculture management system, we surveyed the current status of aquaculture in Xiamen, including its scale, intensity, socioeconomic effect and correlationship with the environment. Further, we estimated the carrying capacity for aquaculture development in Xiamen.

Combined with qualitative data, quantitative estimates were made of the carrying capacity. Three methods used were: 1) trend analysis of historical development of culture area and unit production; 2) regression analysis of yearly unit production fluctuation; 3) environment water quality analysis for the mariculture area. Carrying capacity is finally expressed as the optimum culture areas in Xiamen. The optimum culture area is estimated at 8,366.81 ha, 83.3% of the current level. Further study is needed on the trophodynamics of the aquaculture system.

Introduction

Coastal aquaculture is an old and well-established practice in Xiamen. This sea farming could increase the production of animal proteins, produce high-priced commodities for export, create more employment opportunities and utilize huge areas of unproductive idle lands and water bodies for food production, so it plays quite an important role in Xiamen's socioeconomic development and has been rapidly growing since the 1980s.

However, while bringing about more socioeconomic benefits, aquaculture has an inevitable negative effect on the ecosystem. In the Xiamen coastal areas, unregulated expansion of mariculture has given rise to many pollution-related environment problems since 1990, such as eutrophication, incidence of red tides and so on. A large amount of evidence shows that current aquaculture intensity in Xiamen has exceeded the allowable level and its development should be properly managed (Li Shaojing et al. 1997).

In order to support a scientific management system for aquaculture, we surveyed the current status of aquaculture in Xiamen and, on the basis of present data, we estimated the carrying capacity for aquaculture development in Xiamen.

Materials and Methods

Collection of Secondary Information

Data on current status of aquaculture development and most ecological or biological parameters used in carrying capacity estimation are from secondary information from the following sources: 1) published academic articles, papers and works; 2) unpublished statistics or reports from related government agencies or scientific institutions; 3) interview data from farmers; and 4) satellite remote sensor maps for calibrating the aquaculture distribution map.

Estimation of Carrying Capacity

Trend analysis of historical development of aquaculture and environment water quality assessment were through direct calculation. Regression analysis was carried out using GRAFTOOL Release 3.3. These methods are explained in detail below.

Results

Current Status of Aquaculture Development Along Xiamen Coast

There are different culture types along the Xiamen coast. The main three culture modes are: 1) pond culture of shrimp, crab, fish in the reclamation area, called reclamation culture; 2) stone bar culture of mollusc in tidal flat, called tidal flat culture; 3) hanging culture of mollusc, seaweed and cage culture of fish in shallow sea, called shallow sea culture.

According to 1995 statistics, the total culture area is 10,050.07 ha, and the total production is 30,449 tons with the tidal flat culture accounting for the largest proportion (***Table 1***).

Table 1. Culture Area and Production in Different Culture Modes (according to 1995 statistics).

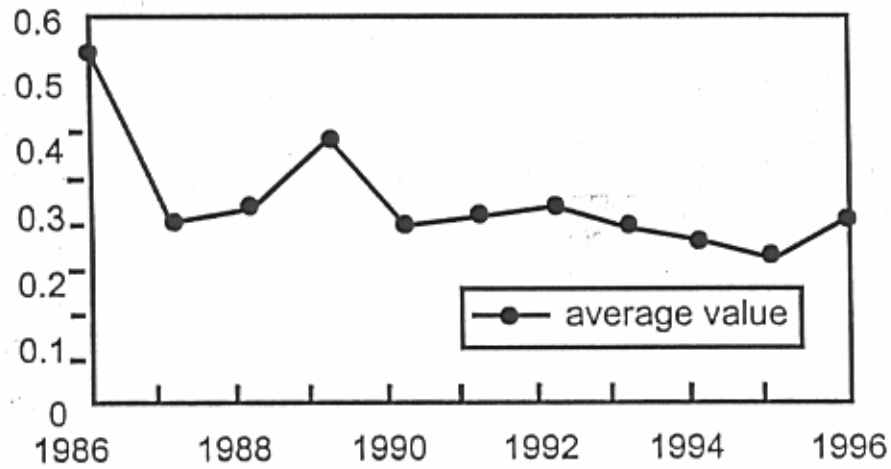
	Reclamation culture	Tidal flat culture	Shallow sea culture
Area (ha)	2,595.7	5,128.5	2,325.9
Production (ton)	4,406.0	13,414.0	12,629.0

Historical Development of Aquaculture Along the Xiamen Coast

Before the 1970s, there was only benthic mollusc culture in Xiamen. After the end of the 1970s, pond shrimp culture extensively developed in the reclamation area. In the 1990s, hanging and cage culture in shallow sea prevailed widely. Monospecies culture of oyster or razor clam in the 1960s was replaced by the present multispecies culture including prawn, clam, mussel, laver and so on.

From 1984 to 1995, both production and area of various culture modes have been increasing consistently. However, unit production was relatively constant all along or even declined in some cases. ***Figure 1*** shows the yearly variations of total culture area, total production and total unit production. We can observe that with the continuous expansion of culture area, production seemed to gradually approach a saturation level. After 1993, total production leveled off at about 30,000 tons and the unit production began to decrease. If we consider the reclamation shrimp culture, this phenomenon will be more clear: while the culture area was maintained at 1,600 ha, production and unit production sharply fell (***Figure 2***).

The variety curve of total nitrogen in Xiamen sea waters from 1986 to 1996



The variety curve of phosphorus concentration in Xiamen sea waters from 1986 to 1996

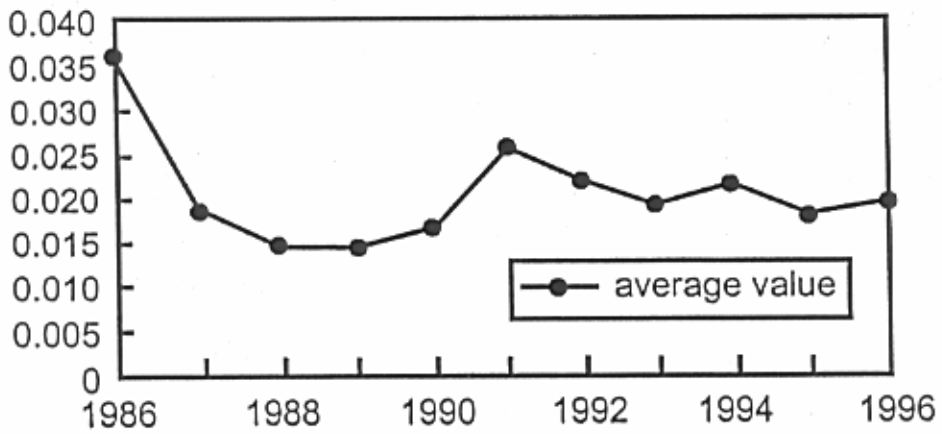
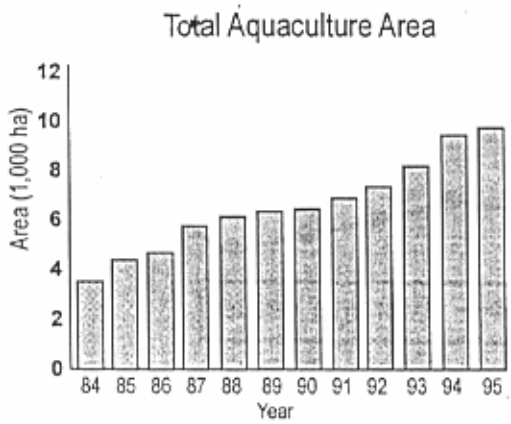


Figure 1. Development of Aquaculture Area and Production of Shrimp in Xiamen Seas from 1984 to 1995.



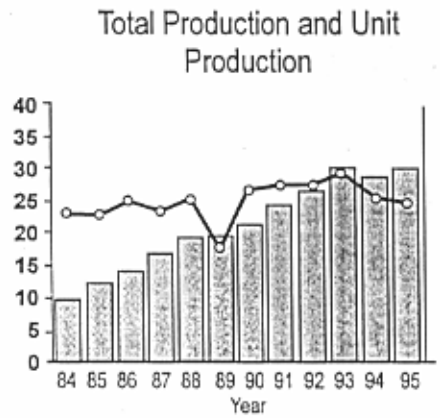
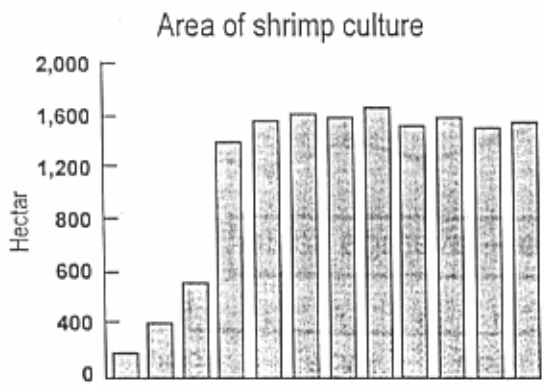
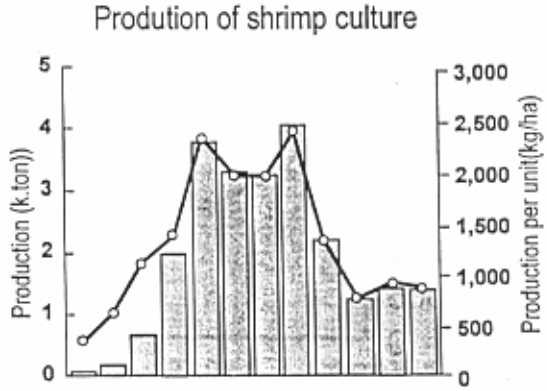


Figure 2. Yearly Variations of Aquaculture Area and Production of Shrimp in Xiamen Seas from 1984 to 1995.





Trend analysis

Historical development of mariculture in Xiamen, especially for recent years, has in fact reflected an intense interaction between culture system and ecological environment. The long-term stop or continuous declining trend of aquaculture development indicated that the environment was no longer available for culture. Data on the impact of aquaculture on the environment suggested that the degradation of the environment could be caused by the overdeveloped mariculture itself, at least to a considerable extent (Du Qi et al. 1997). This is an essential presumption for our estimation of carrying capacity.

From the trend analysis of mariculture development, we could directly find the threshold culture level above which environment degradation would impede its further development. Hence this threshold culture level is what is meant by carrying capacity for mariculture development in Xiamen. In trend analysis, we consider the item, unit production. Unit production represents a kind of culture productivity and can be regarded as a comprehensive indicator marking the response of aquaculture to its environment.

Taking the whole sea area as example (***Figure 3***), the unit production started to continuously decrease from 1993, although the culture area kept increasing. This means the environment is not capable of supporting culture production any longer. It is easy to understand that when above 8,462 ha (culture area in 1993), the more the culture area, the worse the environment, then the less the unit production. The value of 8,462 ha can be approximately considered as carrying capacity for aquaculture development.

Through this method, we estimated the carrying capacities on all the three culture modes and two parts of Xiamen sea area (see ***Table 2***).

Table 2. Carrying Capacity Estimated Through Trend Analysis (ha).

	Whole	East Seas	West Seas	Subtotal
Total area	8,462	6,395	2,109	8,504
Reclamation	1,854	1,127	774	1,901
Tidal flat	4,327	3,466	1,222	4,688
Shallow sea	1,874	1,745	121	1,866
Total	8,055	6,338	2,117	8,455/8,355*

*The former is the total of rows and the latter is the total of columns.

Regression model analysis

This is a more technical method with the same theoretical presumptions as the trend analysis. We treated the statistical data on culture area and unit production using regression analysis and established some polynomial regression models simulating the development of mariculture. Also taking the whole sea area as example (***Figure 4***), we simulated the correlationship between unit production and culture area to the following function:

$$PPU = -1.1348E{-}008 \cdot A^3 + 0.2129E{-}003 \cdot A^2 - 1.1131 \cdot A + 4650.73 \quad (1)$$
$$r = -0.7844$$

Figure 3. Trend Analysis of Aquaculture Area and Unit Production in Xiamen Seas.

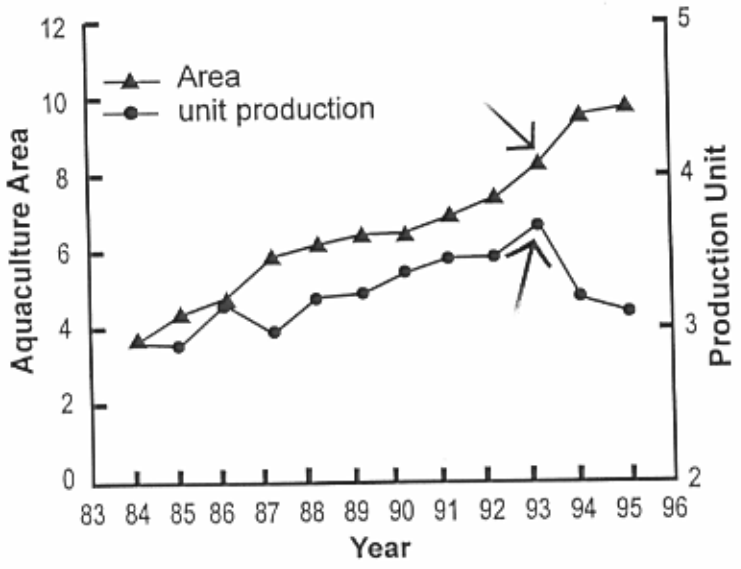
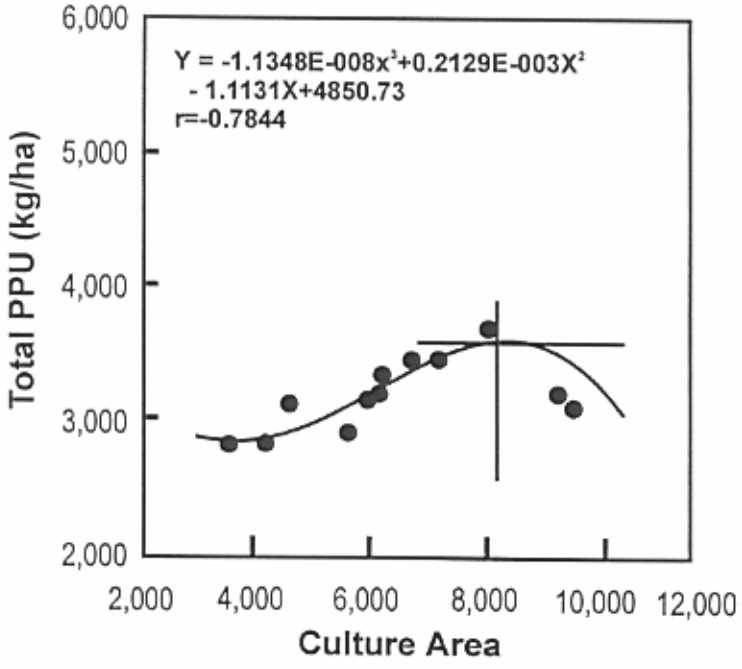


Figure 4. Regression Analysis of Unit Production of Aquaculture in Xiamen Seas.



where PPU is production per unit (in kg/ha) and A is the culture area (in ha).

We can easily solve the maximum of the response variable (PPU) of the function through differentiation treatment:

Let $d(PPU)/dt = 0$

i.e. $-3.4044E{-}008 \cdot A^2 + 0.4258E{-}003 \cdot A - 1.1131 = 0$

Solve the root of equation

$$A = 8{,}785.95 \text{ ha}$$

Substitute into **(1)**, then

$$PPU_{max} = 3.6091 \text{ kg/ha}$$

So we get the maximum available culture area, 8785.95 ha, and the possible maximum unit production, 3.6091 kg/ha. The former is the carrying capacity we seek. Through this method, we also made estimations on other parts listed in ***Table 3.***

Table 3. Carrying Capacity Estimated Through Regression Analysis.

	Area (ha)	**Unit production (kg/ha)**
Shallow sea	1,873.68	5,989.62
Tidal flat	4,516.40	4,240.45
Reclamation	2,066.40	2,226.83
Subtotal	8,456.48	
East sea areas		
Shallow sea	1,637.34	5,782.50
Tidal flat	2,972.22	3,443.71
Reclamation	1,195.58	2,023.04
Subtotal	5,805.14	
West sea areas		
Shallow sea	162.57	13,787.96
Tidal flat	1,185.89	6,290.83
Reclamation	707.46	1,578.40
Subtotal	2,055.92	
Total of West & East seas	7,861.06	

From the different estimation methods above, we get a set of different values about the total optimum culture area (i.e., the total carrying capacity). The result from direct regression analysis on total sea areas is 8,785.95 ha; the total from different culture modes is 8,456.48 ha; and the total from different sea areas is 7,861.06 ha (***Table 3***). It is the same with the results of trend analysis and 8,462; 8,504; 8,055; 8,355; 8,455 are reached, respectively. Finally, the averaged carrying capacity is estimated at 8,366.81 ha, which accounts for 83.3% of the total present culture area.

Mariculture Environment Quality Assessment

During our investigation on the correlation between mariculture and environment, we found the most prominent problem is organic pollution from mariculture to the ecological environment. In the culture areas, the main pollution sources come from metabolites of cultivated animals or residual artificial feeds in pond culture. Quite a large amount of these organic compounds will definitely result in the fluctuation of environment parameters, such as nutrient, COD, plankton biomass etc. Here we try to evaluate the impact of mariculture on the environment water quality(EWQ), thereby assess the EWQ-allowed level for mariculture. As for data availability, we choose Xiamen West seas as the example.

According to the COD standard of the first class seawater quality (GB3097-82 standard, 3.0 mg/l), it is estimated that the environment carrying capacity for COD discharge in Xiamen West seas is 48 ton/day and the current input level excluding aquaculture is 10 ton/day with 38 ton/day for further input (TIO-SOA et al. 1992). On the basis of this estimation, we assume that all the allowed reinput level is used for aquaculture. Then we can use the following equation to calculate the COD-allowed mariculture level:

$$COD_{max} = A \cdot k_r \cdot D_r \cdot E_r \cdot COD_r + A \cdot k_t \cdot D_t \cdot E_t \cdot COD_t + A \cdot k_s \cdot D_s \cdot E_s \cdot COD_s \qquad (2)$$

where

A = potential total culture area in Xiamen West seas;
k_r , k_t , k_s = proportions of reclamation, tidal flat and shallow sea culture area to the total (A); assumed as 34.4%, 57.7% and 7.9%, respectively, based on the optimum area data from regression analysis for these three modes;
D_r = average depth of aquaculture pond, assumed as 1.2 m;
D_t = water depth in tidal flat, assumed as 4 m based on the tidal range (TIO-SOA et.al. 1987);
D_s = hanging depth in shallow sea, assumed as 2 m;
E_r = daily exchanged water volume in pond culture, assumed as 1/3 water body;
E_t , E_s = daily exchanged water volume in shallow sea and tidal flat, assumed as 8% water body (TIO-SOA et al. 1987);
COD_r , COD_t , COD_s = COD levels in culture water for reclamation, tidal flat and shallow sea culture, determined as 7.76 mg/l, 4.32 mg/l, 4.32 mg/l, respectively (FATC 1996; FEMS-FJ 1996); and
COD_{max} = reinputable maximum COD for mariculture, assumed as 30.4 ton/day.

We substitute all the values of the parameters into equation **(2)**, then A is calculated as 179.17 ha. This level is slightly lower than that from regression analysis, 2,055.92 ha.

Discussion

Estimation of carrying capacity for aquaculture is an important part of ICM in Xiamen. However, we have to confess that there are many defects in our work and the methods we used need to be further perfected. Although trend analysis and regression analysis are the popular methods in fisheries, the estimated carrying capacity has some uncertainties because socioeconomic factors, anthropogenic pollution factors and some other factors influencing

aquaculture development were not fully considered. So there exist deviations among different treatments.

Environment water quality assessment is a popular method for environment carrying capacity (TIO-SOA et al. 1990). It can give a clear explanation on the fate of pollutant or environment indicators, e.g., COD, through hydrodynamic simulation model. But when used in aquaculture carrying capacity estimation, it faces the facts that: 1) pollution sources and their intensity are not easy to determine for the culture system is influenced by artificial operations and are always variable; 2) we have to find out what factors can be effectively used as quality indicators. We used averaged COD values of culture water and took them as constant discharge sources. In fact, COD was determined in a range of 3.5-19.0 mg/l in shrimp ponds (FATC 1996) and 2.19-8.66 mg/l in hanging areas (FEMSF-FJ 1996). It varied with time and space. Although marine ecological researches in Xiamen have lasted for decades, studies deep in ecological process and mechanisms have only been on today's agenda. We have few available data on the trophic structure, bioenergetics of cultivated animals, energy transfer efficiency and element cycling rate in the culture system so that we cannot predict the temporal and spatial fluctuation of COD. Besides COD, inorganic nitrogen and phosphate are also important environment quality indicators and their functions in culture system also need to be clarified and quantified. Due to all these uncertainties, the carrying capacity estimated from environment quality is a bit unacceptable. Since it is impossible to use all reinputable COD for aquaculture, the allowed aquaculture level will be far less than that estimated from regression analysis.

We are not sure which one is more resonable. It should be mentioned that we do not think that carrying capacity is just a fixed value. It should be a variable changing with the parameters of physico-chemical process and biological production process in the aquaculture environment. In order to solve this problem, we have started to study the trophodynamic process of the natural ecosystem and culture system (Chen Gang 1996) and ecological energy flow analysis has also been used for estimation of optimum aquaculture area (Lu Zhenbin et al. 1997). We hope some trophodynamic models of culture system will be established for more precise estimation of carrying capacity and for monitoring and management of aquaculture development.

Acknowledgments

This work was part of the subproject "*Abatement and management of pollution from coastal aquaculture in Xiamen*" in the Xiamen Demonstration Project under the Regional Programme of Prevention and Management of Marine Pollution in East Asian Seas funded by GEF/UNDP/IMO. Dr. Chua Thia-Eng, Regional Programme Manager, and Dr. Huming Yu are gratefully acknowledged for their critical comments and technical assistance. We thank Associate Prof. Du Qi , Associate Prof. Lu Zhenbin and other research fellows of Fujian Institution of Fisheries for their collaboration. We are also grateful to Mr. Chen Guoqiang and Mr. Shi Qian and other officers of the Marine Administrative Office of the Xiamen Municipal Government for their assistance.

References

Chen Gang. 1996. Studies on plankton trophic ecology in neritic seas of China. I. Plankton trophodynamic model in Xiamen West Harbour. II. Studies on zooplankton nutritional ecology in Taiwan Strait. Xiamen University. 125 p. Ph.D. thesis.

Du Qi et al. 1997. Pollution from coastal aquaculture and its impacts on its own development in Xiamen. Chapter 2. *In* Li Shaojing et al. Technical report of the subproject "Abatement and management of pollution from coastal aquaculture in Xiamen" in the Xiamen Demonstration Project under the Regional Programme on the Prevention and Management of Marine Pollution in East Asian Seas funded by GEF/UNDP/IMO.

FATC (Fishery Agency of Tong'an County) et al. 1996. New culture mode technology of prawn. (Unpublished)

FEMS-FJ (Fishery Environment Monitoring Station of Fujian Province). 1996. Report of fishery environment monitoring of Fujian Province. (Unpublished)

Li Shaojing et al. 1997. Technical Report of the subproject "Abatement and management of pollution from coastal aquaculture in Xiamen" in the Xiamen Demonstration Project under the Regional Programme on the Prevention and Management of Marine Pollution in East Asian Seas funded by GEF/UNDP/IMO.

Lu Zhenbin et al. 1997. Current status of aquaculture and estimation of optimum culture area in Xiamen, People's Republic of China. (this vol.)

TIO-SOA (The Third Institution of Oceanology, State Oceanic Administration). 1987. Comprehensive investigation on the marine environment of Xiamen estuary. J. Oceanogr. Taiwan Strait. 6(4): 1-139.

TIO-SOA (The Third Institution of Oceanology, State Oceanic Administration) et al. 1990. Researches on the environment capacity and plan of water quality management in Xiamen West Sea. (Unpublished)

A Hydrodynamic and Pollutant Dispersal Model of Batangas Bay, Philippines for Integrated Coastal Management Applications

CESAR VILLANOY
Professor
Marine Science Institute
University of the Philippines
Diliman, Quezon City 1101
Philippines

CESAR VILLANOY. 1998. A hydrodynamic and pollutant dispersal model of Batangas Bay, Philippines for integrated coastal management applications, p. 91. *In* **The Regional Workshop on Partnerships in the Application of Integrated Coastal Management**. 12-14 November 1997, Chonburi, Thailand. 167 p.

Abstract

Circulation patterns of coastal waters provide an important input to integrated coastal management (ICM) as it can provide information on fate and transport of contaminants released into the water as well as infer connectivities between the important biological resource habitats. As part of the Batangas Bay Demonstration Project of the GEF/UNDP/IMO Regional Programme for the Prevention and Management of Marine Pollution in the East Asian Seas, a three-dimensional numerical circulation model was applied to Batangas Bay in the Philippines to obtain advective velocity fields for pollutant disperal modelling. The circulation model used is the Princeton Ocean Model (POM), forced by tides and climatological winds. Surveys were conducted to determine the density structure of the top 200 m and to prescribe open boundary conditions. Results show that tidal currents are not strong enough to flush the waters in the northern part of the bay. It is the wind forcing which eventually dominates the net advection in the surface layer.

The transport of pollutants discharged at the surface was modelled using the advection and diffusion routines for temperature and salinity, and the appropriate boundary conditions. An oil spill trajectory model was also applied to simulate hypothetical oil spills from the location of the oil refineries in Batangas Bay. Simulations of pollutant releases indicate limited flushing when winds are absent or from the southwest. Releases in the northernmost part of the Bay, however, result in entrainment within the area regardless of wind direction. The absence of adequate amount of data necessary to initialize and calibrate models is one of the major limitations. As such, its predictive capability may be limited. Additional data are required to refine the models further but they can be used as diagnostic tools for monitoring purposes.

The Fisheries of Batangas Bay and Maricaban Strait

PORFIRIO ALIÑO
ARVIN DANTIS
ANDRE JON UYCHIAOCO
MARIA CATALINA RAÑOLA
HANNAH REID
FERNANDO CASTRENCE, JR.

Marine Science Institute
University of the Philippines
Diliman, Quezon City
Philippines

PORFIRIO ALIÑO, ARVIN DANTIS, ANDRE JON UYCHIAOCO, MARIA CATALINA RAÑOLA, HANNAH REID AND FERNANDO CASTRENCE, JR. 1998. The Fisheries of Batangas Bay and Maricaban Strait, p. 92-100. *In* **The Regional Workshop on Partnerships in the Application of Integrated Coastal Management.** 12-14 November 1997, Chonburi, Thailand. 167 p.

Abstract

An evaluation of the fisheries potential of the Batangas Bay demonstration site in the Philippines was undertaken to determine the various coastal resource management (CRM) issues related to its industrial development. Insights were gained from a characterization of the municipal and commercial fisheries. Although reef fisheries may be underutilized at less than its potential of around 5 tons (t)/km²/year, the absence of top predators may indicate some cause for concern. Pelagic fisheries activity, though minimal within the bay (3-6 t/km²/year), is highly dependent on imports from outside the bay. The implications of how various resource use conflicts may arise from their interaction in the use of the fishery and the ecosystem they are in, lead to important considerations and recommendations for management. Some issues identified were the: (a) possible marginalization of the sustenance fishers due to diminished access to their fishing area; (b) lower productivity of the bay due to reduced water quality; and (c) spillover of pollution into areas adjacent to the bay (and consequent lowered tourism attractiveness) providing greater impetus for the improved management of the bay. The need to develop safety nets for the fishers and other stakeholders dependent on these resources can be concretized in a strategic micro-demonstration site in Tingloy focused on fisheries management and ecotourism as part of the overall integrated coastal zone management (ICZM) agenda.

Introduction

The biophysical characterization of Batangas Bay is crucial to the formulation of an integrated coastal management plan. One of the crucial inputs to this characterization is the evaluation of the state of the fisheries, an assessment of the fisheries potential of the bay and how the fisheries might respond to the future development of the bay. At present, there are some limitations on the utility of the Department of Agriculture-Bureau of Agricultural Statistics (DA-BAS) reports on the annual fisheries statistics based on fish landed in the bay. These limitations are: (a) the coarse level of the catch and effort information; (b) insufficient spatial elucidation (e.g., where fishing grounds in the bay are, and where the fish landed catches are coming from) of how fishing effort by the various gears are impinging on the multi-species fisheries; and (c) the limited capacity of the Municipal Agriculture Office (MAO) which has the devolved function of fisheries monitoring, evaluation and management.

This paper: (a) characterizes and evaluates the status and potential of the Batangas Bay fisheries; (b) identifies the resource use conflicts of the fisheries sector with the other sectors; and (c) suggests management options to help assure the sustainable development of the bay.

Methods

Commercial Fisheries

The bagnet (*basnig*) fishing catch in the bay was surveyed in two fishing trips on 18 December 1996 and 15 May 1997. On both occasions, the fishers were informally interviewed; the total catches (in kg) were estimated; the fish species and lengths were recorded; and the locations of the fishing ground were plotted.

Municipal Fisheries

A team from the Batangas City municipal agricultural office (MAO) and one of the authors (H.K. Reid) were trained and collected data on the municipal fisheries.

One key informant and ten fishers were interviewed from each of the villages (barangays) bordering Batangas Bay and Maricaban Strait. Information on fishing grounds, gears, numbers of fishing boats and fishers operating within the bay was gathered.

Based on the results of the effort and gear survey, the opinions of the MAO team and the aim to have a representative sample from each spatial region of the coast, the five most important fishing villages around the bay were selected for catch monitoring. The villages that were originally chosen included: (a) Gasang, Mabini; (b) San Andres Proper, Bauan; (c) Wawa, Batangas City; and (d) Poblacion, Tingloy. A southern village of Batangas City was to be selected once the collection of gear and fishing ground survey data were completed. However, the MAO field team monitored Sta. Clara, a northern village of Batangas City due to the greater accessibility of the area. Data on man-hours fishing, catch (in kg) and catch composition were collected and recorded at least weekly for six months, by a resident of the village whose records were collected by the MAO team once a month. In addition, author H.K. Reid personally collected similar data one day in mid-July 1997 from Maricaban and San Juan in Tingloy. The catch per fisher-hour was computed by dividing the total catch (in kg) from one boat by the product of the number of fishers in a boat and the number of hours spent fishing.

Coral Reef Fish Communities

Eight sites around Batangas Bay and Maricaban Strait were surveyed on 18-22 February 1997. A 150-m transect line was laid along the 10-m isobath at each site (except at Matoco Point and Dilao Point where shallower depths were also sampled). Species, numerical abundance (estimated actual counts) and standard length (in cm) of fish observed within 5 m to either side and above the first 50-m and the last 50-m of the 150-m transect line were recorded (modified from English et al., 1994). Observers paused to record data every 5 m along the transect to help standardize rates of observation. The species and numerical abundance of juvenile fish observed within 1 m to either side of the line was also recorded in the same way.

The ECOPATH Modeling of Pelagic and Reef Communities

A balanced (net production = loss to predation and fishing) carbon flow model of the various trophic guilds in the area was estimated by successive approximations with ECOPATH (ver. 3.0) (Christensen and Pauly, 1996). Interactions among commercial and municipal fisheries and the various habitats were considered to take into account the multispecies nature of the fishery and the ecosystem. A trophic model was constructed for the pelagic area and another model was constructed for the reef area. Primary production was estimated by G. Jacinto (pers. comm.) to be 19,133 tons (t)/km^2 /year and 19,066 t/km^2/year for the pelagic and the reef models, respectively.

For the pelagic model, an annual catch estimate of 1,348 t (GEF/UNDP/IMO, 1996a) was used. Given C. Villanoy's (pers. comm.) estimate of the total bay area as 450 km^2, the catch density would be approximately 3 t/km^2/year. The percentage composition of commercial fish catches from the area was assumed to be equivalent to that of the two commercial fish catches sampled. From this, 66% of the catch is *Auxis rochei* and 29% is *Decapterus* spp., the dominant commercial species in the area (GEF/UNDP/IMO, 1996a). Species were grouped into feeding guilds.

For the reef model, biomass estimates were obtained from the reef fish visual census data gathered during the habitat survey. The annual catch was assumed to be 20-30% of the fish species both reported as being caught by artisanal fishing gears and observed during the visual census. Thirty percent of the observed biomass was assumed for "large" reef fishes while 20% was assumed for all other species.

Other parameters including production/biomass (P/B), consumption/biomass (Q/B), ecotrophic efficiency (EE)) were taken from the existing literature (Aliño et al. 1993; Aliño et al. in prep.; Opitz 1996). The diet assumed for each guild was the average of the diets of the dominant species in the guild which are available in FishBase 96 (Froese and Pauly 1996), Opitz (1996) or Aliño et al. (1993). Where the diet information was not available for a species, the diet of the species which most resembles each of the dominant species in the guild or best represents the guild in the model was used. Boxes in the model were provided for each of the food items of the species caught. Diets of these prey species not directly observed were again taken from the literature and boxes were again provided for their prey until a complete food web (from top predator to primary producer) was generated. Based on the input parameters, an initial estimate of a balanced model was derived. Using the results of these runs, modifications were made using the ECORANGER routine in ECOPATH 3.0 to iteratively tighten the balance of the models.

The species composition of the catch between the commercial and municipal fisheries was compared together with the known habitats of these species to determine the degree of species interaction within the bay.

Results and Discussion

Commercial Fisheries

On the first shipboard survey (18 December 1996), two hauling operations were conducted in the bay. The total catch for this survey was 40 kg. The top three species based on the total catch were *Amblygaster sirm* (manansi), *Rastrelliger kanagurta* (alumahan) and *Leiognathus* sp. (sapsap). On the second shipboard survey (15 May 1997), only one hauling operation was conducted. The total catch was 2 kg consisting of Clupeidae (dumpilas). Based on the observations of actual fishing operations and informal interviews from the two shipboard surveys, it appears that fishing grounds were selected by the master fishermen on the basis of time, phase of the moon and light intensity. Other bagnet fishing boats operating in the bay were also sighted during the two shipboard surveys.

Though there are 38 licensed commercial fishing boats of over 3 gross tons based in the bay (six using hook-and-line and 32 using bagnet), much of the fish landed in Batangas Bay is actually caught from fishing grounds outside the bay. Only seven of these 32 bagnet fishing boats occasionally fish within the bay (Medrano, pers. comm.).

Municipal Fisheries

Total effort and gear survey

Data from 44 villages were collected by the MAO team. These include the villages which were reported not to have any fishers. A comparison of the numbers of fishing boats and fishers estimated by the MAO team with similar figures reported by the Department of Agriculture-Bureau of Fisheries and Aquatic Resources (DA-BFAR) (GEF/UNDP/IMO, 1996a) shows the MAO consistently reporting lower estimates. Several factors may have contributed to this: (a) published figures were totals for each municipality, while the figures from this study refer only to the villages of these same municipalities which border Batangas Bay and Maricaban Strait; (b) many more fishers probably live in the villages in Balayan Bay and Tayabas Bay than in the villages of Batangas Bay for municipalities bordering more than one bay; (c) the team may not have interviewed enough people; and/or (d) the number of fishers may actually have decreased over the few years between the published study and this study. On the other hand, numbers reported by H.K. Reid for Tingloy were higher and very close to the published figures. It should be noted that these numbers do not distinguish between those whose main (not necessarily only) source of livelihood is fishing (full-time fishers) and those who derive some but not a major part of their livelihood from fishing (part-time fishers).

In contrast to the published DA-BFAR and Bureau of Agricultural Statistics (BAS) data, these new estimates also provide information on where (or whether) these fishers actually fish within the bay and what fishing gears are used. Informal interviews seem to indicate that many of the fishers based within Batangas Bay actually do not fish within the bay. H.K. Reid also confirmed that many of the fishers of Tingloy fished near Balayan Bay rather than in Batangas Bay. For the same villages of Tingloy, Reid estimated 849 fishers compared to the 70 fishers estimated by the MAO team.

Within Batangas Bay, most fishing effort recorded by the MAO team was concentrated near the Batangas City center. Further, Reid records that almost all Tingloy fishing activities were concentrated in the Verde Island Passage south of Maricaban Island. Gear use and fishing ground trends were similar for total number of boats and total man-hours spent fishing compared with trends for total number of fishers.

Catch per fisher-hour monitoring

For most of the five target villages monitored in this study, data for at least several days for each month were collected. However, in the case of Tingloy, data for only April and May were collected by the MAO team. A total of 1,881 batches of fish catches (one person interviewed per batch) were actually used for the analysis. The highest catch yielded per fisher-hour was recorded for the bagnet (*basnig*), drag seine for shrimp (*biyakos*) and spear fishing (*pana*), all of which yielded over 6 kg/man-hour. None of these high-yielding gears was commonly used by fishers in the bay and was each operated in only one sector of the bay. Hook-and-line, gill nets and drag seines averaged (across sectors) 1.8, 3.3 and 2.8 kg/hour, respectively. The small errors in recording the actual numbers of fishers (e.g., two instead of three) and time spent can lead to inflated catches per fisher-hour. In Tingloy, Reid reported the values 1.51, 0.87, 2.20 and 2.00 kg/hour for spear fishing, hook-and-line, gill nets and drag seines, respectively. All these values were found to be lower than those reported by the MAO team. Passive gears (such as hook-and-line and set gill nets) are generally perceived to exert less stress on the resource base than active gears (e.g., bagnet, spear fishing and drag seine).

The type of fish caught also depended on the type of fishing gear used. Hook-and-line fishers, for example, tended to catch open water fish such as tuna (Thunnidae, *tulingan* or *gulyasan*), scad (*Decapterus* sp.), jack (Carangidae or *tangigue*) and mackerel (Scombridae, *tulingan*). *Sakag* or *salap*, a shallow water drag seine used by fishers, caught only assorted

small fish and fry (*dilis* and *dulong*). Fishers using traps or spear guns caught reef fish such as groupers (Serranidae or *lapu-lapu*) and invertebrates (e.g., octopus). The fishes which dominated municipal catches were sardines (*Sardinella* sp. (tamban), round scads (*galunggong*), tuna, anchovies (Clupeidae or *dumpilas*) and mackerels. Changes in catch composition or size cannot be inferred since adequate baseline data are not available. However, fishers have reported that sharks have declined in terms of abundance. This may be due to fewer large fishes on which sharks prey or the actual fishing of the sharks themselves.

Similar to the status of the commercial fisheries data, no published data on the municipal fisheries of Batangas Bay *per se* can be derived before 1992. Only aggregate fisheries catch data for the entire Batangas coastline from 1978 to 1987 are available. There were no published data from 1988 to 1991. However, municipal marine fish catch estimates for Batangas Bay were published for 1992 to 1995. The National Statistics Office (NSO) population census is only conducted every five years. The fisher population of the four coastal municipalities around Batangas Bay was estimated to be 8,965 in 1994. The total annual municipal marine fishery production for this same year was estimated to be 2,549 t. The municipal catch (3,634 t) for Batangas Bay excluding Tingloy reported for 1993 (GEF/INDP/IMO, 1996a) is higher than the 2,123 t reported by the DA.

Assuming fishers fish 100 days a year, the average catch per fishing day is 0.91. Further assuming three fishing hours per fishing day, this would be equivalent to only 0.90 kg/hour—a very low catch per fisher-hour. In the absence of catch per unit effort data specific to Batangas Bay, maximum sustainable yield (MSY) cannot be computed using the Schaefer surplus production model for multispecies fisheries. However, the current situation of the fisheries (whether it is above or below) relative to the MSY may be inferred from the available data. Municipal fisheries catch has generally declined from 1992 to 1995. On the other hand, assuming fishers are a constant proportion of the general population, since general population of Batangas Bay has increased from 1992 to 1995, fisher population must also have increased during the same period. Thus, if catch has declined over the same period and effort has increased, then the situation is on the down slope of the catch-effort curve.

Another way to get a handle on the exploitation rates is through the catch per unit effort or fisher density. As mentioned, 0.90 kg/hour is a very low catch per fisher-hour. In addition, as a measure of fishing pressure, we estimated 9 to 10 fishers/km^2 of fishing ground within the bay (2,212 fishers in 230 km^2, even though many fishers do not really fish within the bay). In the absence of adequate benchmarks, this estimate can be compared with the estimated 13 fishers/km^2 reported for Lingayen Gulf (an intensely-fished area). Both of these estimates imply that Batangas Bay is highly exploited.

Table 1. Municipal Marine Fishery Production (in t) and Number of Fishers in Four Municipalities within Batangas Bay (Batangas City, Bauan, Mabini and Tingloy).

Year	Batangas Coast (BAS)	Batangas Bay (BAS)	Batangas Bay (excluding Tingloy) (GEF/UNDP/IMO, 1996a)	Fishers (GEF/UNDP/IMO, 1996a)
1978	2,840			
1980				4,690 (4 municipalities)
1981	10,642			
1984	15,903			
1987	20,573			
1988-1991	No census			
1992	8,077	4,485		
1993	2,220	2,123	3,634	
1994	4,293	2,549		8,965 (4 municipalities)
1995	5,236	2,263		
1996	No census			
Current Study				2,212 (Batangas Bay)

Coral Reef Fish Communities

Damselfishes (Pomacentridae), serranids (Serranidae) and wrasses (Labridae) are the most common fishes observed in Batangas Bay reefs (e.g. Bonito Island, Arthur's Rock and Dilao Point). The highest number of reef fish species was observed at Arthur's Rock (66). The other sites have around 41 to 49 species except for Mainaga (24) and Twin Rocks (38). Among the eight sites surveyed, Bonito Island has the highest estimated total biomass with 19 t/km^2 followed by Dilao Point (11 t/km^2) and Arthur's Rock (10 t/km^2). Dilao Point and Arthur's rock were the sites observed to have the most number of economically-important species (e.g., surgeonfishes, threadfin breams and fusiliers).

The ECOPATH Modeling of Pelagic and Reef Communities

Table 2 presents the results of the parameter estimation for the pelagic system. For the large predators (*Auxis*), catches (1.97 t/km^2/year) far outweigh biomass estimates (0.501 t/km^2/year) for the bay. This indicates that the fishery of this group involves imports from outside of the system (i.e., outside of the bay). Also, the catch rates for this group as well as for the intermediate predators (*Decapterus*) are not sustainable (assuming a maximum of 50% of the biomass can be harvested for each group for sustainability of the fishery). The results of the parameter estimation for the reef system is presented in ***Table 3***. Based on the very low estimated ecotrophic efficiencies (EE), most of the reef fishes are not being utilized in the diet of the larger predators. This could be an indication that the reef can accommodate larger predators such as large groupers and even sharks which are now fished out or behaviorally averse to being seen in the area. There seems to be little or no interaction between the species and diet composition of the pelagic and reef fishes. This has management implications in that in coming up with strategies for sustainable utilization, separate schemes will have to be considered.

The estimated biomass of fishes in the pelagic system is 5.871 t/km^2/year while that for the reef is 5.352 t/km^2/year. Comparing the other output estimates for the two systems, a number of noteworthy observations are made (***Table 4***). The total production to total respiration ratio of the reef is higher. This reaffirms the hypothesis that there is high reef potential in the bay. Catch rates for the pelagic system is much higher which is an indication that the fishery heavily relies on this system. Mean trophic level is about the same. It indicates that for both systems, large predators are being favored as fishery resources, in comparison to other areas where planktivores like anchovies and clupeids are selectively being fished.

Schematic diagrams of the ecosystem food webs for the two systems based on the diet matrix tables show the major prey-predator pathways (***Figures 1*** and ***2***). In each box, the annual production is denoted by *P* and mean annual biomass by *B* (values in kg/km^2).

Based on the comparison of species composition of the catch and the habitat where the species are found, there is a minimal interaction between the pelagic and reef systems. However, it is shown that there is considerable overlap in the catch composition of the two types of fisheries, i.e., commercial and municipal. This means that there is a considerable interaction between commercial and municipal fishers in Batangas Bay even if the ecological interaction between the two systems is minimal.

The initial ECOPATH model's parameter estimates provide a holistic ecosystem response both to fishing pressure and its possible alterations in water quality. Based on the desk study, the following were shown:

(a) it was reaffirmed that the pelagic fishery of Batangas Bay (estimated at 3.00 t/km^2) heavily relies on imports probably from outside the area and that it is highly possible that the rate of fishery of the large and intermediate predators is unsustainable;
(b) the reef areas also contribute to the fishery (0.2 t/km^2) and has a high potential, though it is more susceptible to water quality changes; and
(c) there is minimal interaction between the two systems yet these are important in considering how the municipal reef fisheries can be used as a safety net to absorb displacement of various fishery gear users.

For pollution monitoring purposes, it will be better to use sessile organisms (e.g., mussels or some reef invertebrates) rather than the pelagic species in eliciting responses to pollution. Some of the reef species may be more sensitive to various water quality changes. This is because it is easier to link any observed change in sessile organisms with occurrences in its immediate environment as compared with pelagic species which are highly migratory. Aside from getting a pulse on the response of the fishery stock, it may be utilized as a sentinel organism for the health and well-being of the Batangas Bay community.

Management Implications and Recommendations

An important contribution of the fisheries assessment study is its key role in providing the bases for issues identification of potential areas of resource use conflict within the fisheries sector and the concomitant options for their management. Despite the moderate municipal catches within the bay, overfishing may be less of a problem relative to other issues which are impinging on the area. Based on the characterization of the gears operating within the bay, the question of gear competition between commercial and municipal fishing activities is considered minor. Illegal fishing activities are still rampant in some areas of the bay and this may be a result not only due to Malthusian overfishing but may be also attributable to the marginalization of the fishers as a sector within the bay.

For the fisheries sector, these issues can be addressed in the following strategies:

a) develop safety nets to buffer negative impacts on fishers (e.g., entitle municipal fishers some fishing areas within the bay and open opportunities for livelihood activities and establish spatially explicit ecological buffer and monitoring zones) and enhance value and diversification of fisheries;

Figure 1. The ECOPATH Model of the Pelagic System in Batangas Bay Production (P) and Biomass (B).

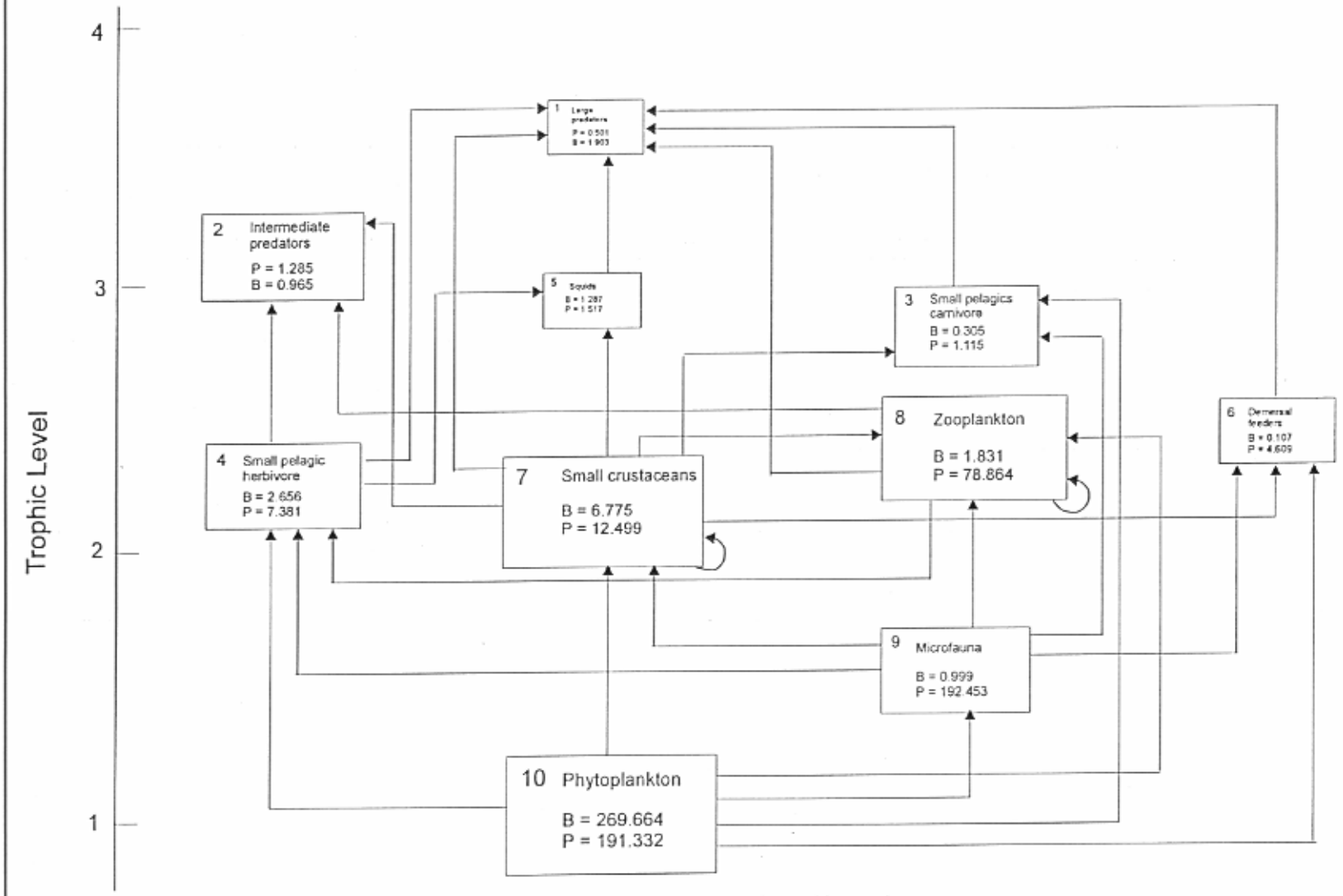
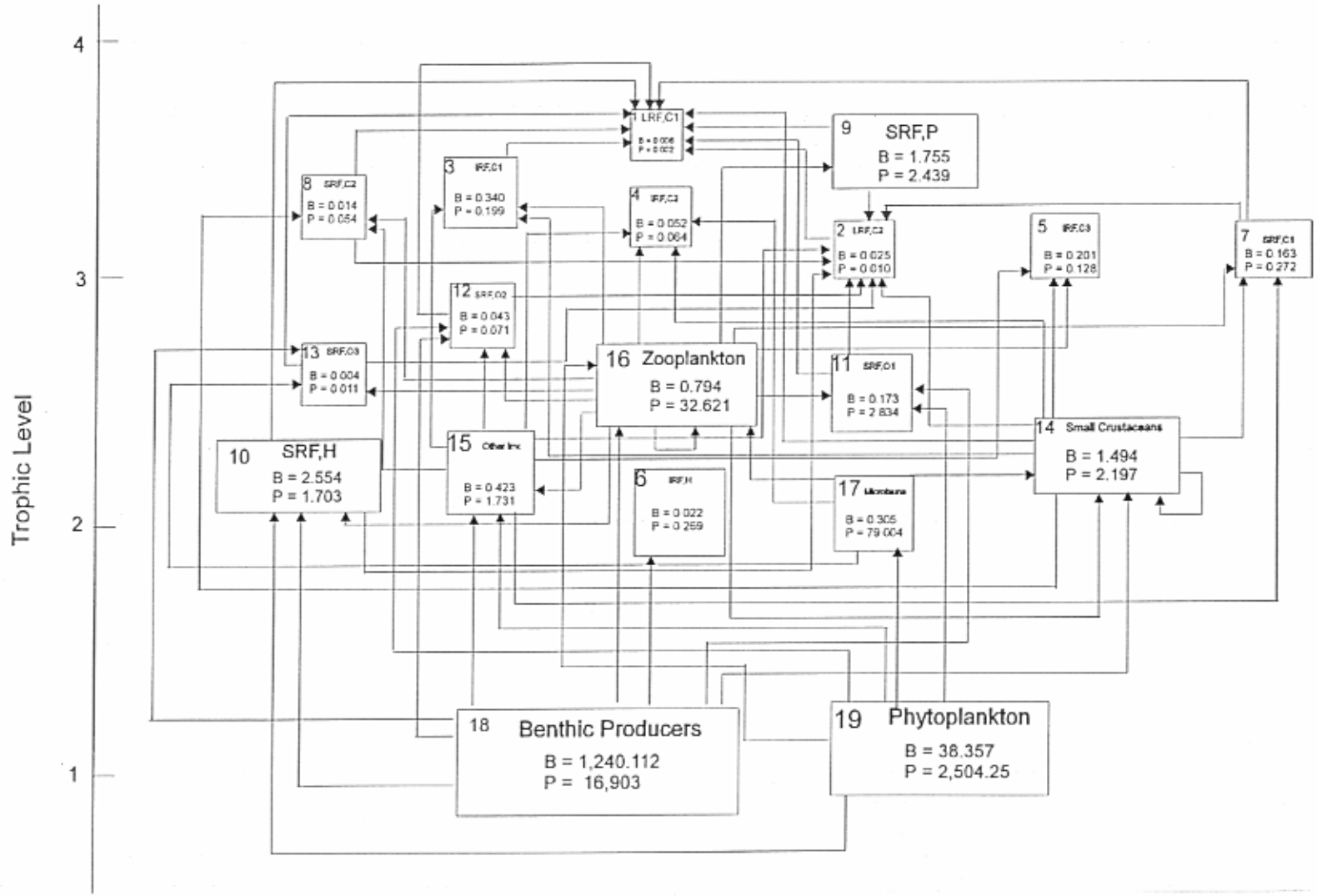


Figure 2. The ECOPATH Model of the Reef System in Batangas Bay with Production (P) and Biomass (B)



b) enhance capacity of the sector to shift towards more stable livelihood and employment options (e.g., through public education, training and facilities to increase the value and marketing of products and commodities, including mariculture and ecotourism) including utilizing research and development as a means of capacity building;
c) adaptive management by providing adequate monitoring, control and surveillance mechanisms so that illegal activities are minimized (i.e., destruction and encroachment of habitats) and optimize information use and benefit (e.g., easy access, feedback and fast communication with improved database);
d) recognize the critical role and involvement of this sector as an active partner in the management of Batangas Bay (e.g., including clarifying and utilizing more effectively the institutional arrangements between DA, MAO and the Environment and Natural Resources Office (ENRO) (as the government organizations) and their interaction with the private sector and establish a fisheries management body in ENRO;
e) enhance access and allocation of benefits; and
f) develop fisheries management as an integral program within ICM.

Acknowledgments

This study is part of the *Fisheries Resources Assessment and Project Development for the Batangas Bay Region Project* funded by the United Nations Development Programme-International Maritime Organization (UNDP-IMO) through the Marine Environment and Resources Foundation, Inc. (MERF). The assistance of the staff from the following agencies were valuable in the implementation of the project's activities: De La Salle University-Lipa, Management Training Development Center (DLSU-MTDC) and Municipal Agriculture Office of the Department of Agriculture Region IV (MAO-DA Region IV).

References

Aliño, P.M., L.T. McManus, J.W. McManus, C.L. Nañola Jr, M.D. Fortes, G.C. Trono Jr. and G.S. Jacinto. 1993. Initial parameter estimations of a coral reef flat ecosystem in Bolinao, northwestern Philippines, p. 252-258. *In* V. Christensen and D. Pauly (eds.) Trophic models of aquatic ecosystems. ICLARM Conf. Proc. 26, 390 p.

Aliño, P.M., M.C. Rañola, F. Guarin, L.V. Castillo and L. Madamba (in prep.) Preliminary estimation of trophic interactions of the fishery resources in Ragay Gulf.

BAS (Bureau of Agricultural Statistics). Commonly used fishing gears in the Philippines. Department of Agriculture, Quezon City.

Christensen, V. and D. Pauly. 1996. ECOPATH Ver.3.0 (Windows version). ICLARM Software 6.

English, S., C. Wilkinson and V. Baker, Editors. 1994. Survey manual for tropical marine resources. Australian Institute of Marine Science, Townsville, Australia. 368 p

Froese, R. and D. Pauly, Editors. 1996. Fishbase 96: concepts, design and data sources. ICLARM, Philippines

GEF/UNDP/IMO Regional Programme for the Prevention and Management of Marine Pollution in the East Asian Seas. 1996a. The coastal environment profile of the Batangas Bay Region. 133 p.

GEF/UNDP/IMO Regional Programme for the Prevention and Management of Marine Pollution in the East Asian Seas. 1996b. Strategic environmental management plan for the Batangas Bay Region. 71 p.

Hill, M.O. 1979. TWINSPAN—A FORTRAN program for arranging multivariate data in an ordered two-way table by classification of individuals and attributes. Cornell University, New York.

Jackson, J. 1995. The dive sites of the Philippines, a comprehensive coverage of diving and snorkelling. New Holland Publishers Ltd. 175 p.

Krebs, C.J. 1989. Ecological methodology. Harper Collins Publishers, Inc. New York. 645 p.

Kulbicki, M., G. Mou Tham, P. Thollot and L. Wantiez.1993. Length-weight relationships of fish from the lagoon of New Caledonia. Naga, ICLARM Q. 16(2):26

Ludwig, J.A. and J.F. Reynolds. 1988. Statistical ecology: a primer on methods and computing. John Wiley and Sons, New York. 337 p.

Opitz, S. 1996. Trophic interactions in Caribean coral reefs. ICLARM Tech. Rep. 43, 00 p.

UPSRF (University of the Philippines Science Research Foundation). 1991. Environmental impact assessment of the Shell Tabangao asset renewal (STAR) project, Tabangao, Batangas. 168 p

Initial Risk Assessment of Pesticides in Batangas Bay, Philippines and Xiamen, People's Republic of China

DAVIDE CALAMARI
Professor and FAO Consultant
Environmental Research Group
Department of Structural and Functional Biology
University of Milan
Via Ravasi 2, 21100 Varese VA
Italy

MARIO DELOS REYES
Consultant
GEF/UNDP/IMO Regional Programme for the Prevention and Management of Marine Pollution in the East Asian Seas
P.O. Box 2502, Quezon City 1165
Philippines

DAVIDE CALAMARI and MARIO DELOS REYES. 1998. Initial risk assessment of pesticides in Batangas Bay, Philippines and Xiamen, People's Republic of China, p. 101. *In* **The Regional Workshop on Partnerships in the Application of Integrated Coastal Management.** 12-14 November 1997, Chonburi, Thailand. 167 p.

Abstract

The pesticides used in Batangas Bay, Philippines and Xiamen, People's Republic of China were listed and were ranked for preliminary risk assessment in relation to their intrinsic ecotoxicological and physico-chemical properties. Only the dominant/relevant types of pesticides were evaluated using the two models. The EQC (Equilibrium Criterion) Model was used to calculate partitioning, transport and transformation of pesticides in an environment. On the other hand, the SOILFUG (Soil Fugacity) Model was used to predict potential surface water contamination derived from pesticide use on agricultural fields. Using a chemical, the output of EQC Model Level I shows that the water compartment holds more than 75.8% of the chemical, while 21.3% is in the soil and 2.5% in the air. The persistence of the chemical using EQC Model Level II shows the same distribution with additional information such as degradation in water as 76%, advection in air as 2%, etc. The results of SOILFUG Model calculations demonstrated that certain quantities of the most commonly used pesticides could have been present at the main rivers entering Batangas Bay and Xiamen at analytically detectable levels. The most dominant/relevant pesticides are *butachlor*, *chlorpyrifos* and *carbaryl* in Batangas Bay and *carbendazim*, *dicofol*, *dichlorvos* and *butachlor* in Xiamen. These pesticides have no bioaccumulative potentials. The ecotoxicological significance of the calculated concentrations were discussed for these representative chemicals.

ICM Training for Marine Pollution Prevention and Management

HUMING YU and CHUA THIA-ENG
GEF/UNDP/IMO Regional Programme for the Prevention and Management of Marine Pollution in the East Asian Seas
P.O. Box 2502, Quezon City 1165
Philippines

HUMING YU and CHUA THIA-ENG. 1998. Training and education programs and activities related to integrated coastal management in Southeast Asia, p. 102-118. *In* **The Regional Workshop on Partnerships in the Application of Integrated Coastal Management.** 12-14 November 1997, Chonburi, Thailand. 167 p.

Abstract

The GEF/UNDP/IMO Regional Programme on Marine Pollution Prevention and Management in the East Asian Seas (MPP-EAS) conducts annually a regional training course on the application of the integrated coastal management (ICM) system for addressing marine pollution problems. The training initiative is unique in that: (a) the training curriculum is tailored for strengthening environmental protection and management capacity in the developing countries; (b) it is conducted in the ICM demonstration sites which provide practical exposure to the problems and their solutions; (c) it is a joint effort of a number of educational and research institutions in the region; and (d) it focuses on providing a broad-base, multidisciplinary training to environmental and natural resource planners, managers and trainers. The training package includes ICM approaches, tools and methodologies particularly concerning institutional arrangements, improving legal regime and enforcement, environmental monitoring, scientific services, sustainable financing and information management. This paper attempts to review the outputs, experiences and lessons learned from the past three years.

Introduction

In recent years, particularly after the United Nations Conference on Environment and Development (UNCED) in 1992, there was an increased application of the integrated coastal management (ICM) system worldwide for addressing the complex environmental and resource management issues of the coastal and marine areas (Chua, 1983; Cicin-Sain, 1993a, 1993b; Sorensen, 1993; Hotta and Dutton, 1995). However, the lack of national capacity became a serious impediment to the successful implementation of ICM programs in many parts of the world (UNESCO, 1988). As the concept and practice of ICM are relatively new to most countries especially many developing nations, there is a pressing need to accelerate the process of human resource development if ICM is to gain wider application.

In response to this need, a number of UN agencies (e.g., UNDP, UNEP, UNESCO/IOC, FAO), World Bank, international NGOs (e.g. IOI and IUCN) and donor agencies (e.g., CIDA, Sida, USAID, IDRC) initiated various ICM training programs. Most of these are short-term courses organised in countries where ICM programs were developed. In Southeast Asia, the ASEAN/US Coastal Resources Management Project conducted a series of ICM training from 1986 to 1991 focusing on the principles of coastal management (Chua, 1992). By 1994, the URI/USAID Coastal Resource Management Project also organised coastal resource management training in the Philippines and Thailand (Crawford, Santos and DeMoranville, 1994). Although these efforts complemented each other and contributed to manpower development in the region, financial resources were limited to enable the continuation of such training efforts. Sustainability of training efforts remains an issue despite the fact that a comprehensive action plan was formulated through the efforts of the United Nations (DPIG/DOALOS, 1994).

Postgraduate ICM training programs were also organised in recent years but these one to two years' masteral degree courses were conducted at universities in limited countries including Australia, United States, UK, Italy, Philippines, Thailand and Indonesia (Chua, 1992; Hay and Chou, 1993; DGIP/DOALOS, 1993; Schroder, 1993; Crawford, Santos and DeMoranville, 1994; Kenchington, 1996). In both the short-term and the long-term masteral degree training, ICM concept, principles and program development are taught with little practical orientation, although computer simulation models are sometimes used. The lack of hands-on training and practical exposure to the problems and their solutions often makes such training grossly inadequate for effective field application.

With the above background, the GEF/UNDP/IMO Regional Programme for the Prevention and Management of Marine Pollution in the East Asian Seas (MPP-EAS) organised a fast-track ICM training program aimed at providing the senior environmental and natural resource officials, coastal planners, managers and trainers a broad-based ICM training, covering a wide spectrum of subjects related to the coastal and marine area management with practical exposure to the operational mechanisms of ICM and practices. A three-week regional training course which has been conducted annually since 1995 focused on the application of the ICM system for marine pollution prevention and management. This training initiative was based on the results, experiences and lessons learned from the two ICM demonstration sites in Batangas Bay (Philippines) and Xiamen (PR China) established by MPP-EAS as well as the past experience on ICM program development especially those in Southeast Asia.

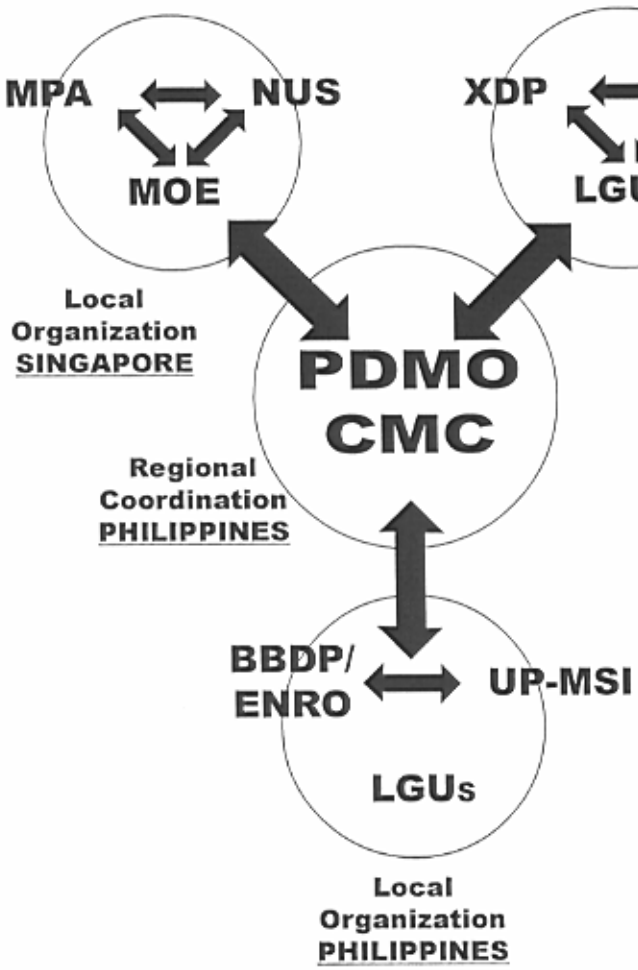
The course was co-sponsored by the Swedish International Development Agency (Sida), and co-organised by the local governments of the two ICM demonstration sites in Batangas and Xiamen, and the Coastal Management Center. Some 16 institutions and more than 20 instructors were involved in the conduct of the training course. A substantial part of the training activities were undertaken in close co-operation with the University of the Philippines, Xiamen University, Jimei University in Xiamen and National University of Singapore (see ***Figure 1***). This training initiative is unique as it uses the ICM demonstration sites as "training laboratories" which provided practical exposure to the management problems and their solutions.

Training Program Development

Training Needs

As part of a long-term strategy for manpower development, a training needs survey was conducted to determine the types and estimated number of manpower required by the countries in the East Asian nations for coastal and marine area management (MPP-EAS, 1995). The survey results showed that ICM was identified as one of the priority areas of the coastal nations as these nations are in the process of developing and subsequently implementing National Agenda 21. In a separate survey conducted by MPP-EAS and the Coastal Management Center in 1996, it was shown that the Philippines alone will require more than 1,353 coastal managers, which corresponds to a ratio of 30,000 inhabitants per coastal manager. Based on these estimates, the East Asian region will certainly need a fairly large number of well-trained coastal managers.

Figure 1. Regional ICM Training Coordinating Mechanism.



Regional ICM Training Coordinating Mechanism

BBDP/ ENRO - Batangas Bay Demonstration Project/Environment and Natural Resources Office, Batangas, Philippines
CMC - Coastal Management Center, Philippines
JU - Jimei University, Xiamen, PR China
LGUs - Local Government Units
MOE - Ministry of Environment, Singapore
MPA - Maritime Port Authority of Singapore
PDMO - Programme Development and Management Office
NUS - National University of Singapore
UP-MSI - University of the Philippines - Marine Science Institute
XDP - Xiamen Demonstration Project, PR China
XU - Xiamen University, PR China

LGUs:
Philippines
Provincial Government of Batangas
Batangas City
Municipality of Bauan
Municipality of Mabini
Municipality of San Pascual
Municipality of Tingloy

PR China
Xiamen Municipal Government

NOTE:

This figure illustrates the linkages among various course organisers, government units, universities for the preparation and conduct of the training course. The Programme Development and Management Office of the MPP-EAS and Coastal Management Center (Located in the Philippines) are the focal point for the course organisation and coordination.

Training Objectives

In designing the training program, special attention was placed on strengthening the planning and management skills of the coastal manager so that he or she could perform a coordinating role, like a "symphony conductor," who should be able to select, coordinate and integrate various planning and management instruments for resolving diverse coastal problems. The salient features of the training course are given in ***Figure 2.*** The training program design which broadly covers the ICM philosophy, processes, techniques/tools and field/case studies is given in ***Figure 3.***

The focus of the training is to strengthen perception and confidence in the application of the ICM concept, principles and approaches. This requires a better understanding of the operation of different economic sectors; the use of scientific knowledge and the application and packaging of planning and management instruments to resolve multiple use conflicts; the development of interpersonal skills for mobilising expertise and resources in attaining management objectives; and changes of attitudes toward the ICM concept, principles and approaches.

Practical Approach

In the conduct of the regional ICM training course, special efforts were devoted to field appraisal and case studies in addition to the basic principles on ICM. The field trips enabled the participants to witness the socio-economic consequences of unmanaged environment, the benefits of integrated management and rehabilitation of damaged habitats, the appropriate technologies for mitigating adverse environmental impacts and treatment of wastes, amongst others. The visit to Batangas, Xiamen and Singapore enabled the participants to have a comparable environmental perspective in relation to economic developments.

The environmental conditions in Batangas could represent that of the 1950s and 1960s of Singapore when Singapore was in the early stage of economic development. The environmental conditions in Xiamen could represent the condition of Singapore during the 1970s and 1980s when rapid economic development took place and a number of habitats were damaged and adverse environmental quality was reported. The visit to Singapore enabled the participants to see the improved environment after the Government of Singapore took the necessary steps to clean up and rehabilitate the Singapore rivers, the treatment of wastes, the restoration of beaches, the management of the port and the greening of the coastal state. Thus, the participants were exposed to the changed conditions in the three sites.

Participants

The three training courses conducted thus far were participated mostly by senior officials nominated by the governments, some from the private sector and academic institutions. The participants were highly qualified with at least a bachelor's degree and about one-third of them having at least a masteral or doctorate degree. Many of them have a long exposure in the government or in related areas. The 20 instructors were senior project personnel from the demonstration sites and subject specialists from within and outside the region.

Figure 2. Features of the Regional Training Course on the Application of ICM System in Marine Pollution Prevention and Management.

1. Practical experience in ICM system development with two-thirds of the course time being devoted to field studies at 17 selected sites in China, Philippines and Singapore;

2. Improving institutional frameworks in order to implement effective technical and engineering interventions in ICM application;

3. Examination of ICM application under different socioeconomic systems; market-based developing economy; market-based developed economy; and developing economy of central planning and market mechanisms;

4. Exploration of rural and urban applications of the ICM system;

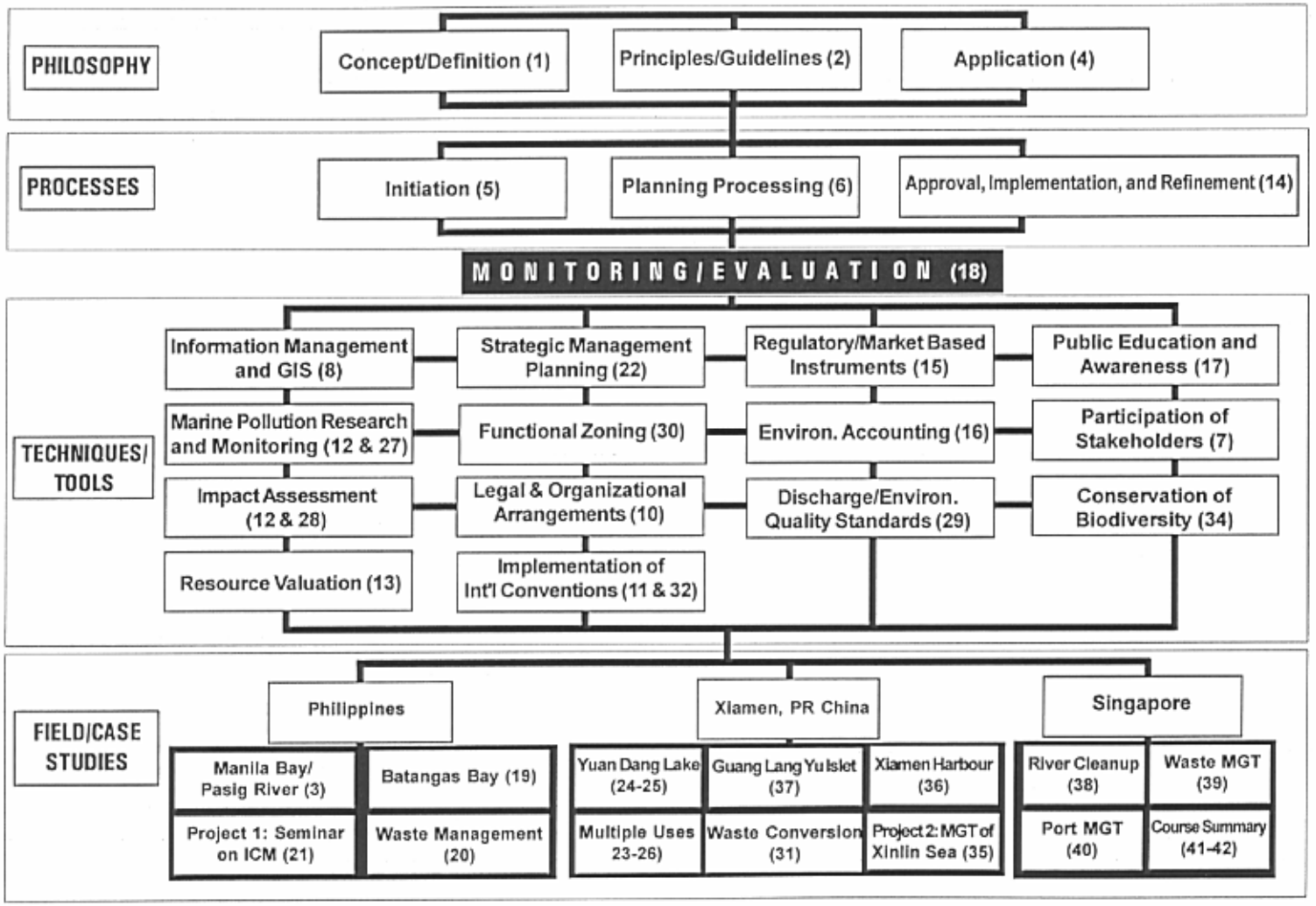
5. Identification of integrated waste management practices, covering hazardous and non-hazardous waste, waste minimization and integrated facilities and services;

6. Examination of sustainable financing mechanisms and options at the local and national levels, including property rights, public and private partnership and use of market-based instruments (MBIs);

7. Analysis of international cooperation in ICM application, particularly at the regional and subregional levels, the networking of ICM sites and projects, compliance with international conventions and guidelines on marine pollution; and

8. Development of ICM strategic planning and application, particularly at the local level.

Figure 3. Training Programme Design.



Note: The course module numbers are sited in brackets.

Curriculum Development

Framework

Although current ICM practices throughout the world vary in scope and level of operation, there are basic elements that are common. These elements which form the management framework include the processes of ICM program development, implementation, monitoring and evaluation; the identification and prioritisation of environmental management issues and the choice and administration of management interventions (Chua and Scura, 1992). Such framework ensures a holistic, integrative and co-ordinated planning and management approach, provides a decision-making platform, and enables stakeholders' participation in the formulation of policy and management actions programs. These basic elements are incorporated into the training curriculum.

Curriculum

The training curriculum has been developed based on the principles and requirements discussed above. Some 42 modules have been formulated, tested and consolidated over the past three years (see ***Appendix I***). These modules are grouped into four components: principles, processes, techniques and tools. Building upon these components are case studies and field visits.

Component I covers concepts, principles and their application. These elements are given in the early phase of the training course so that participants can grasp the common management framework including ICM boundaries, scale and scope of ICM program, level of operation, definition and terminology in view of diverse professional background and perception of the participants. Further, this component also enables the participants to examine diverse ICM practices including community-based management.

Component II addresses major ICM processes from program initiation, planning, implementation to monitoring and evaluation. It exposes the participants to the major ICM program planning processes including problem identification and prioritisation, the development of scientific information base, the design of appropriate management interventions and their subsequent modification and improvement through the feedback mechanism in relation to project monitoring and evaluation. This component highlights the differences and linkages among major processes in terms of tasks, time-frame and budget allocation. It also provides guidance on setting up milestone and success criteria in ICM implementation. This component draws heavily on case studies for illustrating the circumstances, root causes and mechanisms that contribute to the success and/or failure.

Component III covers tested ICM techniques and tools relating to scientific research; pollution monitoring and assessment; data/information management; institutional arrangements; policy; legislation; regulatory, economic and technological interventions; public awareness and participation; sustainable financing mechanisms; and derivation of policy and management options. This component offers a wide range of ecological, socio-economic assessment and management tools and their application. The main purpose of this component is to expose the participants to the availability of the tools, techniques and various legal and regulatory instruments that can be deployed for addressing environmental issues.

Component IV provides practical exposure with respect to the development and application of ICM strategic planning and management interventions in various socio-political and cultural conditions. Participants visited sixteen selected sites including Batangas Bay, Manila Bay and Pasig River in the Philippines; the Yuandang Lagoon, the coastal area of Xinlin District, the Gulangyu

Island, the garbage dump site, and Maluan Bay in the People's Republic of China; and the Singapore River and the Port of Singapore. The visit to the two ICM demonstration sites (Batangas Bay and Xiamen) reinforces the concept, principles and application of ICM as well as provides a better appreciation of the good practices developed so far. For example, the two demonstration sites provide learning opportunities for:

- integrated planning and program development;
- institutional (legal and organisational) arrangements for ICM;
- application of policy and economic instruments;
- measures for compliance and enforcement;
- public awareness instrument and application;
- environmental education and training;
- interdisciplinary, cross-sectoral, management-oriented research and information management;
- practices on implementation of international conventions and national rights and responsibilities;
- environmental quality monitoring and assessment;
- developing sustainable financing mechanisms; and
- success and benefits achieved in pollution prevention and mitigation, particularly the Yuandang Lagoon cleanup.

During the visit to the three countries, participants were requested to conduct rapid appraisals on the ecosystems and socio-economic changes, determined priority management needs based on the secondary information provided and their own observations. They also learned to formulate various scenarios for problem solving. The final stage of the training provided an opportunity for participants to present their findings and discuss their perceptions and lessons learned from the field visit and their assessment of the training course.

Field Trips/Case Studies

The field trips or case studies are organised with the purpose of forging perception changes amongst course participants, to impart the knowledge, experience, and lessons learned from current management practices and the approach, techniques and methodologies that the participants could consider for adoption to their own working environment in their respective countries. The participants were very impressed with the field trips to the Pasig River, Yuandang Lagoon and the Singapore River as they could compare the various techniques and approaches used to rehabilitate the degraded environment. They were exposed to the consequence of multiple use conflicts, and the effectiveness of ICM for marine conservation, tourism management and pollution control and prevention.

The participants were asked to undertake short projects during the training to enable them to have hands-on experience in addressing some of the environmental management issues. Amongst the projects undertaken were the identification and prioritisation of management issues in specific sites and development of possible management interventions; the conduct of field survey at Maluan Bay in Xiamen to develop a management plan outline; summaries of experience gained and lessons learned from the efforts of cleaning and management of damaged habitats in the three countries they visited.

Seminar

Each participant was asked to give a seminar at the end of the course. The purpose is to gauge how much they have learned and to provide them the opportunity for exchange of views and experiences. The seminar has been useful and rewarding to most of the participants especially after a very hectic yet exciting three weeks.

Reference Materials

Apart from the lecture notes and background materials on field studies, some 34 articles and abstracts of documents were selected from international journals, books and publications of relevant UN agencies as reference materials, and packaged in relation to all the training modules. Copies of these materials were distributed to all the participants to assist further studies.

Evaluation and Impact

The training courses conducted in 1995, 1996 and 1997 were evaluated by all the 60 participants from 13 countries in Asia, Africa and South America. The standard course evaluation exercises were undertaken at the end of each training session especially relating to course content, effectiveness of instructors, training facilities, field work and training materials especially pertaining to their relevance to coastal and marine management.

Close and daily interaction with participants was maintained throughout each training course by the concerned training officers. The course participants were generally positive about the course content and the case studies. They especially appreciated the field exposure in the demonstration sites and the applicability of the approaches, methodologies and techniques to their own countries. On the other hand, almost all participants complained about the heavy workload (course materials, field trips, reports and seminars) within a short period of three weeks. Despite their complaints, almost all felt that such workload and field exposure are most necessary.

Based on the assessment of the participants and the views of instructors, the ICM training course has been successful in: (a) inducing perception change; (b) understanding the concept, application and benefits of ICM system; and (c) increasing confidence in environmental management.

Perception Change Induced

The most outstanding achievement of the short-term training is the effectiveness of creating perception change amongst participants with diversified expertise, professional skills and occupational responsibilities. The training enables them to see the physical changes of the environment, the results of management interventions and the approaches, methods and techniques which are available to make integrated management possible. The "real world scenarios" adopted by the training program enabled the participants to widen their horizon, remove or reduce their skepticism or mental resistance to the application of integrated management approach. Thus, the field visits to the demonstration sites were very effective. For example, during the visit to the three countries, the participants were able to physically witness the efforts undertaken in the cleaning of the Pasig River, the Yuandang Lagoon and the Singapore River and the results achieved, particularly the socio-economic benefits of management interventions.

Perception changes are manifested once the mental resistance to the management system is removed. Thus, it may take a number of activities during the training course to convince a participant of the feasibility of the ICM system, its application to the situation in their respective countries and the likely impact it would create. A quotation from Ambassador Fernando Gonzales Guyer of Uruguay in his report on participation in the training course in 1997 (MPP-EAS, 1997) adequately summarised the perception change as he underwent the training:

> "The training course contributed to confirming many of my convictions, intuitions and 'suspicions' about the essence of ICM programs, helping me understand the functioning of ICM instruments and techniques that were only known to me by reference (e.g., GIS), and changed also profoundly my perceptions with regard to several aspects of the ICM process, for example, the inter-relationships between research and management."

ICM System and Its Application Better Understood

Almost all participants going through the training agreed that their understanding of the ICM system has improved considerably especially in the management of the relationship between human activities and the ecosystems. They understood better the relevance of institutional and organisational arrangements, the application of economic instruments to change human behaviour, the need to promote public and private investments in coastal management, the involvement of stakeholders including community participation as well as the effectiveness of environmental monitoring in forging policy and management interventions. The training also helped strengthen their skills in the application of scientific information for ICM planning and operation. The training showed through the field studies at the two demonstration sites how scientific information could benefit management decision and how scientists can make effective contributions through addressing problem-oriented research. It also demonstrates the effectiveness of local governments in the protection and management of coastal and marine environments applying the ICM system, and even in the implementation of marine pollution related conventions such as the London Convention, the MARPOL Convention and the Oil Spill Preparedness, Response and Co-operation (OPRC).

Confidence Increased

A significant impact is the increased confidence amongst course participants in the concept, approaches and methodologies of integrated coastal management. The participants developed confidence in establishing an ICM program if given the opportunity, and many were able to make strategic changes in their own coastal programs under their responsibilities. If the participant is a decision-maker or a coastal manager, knowledge of how the management system works could help solve some of his immediate concerns in his area of responsibility. This will greatly enhance his or her enthusiasm in the application of the system. If the participant is a scientist, the increased knowledge of and exposure to practical problems would show how scientific information could be effectively used to resolve environmental problems.

Increase in confidence of the participant to adopt and apply the management system is a reflection of the effectiveness of the training program. Thus, it is very important to ensure that sufficient dialogues be developed during the training course and that most of the questions from the participants could be answered both in concept and practices.

Conclusions and Recommendations

The results of the course evaluation show that the training has attained its objectives, particularly in the following aspects:

1. ICM training cannot be treated as a conventional training dealing with a single or a few disciplines or subject areas that are related only to certain aspects of the coastal and marine systems. It should be a specialised training package integrating environmental, socio-economic and management sciences into policy, legislation and other technical and economic instruments.

2. The broad-based ICM training will be most beneficial for policy- and decision-makers, senior officials from national and local governments related to the economic, environment and natural resource planning and governing institutions especially those dealing with coastal and marine areas.

3. The development of ICM skills requires practical orientation with a strong emphasis on hands-on training, *in situ* observations, case studies and field appraisals. The ICM demonstration sites no doubt have proven to be effective training grounds.

The course contributed to building up a critical mass of ICM expertise in the region, served as a vehicle for demonstrating the experience gained from the MPP-EAS projects in Batangas and Xiamen, and fostered the formation of a regional prototype mechanism for ICM training.

References

Chua, T.E. 1992. The ASEAN/US coastal resources management project: Initiation, implementation and management, p. 711-792. *In* Chua, T.E. and L.F. Scura (eds.) Integrative framework and methods for coastal area management, ICLARM, Manila.

Chua, T.E. 1993. Essential elements of integrated coastal zone management. Ocean and coastal management, Elsevier Applied Science, 21(1-3): 80-81.

Chua, T.E. and L.F. Scura (eds.). 1992. Integrative framework and methods for coastal area management. ICLARM Conference Proceedings 37, 169 p. International Center for Living Aquatic Resources Management, Manila.

Cicin-Sain, B. 1993a. Sustainable development and integrated coastal management. Ocean and coastal_management, Elsevier Applied Science, 21(1-3): 11-43.

Cicin-Sain, B. 1993b. Education and training in ocean and coastal management: Activities of the marine affairs and policy association (MAPA). Ocean and Coastal Management, Elsevier Applied Science, 21(1-3): 375-377.

Crawford, B.R., J.L. Santos and M. DeMoranville. 1994. "University partnerships: An approach to collaborative international training. Coastal zone Canada '94. Cooperation in the coastal zone Conference Proceedings, September 20-23, 1994. Halifax, Nova Scotia, Canada, Vol. 2: 745-756.

DGIP/DOALOS. 1993. Report of the consultative meeting on training in integrated management of coastal and marine areas for sustainable development. Organized by the Division for Global and Interregional Programmes (DGIP), United Nations Development Programme, and Division for Ocean Affairs and the Law of the Sea (DOALOS), Office of Legal Affairs, United Nations, New York and Italy, 21-23 June 1993.

DGIP/DOALOS. 1994. Action plan for human resources development and capacity building for the planning and management of coastal and marine areas, 1993-1997, United Nations, New York.

Hay, J.E. and Chou Loke Ming. 1993. Contributions to training in coastal zone management in the Asia-Pacific region and report of the first NETTLAP resources management workshop for education and training at tertiary level in coastal zone management, UNEP/ROAP Network for Environmental Training at Tertiary Level in Asia and the Pacific Publication No. 7. UNEP, 245 p.

Hotta, K and I.M. Dutton. 1995. Coastal management in the Asia-Pacific region: issues and approaches, K. Hotta and I.M. Dutton (eds.). Japan International Marine Science and Technology Federation, Tokyo.

Kenchington R. 1996. Integrated coastal zone management training manual, R. Kenchington (ed.) Regional Coordinating Unit, East Asian Seas Action Plan, United Nations Environment Programme in cooperation with the Great Barrier Reef Marine Park Authority, International Tropical Marine Resources Center, AusAid and Ministry of Science, Technology and Environment, Malaysia, Bangkok.

MPP-EAS. 1995. Programme training needs assessment. PSC/95/DOC/09. The GEF/UNDP/IMO Regional Programme for the Prevention and Management of Marine Pollution in the East Asian Seas (MPP-EAS), Programme Development and Management Office, Manila, 38 p.

MPP-EAS. 1997. Report on the third regional training course on the application of icm system for the prevention and management of marine pollution, Philippines, P.R. China and Singapore, 6-26 October 1997. GEF/UNDP/IMO Regional Programe for the Prevention and Management of Marine Pollution in the East Asian Seas (MPP-EAS), Programme Development and Management Office, Manila, 36 p.

Schroder, P.C. 1993. The need for international training in coastal management. Ocean and coastal management, Elsevier Applied Science, 21(1-3): 303-310.

Sorensen, J. 1993. The international proliferation of integrated coastal zone management efforts. Ocean and coastal management, Elsevier Applied Science, 21(1-3): 45-80.

UNCED. 1992. Chapter 17, Agenda 21, Protection of the oceans, all kinds of seas, including enclosed and semi-enclosed seas, and coastal areas and the protection, rational use and development of their living resources. A/CONF.151/26 (Vol. II), p.130-166.

UNESCO. 1988. Year 2000 challenges for marine science training and education world wide. UNESCO Reports in Marine Science 52, UNESCO, Paris.

Appendix 1: ICM Training Course Curriculum

Module 1: ICM Concept and Definition

A. Management: Traditional, Conventional and Integrated Approaches
B. Land-Sea Interface
C. Ecosystem: Terrestrial, Coastal and Marine
D. Biodiversity
E. Carrying Capacity
F. Multiple Use Conflicts
G. Integration: System, Functional and Policy
H. Co-ordination: Vertical, Horizontal and Temporal
I. Sustainable Development

Module 2: Principles and Guidelines

A. Preventive and Anticipatory Approaches
B. Linkages of Research, Monitoring, Assessment and Management
C. Policy/Legal Framework for Use of Coastal Area
D. Siting of Development Project
E. Coastal Profiling
F. Human Settlement and Livelihood
G. Contingency Planning for Pollution and Natural Hazards
H. Multisectoral Coordination with Participation of Stakeholders
I. Demonstration and Human Resource Development (including Centre of Excellence)

Module 3: Case Study 1: Manila Bay and Pasig River

A. Characterising Ecosystem Features and Use Pattern
B. Identification and Prioritisation of Management Issues
C. Field Excursion: Coastal Development and Waste Disposal Sites

Module 4: ICM Application

A. Interplay of Issues, Process and Actions
B. Conditions and Constraints for ICM
C. Approaches and Practices
D. The Ease of Application: National, Regional and Local

Module 5: Initiation of ICM Programme

A. Triggers
B. Feasibility Study
C. Implementing Agency and Funding
D. Resistance to Initiation and Response Strategies

Module 6: Planning Process

A. Objectives and Definition
B. Identification and Prioritisation of the Interventions
   - Criteria and Process
   - Rapid Appraisal of the Coastal Environment
   - Best Use of Secondary Data
C. Multisectoral Consultation
D. Public Participation
E. Profile and Strategic Management Plan
F. Evaluation and Adoption

Module 7: Participation of Stakeholders and Communities

A. An Essential ICM Principle
B. Major Stakeholders and Support Groups
C. Partnership in ICM
D. Legal Safeguards

Module 8: Preparation of Coastal Environment Profile

A. What is a Profile?
B. Why Need a Profile?
C. Who Should Make It?
D. Primary and Secondary Data
E. Data Processing and Analysis
F. Operational Guidelines

Module 9: Information Management and Application of GIS

A. Management, Information Needs and Research
B. Database Development
C. GIS Principles, Mechanisms and Software
D. Designing Specific GIS Applications
E. Basic Procedures and Requirements for GIS Software Operation
F. Integration with Remote Sensing and Spatial Data Management
G. Information Services

Module 10: Institutional and Legislative Requirements

A. Scope and Definition
B. Rational Institutional Requirements
C. Legislative Requirements
D. Practices and Emphasis
E. Lessons Learned

Module 11: International Conventions

A. Framework of International Law on Marine Pollution: UNCLOS Before and After
B. Legal Regime for Land-based Sources
C. Legal Regime for Ship Source Pollution
D. Legal Regime for Other Sea-based Sources
E. Legal Regime for Dumping
F. Legal Regime for Armospheric Sources

Module 12: Marine Pollution Monitoring and Assessment

A. Definition and Parameterization of Marine Pollution
B. Monitoring Strategies
C. Baseline Survey
D. Guidelines, Criteria and Standards
E. Environmental Quality and Damage Assessments
F. Pollution History Survey and Assessment
G. ICM and the Use of Assessment Results
H. International Data Exchange

Module 13: Resource Valuation

A. Economic Analysis and Decision Making in ICM
B. Concept, Approaches and Techniques in Cost/Benefit Analysis (CBA)
C. Valuation of Coastal Resources and Ecosystems (e.g., Coral Reefs and Mangroves)
D. Measuring Rents for Public Coastal Lands and Waters
E. Progress and Constraints

Module 14: Programme Approval

A. Programme Review Processes and Procedures
B. Guidelines, Criteria and Modality for Review and Approval
C. Opportunities and Constraints for Implementation
D. Defining Strategies for Implementation
E. Implementation Processes in Space and Time
F. Creating Favourable Conditions for Implementation
G. Refinements during the Implementation
H. Measures for Output Improvement, Remedy and Follow-ups

Module 15: Regulatory and Market-based Instruments (MBI)

A. Rationale and Definition
B. Ownership, Property Rights and Use Rights
C. Government and Market Interventions: Roles and Failures
D. Regulatory Framework and the Use of MBI
E. Government Expenditures for Environmental Management
F. Violation and Economic Penalty
G. User Fees, Environmental Tax and Emission Fees
H. Case Studies in BOT (Build, Operate and Transfer)
I. Progress and Constraints in the Use of MBI

Module 16: Environmental Accounting

A. Accounting System and Sustainable Development
B. The Concept and Approaches for Environmental Accounting
C. Environmental Accounting in ICM
D. Environmental Accounting Techniques
E. Gradual Introduction of Environmental Accounting System for ICM

Module 17: Public Education and Awareness

A. Objective, Role and Approaches
B. Training: Formulation and Implementation of Programmes
C. Education at Primary, Secondary and Tertiary Levels
D. Public Awareness Campaign
E. Role of Mass Media

Module 18: Monitoring and Evaluation

A. Monitoring and Evaluation in ICM Processes: Objectives and Scopes
B. Monitoring and Evaluation Processes
C. Requirements, Indicators and Methods for Monitoring
D. Requirements, Indicators and Methods for Review and Evaluation
E. Role and Approaches to External Monitoring and Evaluation
F. Institutional Arrangements for Monitoring and Evaluation: Inputs and Feedback
G. Reporting and Recommendations

Module 19: Case Study 2 - Batangas Bay

A. Application of Proactive Approaches to Marine Pollution
B. Role of Private Sector in Environmental Management
C. Field Excursion: "Cleanest Barangay," Waste Disposal Site and Coastal Industries

Module 20: Case Study 3 - Integrated Waste Management Action Plan for the Batangas Bay

A. Status of Wastes, Disposal and Management
B. Framework for Integrated Action Plan
C. Merits and Constraints

Module 21: Seminar I - National Practices in Coastal Management

A. Presentation by Participants on:
    - Ecosystem Features and Economic Development
    - Management Issues, Management Systems, Programmes and their Effectiveness
    - Experience and Lessons
B. Summary: Assessing Need for Application of ICM System

Module 22: Project I - Formulation and Implementation of Strategic Management Plan

A. Classification and Identification of Management Issues
B. Long, Medium and Short Term Objectives
C. Policies, Strategies and Approaches
D. Action Plan
E. Executing Mechanisms, Structures and Processes
F. Work Programme: Tasks, Schedule and Funding
G. Simulation Based on the Experience of Batangas

Module 23: Case Study 4 - ICM in Xiamen

A. Background
B. Institutional Development for ICM
C. Integration of Science and Decision Making
D. Integrated Legislation and Enforcement
E. Integrated Pollution Monitoring and Assessment
F. Developing a Working Team for ICM

Module 24: Case Study 5 - Yuandang Lagoon Management

A. Historic Perspective
B. Technical Intervention
C. Pollution Reduction and Ecosystem Rehabilitation
D. Cost of Resource Misuses and Benefits of Pollution Mitigation

Module 25: Case Study 6 - Integrated Treatment Project in Yuandang Lagoon

A. Overview of the Project
B. Field Excursion to Tidal Inlets

Module 26. Case Study 7 - Multiple Coastal Use Conflicts

A. Multiple Use Conflicts and Their Resolution
B. Field Excursion: Maricultural Sites, Navigational Channels, Coastal Reclamation Sites, Protected Areas and Recreational Sites

Module 27: Case Study 8 - Marine Pollution Monitoring in Xiamen

A. Integration of Sectoral Monitoring Programmes
B. Indicators, Sampling and Chemical Analysis
C. Monitoring Center, Data Quality Control and Exchange Schemes
D. Labs and Equipment for Marine Pollution Monitoring

Module 28: Introduction to Integrated Environmental Impact Assessment

A. Concept Definition
B. Parameterization of Ecological and Socio-economic Conditions
C. Impact Scoping
D. Impacts and Consequences: Probability, Intensity and Tractability
E. Remedial Actions or Alternatives
F. Preparation of Reports

Module 29: Developing Discharge and Environmental Quality Standards

A. Concept and Definition
B. The Standards and Environmental Management
C. Factors Controlling Standards Formulation
D. Process and Techniques in Standard Formulation
E. Limitation of the Standards in Monitoring and Assessment
F. Towards Better Ecosystem Indices

Module 30: Principles and Techniques in Functional Zonation

A. Objectives and Principles of Functional Zonation
B. Classification System and Criteria
C. Division and Subdivision of the Functional Zones
D. Zoning Techniques
E. Application of Zonation Results
F. Merits, Constraints and Future Direction

Module 31: Case Study 9 - Waste Management in Xiamen

A. Objectives and Definition
B. Analysis of Status: Waste Types, Sources and Quantity
C. Analysis of Waste Impacts
D. Legislative Framework for Waste Management
E. Waste Management Measures and Their Effectiveness

Module 32: Case Study 10 - Management of At-Sea Waste Dumping in Xiamen

A. International and National Legal Framework
B. Siting of At-Sea Waste Disposal
C. Designing Disposal Programme
D. Supervision and Management of Dumping Areas Experience and Lessons Learned in Xiamen

Module 33: Aquaculture and the Environment

A. Analysis of Issues in Xiamen
B. Environmental Problems, Causes and Effects
C. Abatement and Management of Pollution by Aquaculture Activities

Module 34: Introduction to Marine Biodiversity Conservation

A. Marine Biodiversity Conservation: Necessity and Urgency
B. Analysis of Changes in Marine Biodiversity
C. *In-situ* Protection
D. *Ex-situ* Protection
E. Application of ICM System for Marine Biodiversity Conservation

Module 35: Project 2 - Xinlin Seas and Maluan Bay

A. Analysis of Impacts of Economic Development on the Environment
B. Review of Integrated Management Plan
C. Field Excursion: Maluan Bay, Sewage Treatment Plan and Waste Conversion Facilities
D. Simulation: Management Plan for the Xinlin Seas

Module 36: Case Study 11: Environmental Management in Xiamen Port Development

A. Contribution of Port Development to Xiamen Socioeconomic Growth
B. Environmental Impacts of Port Development
C. Resolving Conflicts of Port Development with Other Uses
D. Environmental Management Measures and their Effectiveness

Module 37: Case Study 12 - Tourism Development and Management for Gulangyu Islet

A. Review of Tourism Development and Management Programme
B. Field Excursion: Waste Management Facilities, Beaches and Sites of Historical Interest

Module 38: Case Study 13 - Cleaning of Singapore River

A. Historical Perspective
B. Action Plan and Implementation
C. Impacts
D. Field Excursion to Singapore River

Module 39: Case Study 14 - Solid Waste Management

A. Legislation
B. Technology
C. Field Excursion to Waste Management Facilities

Module 40: Case Study 15 - Maritime Port Management

A. Interplay of Navigation and Coastal Management
B. Shipping and Port Development
C. Port Operation and Management
D. Environmental Management of Port Development
E. Field Excursion to Port Facilities and Waste Receptacles

Module 41: Project 3 - Lessons Learned

A. Philippines (Group 1)
B. PR China (Group 2)
C. Philippines (Group 3)

Module 42: Seminar 2 - Conclusions and Recommendations

A. Presentation by Individual Groups
B. Discussion and Summary

Training and Education Programs and Activities Related to Integrated Coastal Management in Southeast Asia

CHOU LOKE MING
Tropical Marine Science Initiative
National University of Singapore
10 Kent Ridge Crescent
Singapore 119260

CHOU LOKE MING. 1998. Training and education programs and activities related to integrated coastal management in Southeast Asia, p. 119-127. *In* **The Regional Workshop on Partnerships in the Application of Integrated Coastal Management.** 12-14 November 1997, Chonburi, Thailand. 167 p.

Abstract

The results of coastal mismanagement are evident throughout Southeast Asia. Expanding economies and rapid population growth in recent decades compound the pressure on the coastal environment leading to widespread degradation. Integrated management of the coastal area has been advocated as a means to minimize such impacts so as to achieve sustainable development. Greatly lacking is appropriately-trained people in integrated coastal management. Such training is necessary to provide coastal zone managers with enhanced capabilities to deal with interdisciplinary issues and multisectoral planning. Some of the region's tertiary institutions have started offering degree programs in integrated coastal zone management. Many have been active in conducting short-term training courses not only for practitioners but also for different sectors of the community. The current priority is to train managers of today, while recognizing the long-term need to train managers of tomorrow. However, many trainers are not in the best position to conduct formal or informal training courses on their own as they themselves have been trained in separate disciplines and lack an essential understanding of issues and processes beyond their fields of expertise.

Introduction

The coastal environment is a dominant feature of Southeast Asia and in most countries, a high percentage of the population remains concentrated in coastal areas. Expanding population and rapid coastal development have placed increasing pressure on coastal resources, resulting in habitat destruction, marine pollution and diminished resources (Chou 1994; Chua and Garces 1994; Hay et al. 1994). Integrated coastal management (ICM) is an effective strategy that provides a broad, anticipatory, management-based approach, compared to the reactive and problem-driven approach of sectoral management. With development, loss of environmental assets cannot be totally avoided, but can be effectively minimized through appropriate planning and management. Traditional disciplinary-based sectoral planning and management have not been successful because of the multidisciplinary nature of coastal management issues (Scura et al. 1992). Integration and coordination are important considerations for effective management. Since ICM requires an integrated, multidisciplinary approach, it will also require appropriately-trained personnel. This is an important area in which the region's tertiary institutions can play a positive role (Chou 1995a). Equally important is the time taken before the region acquires sufficient numbers of ICM-trained personnel.

At the 1990 ASEAN-US Workshop on Coastal Area Management Education in the ASEAN Region, it was agreed that trained manpower in integrated coastal zone management is not adequately provided by educational institutions in the ASEAN region (Chua 1991). While effective coastal area management can best be achieved through the development and

implementation of integrated programs, the management capabilities of government and non-government organizations responsible for coastal area management need to be strengthened. The public and all stakeholders also need to be made aware of society's critical dependence on the continued productivity of coastal resources, and this can be achieved through non-formal education programs. Professional and technical support staff of coastal management-related agencies must receive formal training in coastal area management in order to deal efficiently with issues and problems, and to develop effective strategies. Their capability must be enhanced with good knowledge of coastal resources and the environmental, social, cultural and economic systems, as well as an understanding of present and future environmental problems and their solutions through an integrated management approach.

Training and Education Needs

It is accepted that a major step towards ensuring success in ICM programs has to be the development of capacities at the national and local levels to plan and manage the coastal zone. Education, training and networking were identified as the general modes of enhancing human resources development (Chua 1996). The lack of technical and management capacities particularly at the local level is identified as a main constraint to ICM programs in the region (IWICM 1996).

Coastal managers with broad-based environmental management training can responsibly lead and coordinate ICM program development and implementation. Presently, there are insufficient numbers of coastal managers with the necessary interpersonal skills to coordinate inter-agency activities, to mobilize human and financial resources, and to direct management-oriented research and information development. This deficiency is serious in view of the rapid pace of coastal development throughout the region. While it is argued that there is a clear need for coastal managers with a holistic approach to coastal resources systems, a broad knowledge of human activities directly or indirectly associated with coastal resources, strong interpersonal skills, and a sensitivity to the interests and concerns of different interest groups (Chua 1996), such qualities are also highly desirable of ICM trainers. Present-day trainers from tertiary institutions who are expected to conduct ICM courses often themselves lack the multidisciplinary background if they are to handle courses single-handedly. Coastal management is currently being taught in different faculties as part of a broader environmental science program, and maintains a strong discipline bias. Many of today's trainers in the region have been trained in separate disciplines and lack a proper understanding of issues and processes beyond their fields of expertise.

Chou (1995b) provided a review of the region's needs in ICM training and education. A 1986 UNEP survey showed that many tertiary institutions within the Asia-Pacific region have incorporated environmental education either as part of a discipline such as engineering, biology, earth sciences, and law, or as an independent degree program. A few of the many examples of the latter are the degree programs on environmental studies in Indonesia, and environmental engineering at the Asian Institute of Technology in Thailand. That survey also revealed the tendency for education and training in environmental issues to be orientated towards general degree programs rather than specialist training because of a shortage of employment opportunities for the latter in the region (ESCAP 1992).

In her assessment of training needs in coastal zone management for the region, McManus (1993) stressed that both long-term as well as short-term training are necessary. Degree programs provide a pool of professionally-trained managers and coordinators of integrated coastal management initiatives. In Southeast Asia, most ICM practitioners begin with a degree in a related discipline and do require short-term training in ICM while on the job.

Chou (1995a) and Hay et al. (1994) pointed out that the need to train ICM practitioners is also accompanied by the need to train those responsible for educating and training such individuals. Immediate training needs in ICM for Southeast Asia are in the following categories:

1. Formal degree programs to train managers for the future;
2. Non-formal, short-term programs for present-day managers;
3. Programs for educators of today and tomorrow; and
4. Programs for different user groups such as policy-makers, developers, public, coastal communities.

These strategies should overcome the present problem of a limited pool of trained people. In addition, effective dissemination of information to policy-makers and different levels of society will increase awareness of the importance of integrated coastal management. Capacity-building is an important objective of ICM training and education activities for the region.

The observation by Crawford and West (1993) that the major gap in integrated coastal zone management training is the lack of professionals with interdisciplinary views and experiences, fully applies to the region. Kenchington (1993) stressed the importance of training educators, managers and the public.

The ASEAN-US Coastal Resources Management Project invested much resources for manpower development in order to upgrade national and local capabilities in ICM. Short-term training courses were organized for all groups of project personnel in order to enhance capacity while a few younger project staff were selected for Masters degree programs in the United States in relevant specialized fields of coastal and marine resource management (Scura et al. 1992). A survey conducted towards the end of the training phase concluded that among the 118 ASEAN nationals involved, 68% were in jobs for which they were trained, 93% considered their training relevant and almost one-third had increased levels of responsibility (Dalusung 1992).

Chua and Parmintuan (1996) estimated that in the Philippines, one coastal manager is needed for every 30,000 people in coastal municipalities. Based on this, there is a tremendous shortage of suitably-trained coastal resource managers with knowledge and technical skills to implement ICM particularly at local levels. R. Dahuri (pers. comm.) said that there was a great demand for the training of coastal managers from Indonesia's 230 coastal districts. The Regional Workshop on the Protection and Management of the East Asian Seas held in Subic Bay, Philippines in July 1997 recognized the need to conduct regional training to strengthen national capacity in planning and effective management of coastal and marine areas.

Strategies to strengthen human resources and institutional capacities are required and should be built into ICM programs. IWICM (1996) suggested that acquisition of knowledge and practical management skills is best facilitated through in-service training and active participation in existing ICM programs. Improving the capacity of stakeholders to contribute effectively to ICM programs is best achieved through public meetings, extension services and workshops.

Status of ICM Training and Education Activities

A 1993 survey of the region's institutions carried out by UNEP's Network for Environmental Training at Tertiary Level in Asia and the Pacific (NETTLAP) showed that various degree courses covering a broad range of marine environment related topics are being taught. Most of these courses are given as part of a broader environmental science degree

course. Some universities offer further specialized courses at Masters level, but to date, few institutions in Southeast Asia are offering a basic or higher degree course in ICM. Many of the institutions have indicated the intention to introduce a specialized Masters course in ICM in the near future in order to meet the demand for trained personnel to handle what is recognized as a growing environmental problem. The situation remained unchanged when assessed at a regional intergovernmental meeting at the end of 1993 (Hay and Pradhan 1993).

While increasing attention on the region's coastal zone management problems is evident from the growing number of research projects, conferences/meetings, and short-duration training courses involving researchers and policy-makers, a gap remains in terms of a structured degree course in integrated coastal management. The demand for the integration of the environment into development and decision-making is resulting in an increase in the number and type of short-term professional and in-service training courses in tertiary level education.

Non-formal Training

A regional report indicated that short-term training courses at the national level are not lacking (Hay and Chou 1993). Many programs have been developed and packaged for different target groups. Bogor Agricultural University (Indonesia), for example, has provided short-term training in Integrated Coastal Zone Planning and Management for eleven batches of planners, managers, government officers, private-sector officers and tertiary-level educators since 1993. These short-term training courses are useful as immediate-term measures to raise the level of awareness and understanding of specific groups, in view of the lack of appropriately-trained personnel. There are also many of such initiatives in the region as well and the following are few of the examples.

The University of Rhode Island (USA) has established a Coastal Resources Centre in Sri Lanka and has organized short-term training courses in special area "Integrated Coastal Zone Management" in collaboration with two institutions in Southeast Asia, the Prince of Songkla University in Thailand and Silliman University in the Philippines (Crawford et al. 1993). The Coastal Resources Institute of the Prince of Songkla University has continued this short-term training in "Integrated Coastal Zone Management" with a 3-week course early this year.

The International Tropical Marine Resource Centre, a consortium comprising the Great Barrier Reef Marine Park Authority, James Cook University and the Australian Institute of Marine Science, conducted a 3-week training course on "Management of Marine Ecosystems and Their Uses" for scientists and managers of the region. The course, conducted in Malaysia in September 1993, was followed by in-country training courses in Indonesia, Mauritius, Papua New Guinea, Thailand and Vietnam.

Through the Coordinating Body on the Seas of East Asia (COBSEA), an intergovernmental organization that advises UNEP on the East Asian Seas Action Plan, two projects have been implemented to produce training materials. From these projects, training materials for marine protected areas (Kenchington and Ch'ng 1994) and integrated coastal management (Kenchington 1996) have been published. One of its recent training activities concentrated on biological impacts of pollutants in the marine environment (UNEP 1994, Chou 1995c, Ward 1996).

A series of ICM awareness-raising workshops in Vietnam and Indonesia was organized in 1996 by the Japan International Marine Science and Technology Federation (JIMSTEF) in collaboration with agencies from both countries. This followed the publication of a book on coastal management issues and approaches in the Asia-Pacific region (Hotta and Dutton 1995).

The GEF/UNDP/IMO Regional Programme for the Prevention and Management of Marine Pollution in the East Asian Seas developed a 3-week training workshop combining formal lectures with sequential visits to demonstration sites in Batangas (Philippines), Xiamen (China) and Singapore. This course entitled "The Application of ICM System to the Prevention and Management of Marine Pollution in the East Asian Seas Region" has been conducted for the third time in as many years and has received participants not only from East Asia, but also from South Asia, East Africa and Latin America. Highlights of this training workshop are given in Table 1. The Programme has also conducted a series of on-site training to increase the capacity of coastal planners and stakeholders at its two ICM pilot sites, Batangas and Xiamen. In addition, the program has conducted various training activities in a wide range of ICM-related topics. In December 1997, the program offered a one-week training course on integrated environmental impact assessment in conjunction with the City University of Hongkong and the Coastal Management Center (Manila). Activities included the development of training materials on Integrated Coastal Management, and Integrated Environment Impact Assessment for publication in 1998.

The UNDP (United Nations Development Program) is in the process of developing the "Train-Sea-Coast" program. The approach involves the creation of intercountry cooperative training and human resource development networks of training/educational centers that agree to join the global network and share the task of training development.

Table 1. Features of the GEF/UNDP/IMO Regional Training Course "The Application of ICM System to the Prevention and Management of Marine Pollution in the East Asian Seas Region" (provided by H.M. Yu).

1.	Practical experience in ICM system development with two-thirds of course time devoted to field studies at 17 selected sites in China, Philippines and Singapore
2.	Improving institutional frameworks in order to implement effective technical and engineering interventions in ICM application
3.	Examination of ICM application under different socioeconomic systems: market-based developing economy; market-based developed economy; and developing economy of central planning and market mechanisms
4.	Exploration of rural and urban applications of the ICM system
5.	Identification of integrated waste management practices, covering hazardous and non-hazardous waste, waste minimization, and integrated facilities and services
6.	Examination of sustainable financing mechanisms and options at the local and national levels, including property rights, public and private partnership and use of market-based instruments
7.	Analysis of international cooperation in ICM application, particularly at the regional and subregional levels, the networking of ICM sites and projects, compliance with international conventions and guidelines on marine pollution
8.	Development of ICM strategic planning and application, particularly at the local level

Degree Programs and Curricula

Courses in some aspects of integrated coastal management are being offered by tertiary institutions of the region and are in various stages of development. Due to its multidisciplinary nature, many of these courses remain within their respective faculties and retain a discipline bias. Some other constraints include the absence of curriculum guidelines, and the limited number of instructional materials and educators trained in coastal management.

A structured degree course in coastal management requires input from many disciplines and inevitably an adjustment of present administrative and operational procedures within institutions. Such a change should be worth the effort for universities within the region to accept in order to serve the needs of the region.

Participants at a regional workshop to assess coastal area management education in the ASEAN region agreed that trained manpower in integrated coastal management is not adequately provided at present by the region's educational institutions (Chua 1991). While both formal and non-formal education in coastal area management were considered important, the workshop restricted discussion to the former in which a Masters program in integrated coastal zone management was considered necessary for coastal area planners and managers. A proposed one-year Masters curriculum focused on issues of regional relevance and covered basic principles of tropical ICM with emphasis on regional and developing-country examples. In this way, educational institutions can adopt the curriculum on a national or regional basis.

The Prince of Songkla University (Thailand) established a 2-year Masters and a 1-year Diploma program in Coastal Resources Management in 1991 (Boromthanarat 1991). Implemented through its Coastal Resources Institute (CORIN), the curricula provided for a multidisciplinary approach. Zulfigar (1993) indicated that 2 Malaysian universities—Universiti Putra Malaysia (UPM) and the Universiti Sains Malaysia (USM) were due to offer Masters degree programs in coastal zone management from 1994. The proposed duration of these courses is 18 to 24 months. While the curriculum developed by UPM provided for a multidisciplinary and generalized approach, the one developed by USM provided the opportunity to specialize in either "pollution studies", "coastal ecology" or "aquaculture". These topics were selected based on the country's identified needs. The National University of Singapore has recently established an interdisciplinary consultative group on environmental issues and technology, and is in the process of developing a Masters program in ICM. Bogor Agricultural University in Indonesia started an MSc program in ICM in August 1997 with 24 students from various local agencies and the private sector. This is in response to the country's need to train coastal managers from their 230 coastal districts and each course will accept up to 25 participants. The Asian Institute of Technology has recently announced implementation of MSc and PhD programs in Integrated Tropical Coastal Zone Management. These programs will be offered from 1998.

In all types of training, the approach is to provide trainees with interdisciplinary skills in identifying and implementing appropriate solutions to coastal zone management problems and in the adoption of preventive and mitigative strategies, rather than programs which are multidisciplinary or founded on the single disciplines on which coastal zone management is based. Hay (1993) advocates the maturation of training programs to the extent that the focus is on solution-oriented approaches rather than on sectoral problem identification and quantification, and the development of generalized approaches.

NETTLAP

The Network for Environmental Training at Tertiary Level in Asia-Pacific (NETTLAP) is a UNEP initiative designed to enhance capacity of tertiary institutions in the Asia-Pacific region to help meet the education and training demands associated with efforts to achieve sustainable development in the region. The program's ultimate aim is to strengthen environmental expertise at both technical and managerial levels in the region and this is to be achieved by increasing environmental expertise of tertiary-level educators and, through them, graduates of tertiary institutions and decision-makers and policy formulators in both government and private sector.

The Network has established a directory of key tertiary-level environmental institutions and educators throughout Asia-Pacific. It encourages development and application of innovative methods in environmental training, identification of needs and sharing of knowledge through ongoing interaction among network partners, preparation and

dissemination of instructional materials, curricula guidelines and training and educational systems, and organization of technical training seminars and workshops. The project is implemented by UNEP/ROAP (Regional Office for Asia and Pacific), in collaboration with UNEP's Environmental Education and Training Unit (EETU), and was initiated in January 1993 as the second phase of an earlier activity arising from the recommendations of the Regional Meeting of Experts to Develop a Programme of Action for Environmental Education and Training in Asia and the Pacific, held in Bangkok, November 1985.

Within the project's framework, a few thematic networks have been established, each with a different coordinator and supported by 2 additional network nodes. One of these thematic networks is "Coastal Zone Management". Coordination of project activities is through National Focal Points identified by participating countries and through Specialist Focal Points, one for each Network theme.

It is envisaged that many of the identified constraints to ICM training can be addressed through the Coastal Zone Management Thematic Network of NETTLAP. The identification of appropriate training materials which have been developed within the region and their wide dissemination throughout the region would be a welcome solution in assisting coastal management educators establish effective and much-needed training programs. Such programs would be significant in contributing towards producing sufficient numbers of trained personnel equipped to handle coastal management problems.

Consolidating and Strengthening Future Efforts

Capacity-building in ICM for the region requires intensified training activities. These activities should be aimed at training more trainers, providing them with effective support, and developing effective means of assisting trainers and trainees in communication (Chua 1996). A strong and effective regional coordinating effort can help to consolidate all the different ICM training and education initiatives. A Southeast Asian "training network" mechanism will be useful for:

1. identifying all available training programs in the region and to review their effectiveness;
2. facilitating exchange of information and experiences concerning the training of planners, managers and stakeholders;
3. making widely available the lessons learned from regional ICM initiatives which will serve as useful examples to ICM training and education;
4. assisting and strengthening tertiary institutions in the region to provide ICM training;
5. supporting trainers with appropriate training materials and technical advice; and
6. informing donor agencies of ICM training and education needs and directing their efforts towards meeting long-term regional requirements rather than isolated, short-lived, project-driven needs.

It is timely to consider training and education in ICM over the long term. It is also necessary to make these requirements known to donor agencies so that they can contribute to a more consolidated effort that addresses the needs of the region. Quality control must be applied to the selection of training materials and courses that have been offered in the region so that only those considered most appropriate and relevant could be supported over the long term.

References

Boromthanarat, S. 1991. The establishment of a Master of Science degree and a diploma course in coastal resources management: Prince of Songkla University, Thailand, p. 65-68. *In* T.E. Chua (ed.) Coastal area management education in the ASEAN region. ICLARM Conference Proceedings 29, 92 p. International Center for Living Aquatic Resources Management, Manila.

Chou, L.M. 1994. Marine environmental issues of Southeast Asia: state and development. Hydrobiologia 285: 139-150.

Chou, L.M. 1995a. The role of tertiary institutions in integrated coastal zone management training, p. 5-13. *In* J.E. Hay, W. Ponniah and M. Pradhan (eds.) Resources volume for tertiary level education and training in coastal zone management. United Nations Environment Programme (UNEP), Regional Office for Asia and the Pacific (ROAP), Network for Environmental Training at Tertiary Level in Asia and the Pacific (NETTLAP). NETTLAP Publication No. 13. UNEP, Bangkok.

Chou, L.M. 1995b. Status and trends in coastal management-related training and degree programs in Southeast Asia, p. 49-53. *In* B.R. Crawford, J.S. Cobb and L.M. Chou (eds.) Educating Coastal Managers: Proceedings from the Rhode Island Workshop. Coastal Resources Management Project, Coastal Resources Center, The University of Rhode Island, and Center for the Environment, US Agency for International Development, Narragansett, Rhode Island.

Chou, L.M., Editor. 1995c. Proceedings of the workshop on soft-bottom benthic communities as indicators of pollutant-induced changes in the marine environment. RCU/EAS Technical Reports Series No. 7, 83 p. UNEP, Bangkok.

Chua, T.E., Editor. 1991. Coastal area management education in the ASEAN region. ICLARM Conference Proceedings 29, 92 p. International Center for Living Aquatic Resources Management, Manila.

Chua, T.E., Editor. 1996. Lessons learned from the successes and failures of integrated coastal management initiatives. MPP-EAS Technical Report No. 4, 90 p.

Chua, T.E. and L.R. Garces. 1994. Marine living resources management in the ASEAN region: lessons learned and the integrated management approach. Hydrobiologia 285: 257-270.

Chua, T.E. and I. Parmintuan. 1996. Estimation of training needs for coastal planners and managers in the Philippines. International Workshop on Integrated Coastal Management in Tropical Developing Countries: Lessons Learned from Successes and Failures, 24-28 May 1996, Xiamen, People's Republic of China.

Crawford, B.R. and N. West. 1993. Professional training for international coastal resource managers. 8th Symposium on Coastal and Ocean Management, 19-23 July 1993, New Orleans.

Crawford, B.R., J.S. Cobb and A. Friedman. 1993. Building capacity for integrated coastal management in developing countries. Ocean Coastal Manage. 21: 311-337.

Dalusung, M.L. 1992. Post-training survey report of the ASEAN/US coastal resource management project. Trop. Coast. Area Manage. 6(3): 34-36.

Economic and Social Commission for Asia and the Pacific (ESCAP). 1992. State of the environment in Asia and the Pacific 1990. ST/ESCAP/917.

Hay, J.E. 1993. Retrospective, contemporary and prospective views on training programmes for integrated coastal zone management: a comparative analysis, p. 35-47. *In* J.E. Hay and L.M. Chou (eds.) Contributions to training in coastal zone management in the Asia-Pacific region and report of the first NETTLAP resources development workshop for education and training at tertiary level in coastal zone management. UNEP/ROAP Network for Environmental Training at Tertiary Level in Asia-Pacific (NETTLAP). NETTLAP Publication No. 7, 245 p. UNEP, Bangkok.

Hay, J.E. and L.M. Chou, Editors. 1993. Contributions to training in coastal zone management in the Asia-Pacific region and report of the first NETTLAP resources development workshop for education and training at tertiary level in coastal zone management. UNEP/ROAP Network for Environmental Training at Tertiary Level in Asia and the Pacific (NETTLAP). NETTLAP Publication No. 7, 245 p. UNEP, Bangkok.

Hay, J.E. and M. Pradhan, Editors. 1993. Environmental training at tertiary level in the Asia-Pacific region. Report of the Regional Consultative Meeting on Environmental Training at Tertiary Level in Asia and the Pacific. United Nations Environment Programme (UNEP), Regional Office for Asia and the Pacific (ROAP), Network for Environmental Training at Tertiary Level in Asia and the Pacific (NETTLAP). NETTLAP Publication No. 8, 109 p. UNEP, Bangkok.

Hay, J.E., L.M. Chou., B. Sharp and N.G. Thom. 1994. Environmental and related issues in the Asia-Pacific region: implications for tertiary-level environmental training. United Nations Environment Programme (UNEP), Regional Office for Asia and the Pacific (ROAP), Network for Environmental Training at Tertiary Level in Asia and the Pacific (NETTLAP). NETTLAP Publication No.1, 72 p. UNEP/ROAP, Bangkok.

Hotta, K. and I.M. Dutton, Editors. 1995. Coastal management in the Asia-Pacific region: issues and approaches. Japan International Marine Science and Technology Federation, Tokyo. 421 p.

IWICM (The International Workshop on Integrated Coastal Management in Tropical Developing Countries: Lessons Learned from Successes and Failures). 1996. Enhancing the success of integrated coastal management: Good practices in the formulation, design, and implementation of integrated coastal management initiatives. MPP-EAS Technical Report No. 2, 32 p.

Kenchington, R. 1993. Coastal zone management training programmes for educators, managers and the public, p. 25-34. *In* H.E. Hay and L.M. Chou (eds.) Contributions to training in coastal zone management in the Asia-Pacific region and report of the first NETTLAP resources development workshop for education and training at tertiary level in coastal zone management. UNEP/ROAP Network for Environmental Training at Tertiary Level in Asia and the Pacific (NETTLEP). NETTLAP Publication No. 7, 245 p. UNEP, Bangkok.

Kenchington, R., Editor. 1996. Integrated coastal zone management training manual. RCU/EAS Technical Reports Series No. 12, 382 p. UNEP, Bangkok.

Kenchington, R. and K.L. Ch'ng, Editors. 1994. Staff training materials for the management of marine protected areas. RCU/EAS Technical Reports Series No. 4, 543 p. UNEP, Bangkok.

McManus, L.T. 1993. Training needs in and teaching curricula for coastal zone management in the Asia-Pacific, p. 15-24. *In* H.E. Hay and L.M. Chou (eds.) Contributions to training in coastal zone management in the Asia-Pacific region and report of the first NETTLAP resources development workshop for education and training at tertiary level in coastal zone management. UNEP/ROAP Network for Environmental Training at Tertiary Level in Asia and the Pacific (NETTLAP). NETTLAP Publication No. 7, 245 p. UNEP, Bangkok.

Scura, L.F., T.E. Chua, M.D. Pido and J.N. Paw. 1992. Lessons for integrated coastal zone management: the ASEAN experience, p. 1-70. *In* T.E. Chua and L.F. Scura (eds.) Integrative framework and methods for coastal area management. ICLARM Conference Proceedings 37, 169 p. International Center for Living Aquatic Resources Management, Manila.

UNEP. 1994. Proceedings of the UNEP workshop on biological effects of pollutants. RCU/EAS Technical Reports Series No. 3, 67 p. UNEP, Bangkok.

Ward, T.J. 1996. Proceedings of the workshop on eutrophication in tropical marine systems - the impacts and management of nutrient pollution. RCU/EAS Technical Reports Series No. 8, 137 p. UNEP, Bangkok.

Zulfigar, Y. 1993. Coastal zone management training in Malaysia, p. 143-148. *In* H.E. Hay and L.M. Chou (eds.) Contributions to training in coastal zone management in the Asia-Pacific region and report of the first NETTLAP resources developement workshop for education and training at tertiary level in coastal zone management. UNEP/ROAP Network for Environmental Training at Tertiary Level in Asia and the Pacific (NETTLAP). NETTLAP Publication No. 7, 245 p. UNEP, Bangkok.

Coastal and Ocean Policy and Institutional Development in the Republic of Korea

SEOUNG-YONG HONG
President

JIHYUN LEE
Senior Researcher

Korea Maritime Institute
154-10, Samsung-Dong, Kangnam-Gu
Seoul, Korea

SEOUNG-YONG HONG and JIHYUN LEE. 1998. Coastal and ocean policy and institutional development in the Republic of Korea, p. 128. *In* **The Regional Workshop on Partnerships in the Application of Integrated Coastal Management.** 12-14 November 1997, Chonburi, Thailand. 167 p.

Abstract

Korea is leading in experimenting with the concept of integrated coastal and ocean management. The creation of the Ministry of Maritime Affairs and Fisheries (MOMAF) on 3 August 1996 is a prominent example of such endeavor, integrating the marine-related functions from ten government authorities in order to ensure consistent and effective coastal and marine policy. The underlying principle of changing institutional mechanism is the national mandate to move in the direction of a sustainable society as the general action plans outlined in Agenda 21. This paper describes how Korea has transformed its coastal and marine policies responding to Agenda 21 and dicusses the national efforts of establishing a national mechanism of integrated coastal management.

The Philippines Tests New Approaches to Coastal Resource Management

CATHERINE COURTNEY
Chief of Party
Coastal Resource Management Project
Tetra Tech EM Inc.
5th Floor, CIFC Towers
North Reclamation Area, Cebu City
Philippines

ALAN WHITE
CRM Advisor
Coastal Resource Management Project
Tetra Tech EM Inc.
5th Floor, CIFC Towers
North Reclamation Area, Cebu City
Philippines

ANNABELLE CRUZ-TRINIDAD
Policy Advisor
Coastal Resource Management Project
PRIMEX, 504 Manila Luxury Condominium
Pearl Drive, Ortigas Center
Pasig City, Philippines

CATHERINE COURTNEY, ALAN WHITE and ANNABELLE CRUZ-TRINIDAD. 1998. The Philippines tests new approaches to coastal resource management, p. 129-136. *In* The **Regional Workshop on Partnerships in the Application of Integrated Coastal Management**. 12-14 November 1997, Chonburi, Thailand. 167 p.

Abstract

Coastal resource management (CRM) has been practiced in the Philippines over the last two decades. Other than the name, which otherwise appears in development literature as coastal zone management, coastal area management and integrated coastal management, CRM initiatives have been supported and nurtured by a variety of institutions, i.e., government, non-government, people's organizations, and by multilateral and bilateral donor organizations, employing different strategies and approaches. The United States Agency for International Development (USAID)-funded Coastal Resource Management Project (CRMP) is capitalizing on the experiences of past efforts and introducing innovations. CRMP espouses the traditional multidisciplinary, multisectoral, multistage and participatory processes of planning, implementation and monitoring for sustainable coastal resource management.

Innovations in CRMP's approach include the development of a critical mass of local leaders who will support and perpetuate CRM practices. This is supported by a strong synergy between the project's national and local level initiatives to ensure that the development of local CRM regimes are consistent with national government policies and also for the latter to be infused with the practical and realistic experiences at the field level. An innovation designed to increase sustainability of CRMP's initiatives is the prerequisite budget allocation for CRM at the municipal level. Meanwhile, replicability is approached by veering away from site-focused models to that of expansion using a variety of forms of community resources. Lastly, an aggressive education and communication campaign at the national and local levels is integrated with the other project components to achieve maximum and long-lasting influence on different interest groups.

Background

Fisheries declined, mangrove forests were devastated, coral reefs were battered and coastal communities became impoverished. Such were the problems that surfaced in the

Figure 1. CRM Learning Areas.

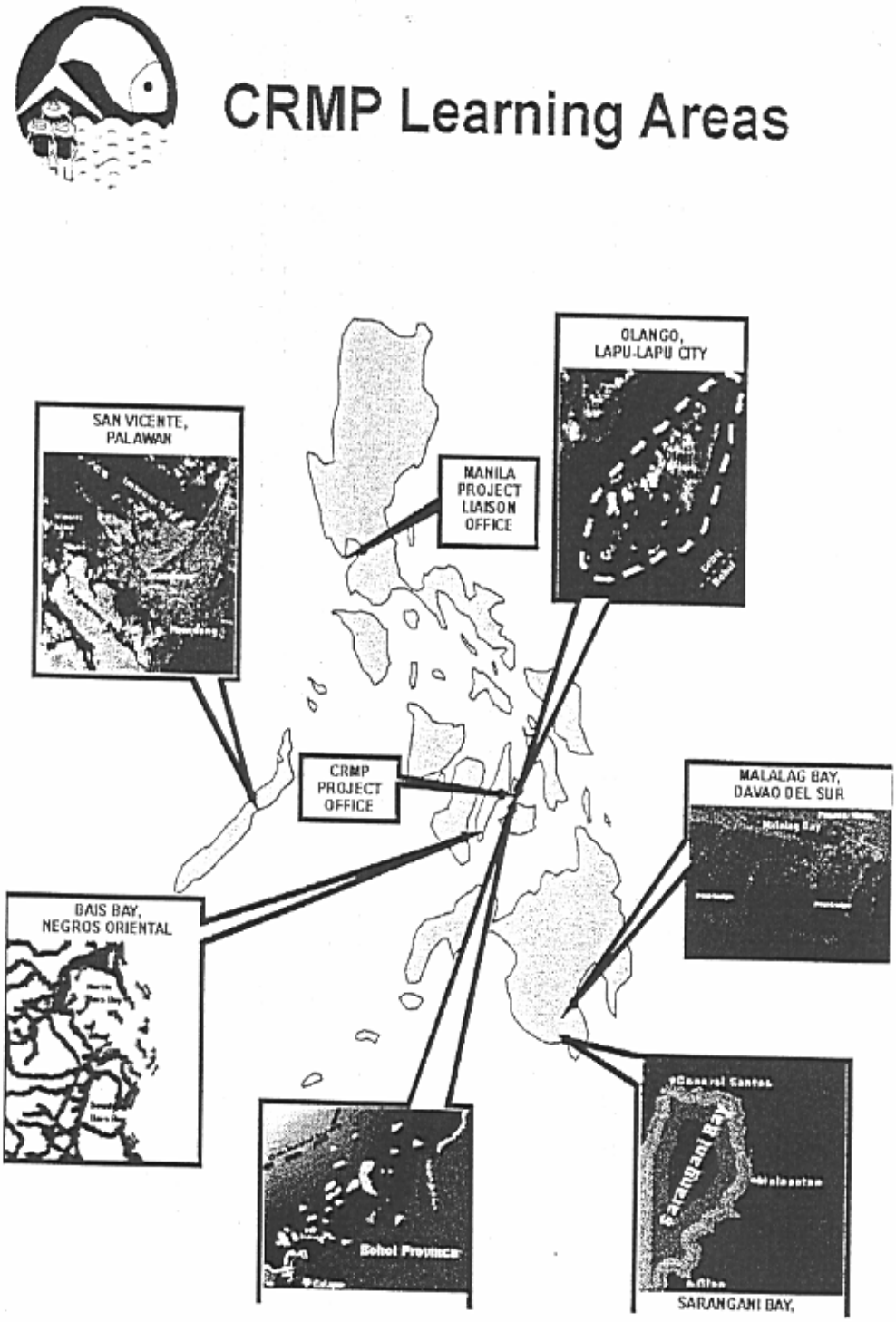


Table 1. Tested and New Approaches to CRM Espoused by the Project.

Tested Approaches	New Approaches
• CRM is an integrated, multi-disciplinary and multisectoral approach	• Technical assistance is conducted simultaneously and synergistically at three levels, i.e., national, local and strategic expansion areas
• CRM is participatory	• Champions of CRM at the national and local levels are trained, developed and supported
	• Transformational communication
	• Strategic expansion to cover a critical mass of shoreline practicing CRM
	• Success is measured in terms of strategic indicators of progress in project areas

Tested Approach: CRM is Integrated, Multidisciplinary, Multisectoral

A "must" and time-tested approach in any CRM initiative, whether conducted at the national or local level, is the integrated, multidisciplinary, multisectoral and character of all processes leading to CRM planning and implementation (Chua and Scura, 1992). CRMP promotes an integrated coastal management approach that focuses on sustainable coastal resource use and the direct impacts on coastal resources from fishing, aquaculture and tourism. It also considers land-based activities, such as deforestation and urbanization. This integrated approach is accomplished by collaborating with ongoing projects of the municipal and national governments and other donor-assisted projects focused on the coastal environment and its governance. It also entails a variety of strategies and activities such as:

- Participatory coastal resource assessment;
- Coastal resource management planning;
- Economic development for coastal resource users;
- Implementation of limited access regimes such as marine reserves and sanctuaries;
- Training in skills relevant for CRM implementation;
- Legal instruments required for effective support of CRM;
- Policy analysis and formulation; and
- Monitoring and evaluation.

Tested Approach: Participatory Tools

Past experience shows that an essential element of successful coastal resource management is active participation by the entire community (Tobin and White, 1992). This includes:

- Day-to-day resource users such as fishers;
- Local government;
- National government;
- Non-government organizations;
- Private sector; and
- Other stakeholders.

The project is assisting communities to develop CRM plans through a participatory process involving preparation of coastal area profiles using participatory coastal resource assessment and identifying and evaluating management options. Implementation of the CRM plans is facilitated by assistance to LGUs to institutionalize CRM. Monitoring coastal resource use will be strengthened by assisting national government agencies and law enforcement branches of the government.

Innovation: Coastal Resource Leadership Challenge

A major theme of the CRMP is the challenge of coastal resource leadership. The nation is confronted with problems of overexploitation of resources, pollution and habitat destruction, compounded by rapid population growth and slow economic development. CRMP suggests that sustainable use of coastal resources in the Philippines is a battle that can only be won through strong leadership, particularly from within the community and LGUs.

The project promotes CRM as the process of planning, implementing and monitoring beneficial and sustainable uses of coastal resources through participation, collective action and sound decision-making. CRMP blends multiple tasks that highlight integrated, strategic and sustainable strategies for coastal resource management implementation. While individual strategies being used by the project may have been accomplished before, CRMP is designed to take advantage of opportunities for synergy to achieve results beyond which any one effort could have accomplished alone.

The CRMP aims to identify, cultivate and promote the current and future coastal resource leaders in the Philippines for implementation of coastal resource management plans. How? The five practices of effective leaders espoused by Kouzes and Posner (1995), will be adapted for CRM leadership and used as a guide. These are:

Challenge the process. Search for answers to the open access problem and stop destructive practices. Take risks to achieve extraordinary results.

Inspire a shared vision. Enlist all stakeholders to share a vision of sustainable use of coastal resources where active participation and management is the norm.

Enable others to act. Foster collaboration in planning and implementing coastal resource management by soliciting participation and sharing information.

Model the way. Set an example by participating in and contributing to coastal resource management activities.

Encourage the heart. Recognize the hard work and commitment of others and advertise the successes to other coastal communities.

Innovation: Strong Synergy between Local and National Level Activities

Past CRM precursors either focused on national level setups or went too much on the downstream, i.e., site-specific and/or community based. CRMP works synergistically and simultaneously at both levels. Thus, the practicality of field experience infuses the generalities espoused at the national level.

The processes related to the preparation of the *Legal and Jurisdictional Guidebook for Coastal Resource Management in the Philippines* (DENR/DA/DILG, 1997) shows this synergy. At the field level, problems pertaining to clarification, interpretation and implementation of laws affecting coastal resource use were identified. CRMP, specifically its Policy Component, conducted initial research on these topics and thereafter convened a series of Technical Working Group (TWG) meetings involving the Department of Environment and Natural Resources (DENR), Department of Agriculture-Bureau of Fisheries and Aquatic Resources (DA-BFAR), Department of Interior and Local Government (DILG), and a host of people's organizations (POs), non-government organizations (NGOs), as well as the academic and scientific communities. The main objectives of TWG meetings were to validate interpretations

of conflicting laws and/or policies, achieve a consistent opinion between and within government agencies, and ensure a comprehensive treatment of the policy framework for coastal resource management. The results of these TWG meetings were validated in five of CRMP's six learning sites. The issues raised were brought to the attention of our national agency partners and resolved. This mode of operation brings to a singular forum concerns of both national and local level CRM practitioners in an efficient and practical manner without diluting the specific sectoral concerns.

Innovation: Transformational Communication

CRMP intends for CRM and CRM-issues to capture the interest of the mass of Filipino population by embarking on media and education campaigns that are designed to increase awareness and ultimately, mobilize the populace into action. CRMP integrates four communication components: development support communications (DSC); information, education and communication (IEC); social marketing; and social mobilization into a unified approach that serves as the foundation for promoting sustainable coastal area development leadership. The approach builds and enhances networks of constituency groups to support CRM initiatives thus ensuring sustainability beyond the life of the project.

Innovation: Success is Measured in Terms of Indicators Showing Sustainable Management

CRMP's progress towards attaining the strategic objective of *"2,000 km of sustainably managed shoreline"* is measured using a composite index of national and local level indicators. National level indicators include the following: (1) development and application of legal and operational guidelines for CRM implementation; (2) setting CRM on the national social agenda; and (3) aligning resources and funding toward a common CRM objective. Local level indicators measure progress toward achieving a local CRM threshold through: (1) institutionalizing CRM in the learning areas and (2) replicating CRM implementation in expansion areas through the application of packaged CRM management and training tools. As such, both national and local categories of indicators include measures of the impact of strategic expansion.

Innovation: Strategic Expansion

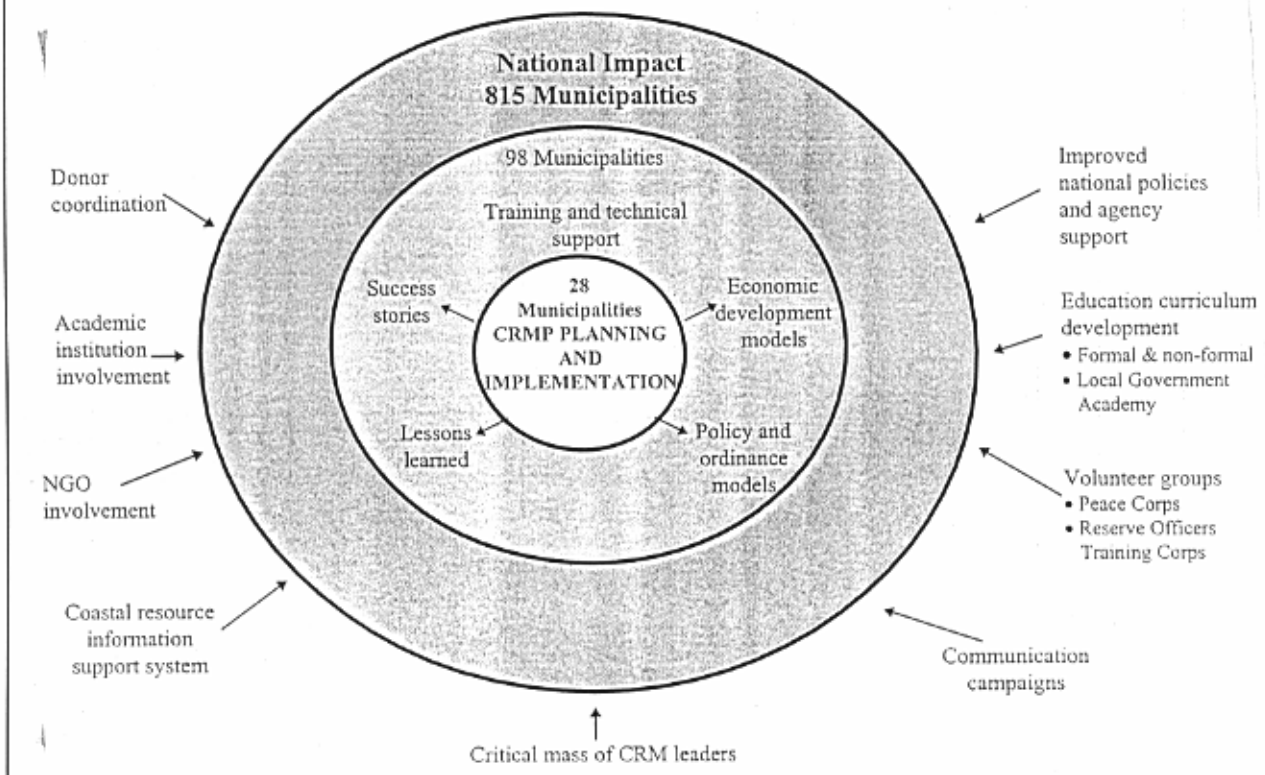
CRMP would like to establish a critical threshold of coastal municipalities actively implementing CRM to achieve the "snowballing" effect. At present, technical assistance at both national and local levels targets 2,000 km of shoreline or roughly 11% of national shoreline length. At this threshold level, CRM is anticipated to continue beyond project life because of the development, implementation and institutionalization of CRM tools. The expansion of CRM to other geographic areas by means of donor support and collaboration is expected to increase the threshold level to that of critical mass level, i.e., 6,000 km or 30% of national shoreline length. At this point, CRM expansion is anticipated to achieve a national momentum.

Anticipated Legacy of CRMP

In summary, CRMP is consciously working to bequeath three significant legacies to Philippine CRM history:

I. Establish CRM in the national social agenda;
   - by enhancing environmental literacy and ethics, individuals or groups are encouraged to support or defend environmental issues actively

Figure 2. Strategic Expansion Mechanisms and Level of Impact.



II. Nurture and develop a group of CRM leaders;
   - by providing skills and training opportunities, CRMP will develop cohorts of present and future leaders who will pursue CRM initiatives well beyond their political careers

III. Strategic expansion by means of donor coordination;
   - by an "expense-sharing" system with other donors with CRMP providing training modules and information materials, the project will cover up to 30% of national shoreline length of 18,000 km, a sound momentum for national CRM expansion.

Acknowledgments

The CRMP is an initiative of the Government of the Philippines that began in March 1996 and is supported by the United States Agency for International Development. CRMP is jointly implemented by the Department of Environment and Natural Resources, Department of Agriculture-Bureau of Fisheries and Aquatic Resources, local government units, non-government organizations and other assisting organizations. Technical support and management are provided by Tetra Tech EM Inc.

References

Christie, P. and A.T. White. 1997. Trends in development of coastal area management in tropical countries: from central to community orientation. Coastal Management 25:155-181.

Chua, T.E. and L.F. Scura, Editors. 1992. Integrative framework and methods for coastal area management. ICLARM Conference Proceedings 37, 169 p. International Center for Living Aquatic Resources Management, Manila.

Department of Environment and Natural Resources (DENR), Department of Interior and Local Government (DILG), Department of Agriculture–Bureau of Fisheries and Aquatic Resources (DA-BFAR) and Coastal Resource Management Project (CRMP). 1997. Legal and jurisdictional guidebook for coastal resource management in the Philippines. Coastal Resource Management Project, Manila, Philippines. 196 p.

Kouzes, J.M. and B.Z. Posner. 1995. The leadership challenge. Jossey-Bass Publishers, California. 134 p.

Scura, L.G. 1994. Typological framework and strategy elements for integrated coastal fisheries management. Food and Agriculture Organization of the United Nations, Rome. 23 p.

Tobin, R.J. and A.T. White. 1992. A Southeast Asian perspective on sustainable development. International Environmental Affairs 4: 50-66.

White, A.T. 1996. Integrated coastal management: lessons to build on. Tambuli 1: 18-23.

White, A.T. and N. Lopez. 1991. Coastal resources management planning and implementation for the fishery sector program of the Philippines, p. 762-775. *In* Proceedings of the 7th Symposium on Coastal and Ocean Management, 8-12 July 1991, Long Beach, California.

An Analysis of Coastal Management Projects and Programs in the Philippines

GIL JACINTO
BRESILDA GERVACIO
Technical Study on Integrated Coastal Management
Department of Environment and Natural Resources
Quezon City, Philippines

GIL JACINTO and BRESILDA GERVACIO. 1998. An analysis of coastal management projects and programs in the Philippines, p. 137. *In* **The Regional Workshop on Partnerships in the Application of Integrated Coastal Management.** 12-14 November 1997, Chonburi, Thailand. 167 p.

Abstract

About 161 project units or sites of 52 major coastal management programs and projects all over the country have been implemented since the 1980s by government, research/academic and non-government/people's organizations. More project sites probably exist if the initiatives of the NGOs/POs could be adequately cited.

Coastal management activities varied according to their geographical scope and scale to include: national, regional, gulf/bay-wide, local or municipal, and community or village level. The typology of these activities also varied according to the major implementors of the interventions or the sector to be managed. A majority of the completed and ongoing programs (28 of 45) initiated by an implementing agency has remained with the agency while several programs (7) started by an implementing agency have been taken over by local government units (LGUs). Most of the coastal management programs (31 of 45) focus on marine resources and emphasize fisheries as the sector to be managed.

Environmental profiles and documentation on the developments in specific coastal areas are available. Moreover, coastal management plans have been integrated, fully or partly, into the local economic development plans of certain LGUs. One of the more important inroads of coastal management programs and related initiatives has been to sensitize policy-makers on the importance of sustainable management of coastal areas.

Coordination among line agencies that have different mandates to contribute to the specific needs of integrated coastal management (ICM) may work in an ideal situation. However, sharing of resources by these agencies could be an issue unless a national ICM framework is evolved and is incorporated in the vision and thrusts of the line agencies and other organizations.

There are opportunities for complementation and linkages among various ICM initiatives in the country to set up parallel ICM sites. Building upon and completing ICM activities will have to be seriously explored.

National Coastal and Marine Policies and Programs in the People's Republic of China

DU BILAN
China Institute for Marine Development Strategy
State Oceanic Administration
1 Fuxingmenwai Avenue
Beijing 100860, People's Republic of China

DU BILAN. 1998. National coastal and marine policies and programs in the People's Republic of China, p. 138-146. *In* **The Regional Workshop on Partnerships in the Application of Integrated Coastal Management.** 12-14 November 1997, Chonburi, Thailand. 167 p.

Abstract

The Chinese Government has attached importance to marine resources development and environment protection in the coastal zone and sea areas because of their importance for the development of the national economy. For this reason, a national marine development strategy and a series of marine policies have been worked out. In this paper the relevant marine policies including the marine legislation and its enforcement, integrated coastal management, the users-pay regime of state-owned sea areas, the national marine functional zonation, the program of development of the marine economy with science and technology and the national marine development program have been set forth.

Introduction

China has a total of 18,000 km of mainland coastline. The area of the internal waters and the territorial sea is about 380,000 km^2 and the area of possible jurisdictional sea area including the exclusive economic zone (EEZ) and continental shelf is nearly 3 million km^2. Generally, in the coastal zone and marine area are found marine resources which can meet the demands of marine exploitation and develop a powerful marine economy. In recent years, following a rapid growth of the national economy, the Chinese government has attached greater importance to construction and protection of the "blue territory". Relevant development policies and a series of programs have been formulated.

Bringing the Coastal Zone and Marine Area into Full Play

China's coastal zone and offshore area, which are the forward bases to develop the economy to the outside world, have a favorable geographical position. The coastal zone extends the load-bearing capacity of the coastal region. The area of China's coastal region which accounts for 13% of the whole territory, holds 40% of the country's population; it provides more than 60% of the national GNP. The coastal zone and marine area can provide huge strategic resources and energy. Faced with the increasing scarcity of land resources and energy in China, the marine resources of the coastal zone, continental shelf and exclusive economic zone have become important strategic reserves of resources and energy.

Many kinds of marine resources, such as oil and natural gas, aquacultural resources, port resources, seawater resources, coastal mineral resources, tourism resources and renewable marine energy, have great potential. Lying on a foundation of over ten years of development, a marine industrial group is being formed in China. Since the reform and opening to the outside world, the

marine output value has grown rapidly—8 billion yuan in 1980; 14.76 billion yuan in 1985; 44.74 billion yuan in 1990 and 246.39 billion yuan in 1995. The average annual growth rate is 24.26% (***Figures 1*** to ***4***). The contribution ratio of marine output value to GDP reached 2.03% in 1994, which may grow to 5% in early next century. Marine economy has become an important motivating force in the development of national economy especially in the coastal region where it has already become a new economic growth point.

Marine Development and Environment Protection in the Legal System

Since the 1980s, China's marine development has entered a flourishing stage. On one hand, remarkable achievements have been made. On the other hand, a series of new contradictions have been introduced, such as the contradiction between the development of marine resources and environment protection, and the contradictions between the different sectoral agencies in the use of resources and coastal space. Therefore, China has brought about a series of relevant marine laws and regulations at the national and regional levels. The relevant national laws and regulations are shown in ***Table 1***.

Table 1. National Laws and Regulations on Marine Resources and Environment.

Title	Date
Regulations on the Exploitation of Offshore Petroleum Resources in Cooperation with Foreign Enterprises	30 Jan 1982
Marine Environmental Protection Law	1 Mar 1983
Maritime Traffic Safety Law	1 Jan 1984
Regulations on the Dumping of Wastes at Sea	6 Mar 1985
Fisheries Law	1 Jul 1986
Regulations on the Prevention of Pollution Damage to Marine Environment by Ship-Dismembering	18 May 1988
Regulations on the Prevention of Pollution Damage to Marine Environment by Land-based Pollutants	1 Aug 1990
Regulations on the Prevention of Marine Environment Damage Caused by Coastal Construction Projects	1 Aug 1990
Territorial Sea and Contiguous Zone Law	25 Feb 1992
Regulations on the Management of Marine Protected Areas	11 May 1995
Mineral Resources Law (revised)	29 Aug 1996
Mineral Resources Law (revised)	29 Aug 1996
Exclusive Economic Zone and Continental Shelf Law (examined and approved by the National People's Congress)	-

Legislation on the regional level includes the regulations promulgated by the coastal provinces and cities, some of which are shown in ***Table 2***.

Table 2. Regional Regulations on Marine Resources and Environment for Coastal Provinces and Cities.

Title	Date
Provisional Regulations on Management of Sea Flat of the Shanghai Municipality	1986
Regulations on Coastal Zone Management of Jiansu Province	3 Mar.1991
Regulations on Coastal Zone Management of Hainan Province	(draft)
Regulations for Environmental Protection of Xiamen City	1994

Figure 1. Total Output Value of Marine Industry.

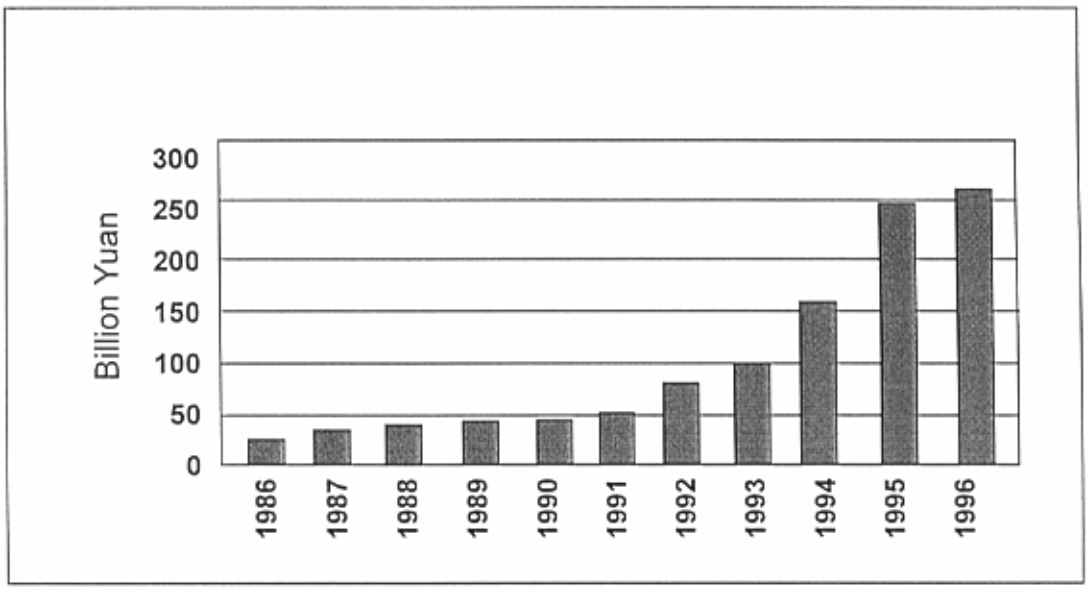


Figure 2. Total GDP Coastal Province.

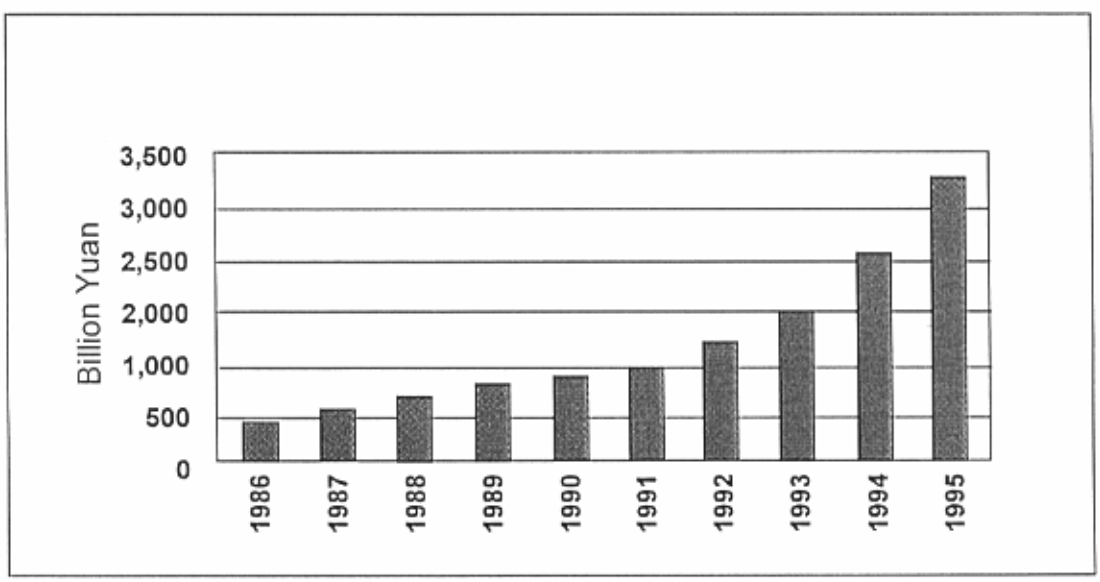


Figure 3. Total GDP Coastal Cities and Counties.

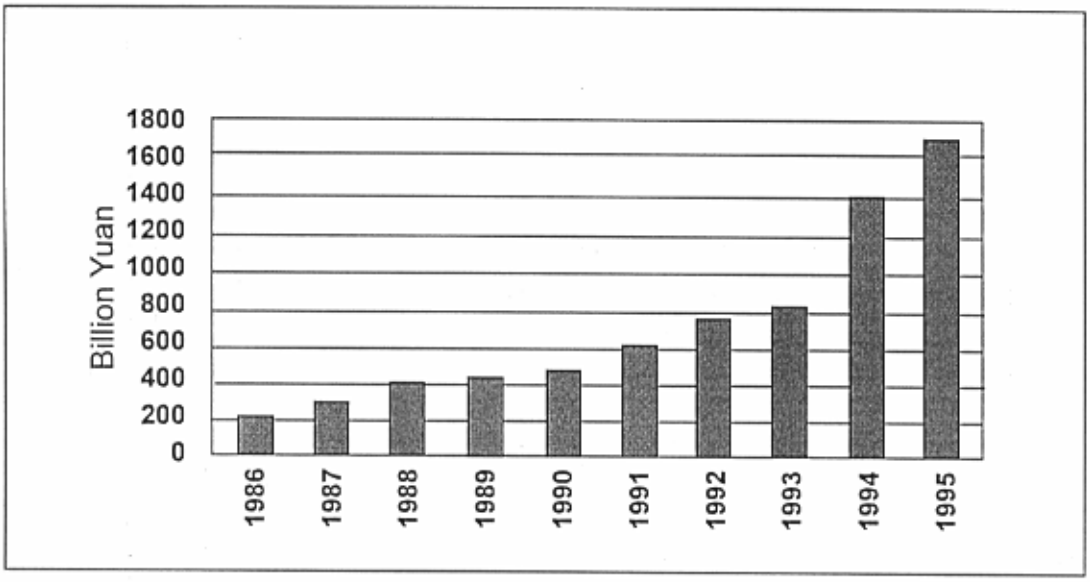
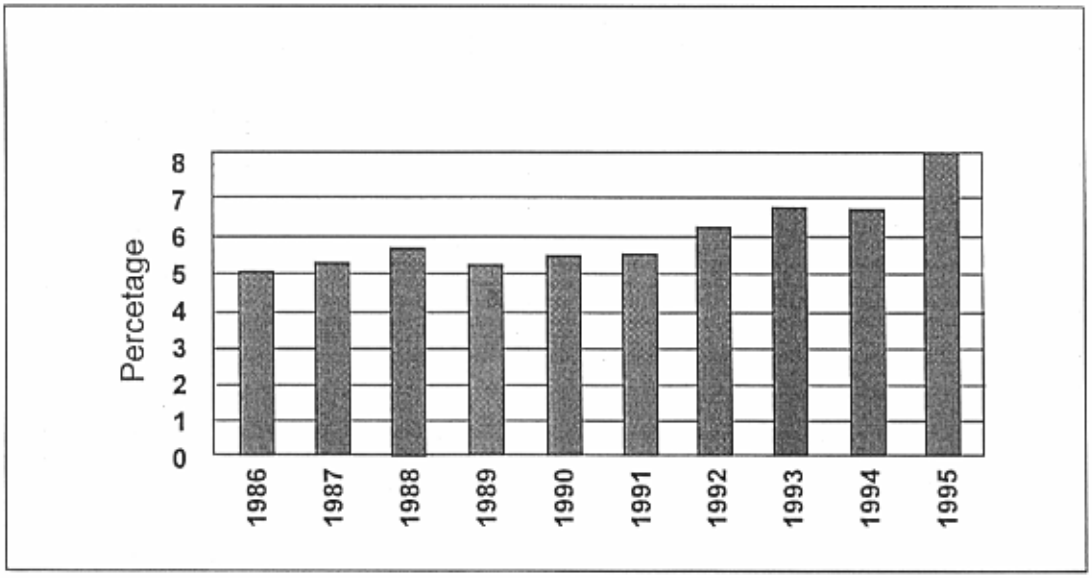


Figure 4. The Proportion of Total Output Value of Marine Industry to Total GDP Coastal Provinces.



Law Enforcement

Owing to historical reasons, the government's administrative authority in the management of marine resources and environment is currently classified according to oceanic, environmental protection, harbor superintendency and fishery administration. The responsible agencies set up their own law enforcement groups. However, the limited labor and facilities restrict the role they play in monitoring, surveillance and enforcement activities so that even existing legislation cannot be fully implemented in some cases.

Sustainable Marine Development Strategy

The United Nations Conference on Environment and Development (UNCED) adopted the United Nations Agenda 21 in June 1992, which focuses on the protection of marine resources, rational utilization and development. UNCED Agenda 21 points out that the marine environment has been considered as a whole, that it is an essential component of the global life support systems and is valuable to realize sustainable development.

The Chinese government, in the spirit of UNCED in 1992, has formulated China's Agenda 21—White Paper on China's Population, Environment and Development for the 21st Century in 1994, which makes conservation and sustainable development of marine resources as important program areas in the action plan. In order to implement China's Agenda 21 and promote marine sustainable development and rational utilization, the Chinese government has formulated China Ocean Agenda 21 and Action Plan in 1996. China Ocean Agenda 21 points out that the growth rate of the marine economy has been maintained at 12-13% since the past 10 years.

China Ocean Agenda 21 consists of 11 chapters, 43 program areas, 204 action plans and its main fields include:

- Strategies and Countermeasures
- Sustainable Development of Marine Industries
- Sustainable Development of the Ocean and Coastal Areas
- Sustainable Development of Islands
- Conservation and Sustainable Utilization of Marine Living Resources
- Promotion of Sustainable Development of Oceans with Science and Technology
- Integrated Management of Coastal Areas and National Jurisdictional Waters
- Marine Environmental Protection
- Natural Marine Disasters Prevention and Mitigation
- International Marine Affairs
- Public Participation

In order to implement China Ocean Agenda 21, some projects have been worked out including:

- The Sustainable Utilization and Integrated Management of the Coastal Zone in China
- The Impacts of Sea Level Rise on the Economic and Social Development of the Coastal Zone and Countermeasure Studies
- Marine Disaster Monitoring and Prediction System Studies and Upgrade on Monitoring, Prediction and Pre-warning Capacities

- Marine Disaster Monitoring and Prediction System Studies and Upgrade on Monitoring, Prediction and Pre-warning Capacities
- Conservation and Management of the Mangrove Ecosystem in China
- Coral Reef Ecosystem Restoration and Biodiversity Protection and Management of the South China Sea
- Sustainability and Protection of the Yellow Sea Large Marine Ecosystem (YSLME)
- Research on Tropical Seawater Agriculture and Demonstration Site Development
- Research on the Acid Fog in the Coastal Zone Caused by Marine Organisms and Ecological Countermeasures
- Modern Ecological Agriculture in the Tidal Flat in Jiangsu Province
- The Demonstrated Engineering of "Man and Biosphere" in the Nanji Archipelago Marine Natural Protected Area, Zhejiang Province
- The Demonstration Bases of New Energy Comprehensive Utilization on the Island
- Public Participation, Training, Education and Assistance Plan

The Program of Development of the Marine Economy with Science and Technology

We need high and new technology, because the marine environment is complicated and highly variable, and its exploitive capacity is more difficult. In recent years, the Program of Development of the Marine Economy with Science and Technology has been launched in China's coastal areas. Progress in science and technology has promoted the rapid development of the marine economy.

The State Science and Technology Commission and the State Oceanic Administration are formulating an Outline of the "Programme of Development of the Marine Economy with Science and Technology" for the 9th Five-year Plan and the year 2010 for the whole country. The transformation rate of marine technological achievements will reach 30% by 2000. During the 9th Five-year Plan, the increasing marine gross product will reach 30 billion yuan, and the contribution ratio of marine industries to the national economy will reach 3.5% to 5.0%. The role of the scientific and technological progress for the gross product of marine industries will reach over 50%. The contribution ratio of marine industry appreciation to the national economy will reach 10% in the year 2010.

Integrated Management in the Coastal Zone and Marine Area

For many years, China's integrated management in coastal and marine areas is based on the different sectoral management, resulting in a disorderly resource development, unreasonable utilization and degeneration of the marine environment. With rapid development in the marine economy, people have progressively recognized the necessity of marine integrated management. China is taking various measures to strengthen integrated management in order to realize the objective of combining sectoral management in integrated marine management.

Adjusting the Structure and Enhancing the Integrated Marine Management System

Efforts should be made, firstly, to improve the responsible administrative organizations from various central departments and local agencies. A wider integrated marine management

function is authorized by the State Council and each administrative body at various levels. Sea area management duties should be readjusted and divided for the integrated departments at various levels. Secondly, the high level national and regional leading and coordinating structures should be established for integrated marine management (such as the Marine Affairs Management Commissions directly under the State Council and regional governments). A stable and effective coordination mechanism and consultation system between departments and between regions should be established and consolidated. Offshore production and safeguarding systems should be developed, such as transdepartmental and transregional ocean monitoring network, communication network, early warning network and safety command system.

Administrative Management on the Use of State-owned Sea Areas

The space of the coastal zone and sea area is limited, especially those areas are bound of? marine resources and the transport facilities are available. Being the competitive case, the contradiction in use of sea areas becomes remarkable day by day. The scramble of socio-sectoral agencies for use of state-owned sea areas inevitably leads to unreasonable utilization even the waste and damage of marine resources. In order to reverse the trend, it is necessary to strengthen the administrative management on use of the sea area.

The core of managing the use of state-owned sea areas is to implement the licensing system on use of sea areas and to adhere to the users-pay principle. Provisional Regulations on Use of State-Owned Sea Areas have been promulgated by the Ministry of Finance and the State Oceanic Administration (SOA) in 1993. A preliminary management regime has been set up in China and it will be perfected in the future.

Marine Functional Zonation and Scientific Basis for Integrated Coastal Management

The program of marine functional zonation in China was completed in 1989-1991 and corresponding marine exploitation schemes were worked out. Marine functional zonation is an important management tool for coastal and marine managers. Functional zonation is a process of subdividing a geographic area into zones based on optimization of desired socioeconomic characteristics of each zone, e.g., industrial zone, fisheries zone, conservation zone, etc. With the aid of GIS, the zoning scheme can be used to analyze and resolve resource use conflicts.

Under the organization of the SOA, a general zonation scheme for the whole coastline of China has been developed. The scheme provides guidelines for optimum use of coastal and marine resources throughout the country. However, for local management purposes, more detailed, site-specific zonation schemes based on functional characteristics of each site are needed and have been developed only for several bays and sea areas of small size.

Impacts of Sea Level Rise and Adaptive Strategies

China's coastal areas vary with complex topography. The possible major vulnerable areas due to sea level rise in the future are the plains of the Zhujiang River Delta, Changjiang River Delta and Yellow River Delta (***Figure 5***). According to our calculation, the Chinese coastal zone, with an elevation less than or equal to 5 m, is about 143,900 km^2. This area accounts for about 11.3% of the total area of the eleven coastal provinces, municipalities and autonomous areas. For example, in the case of a 65 cm sea level rise in the future, the potentially submerged area in the Zhujiang River Delta is about 3,453 km^2 in cases with tide defenses and the highest water level in record (***Figure 6***).

Figure 5. Littoral Plains Along China's Coast Vulnerable to Sea Level Rise (areas shoreward from dotted areas) (Source: Han Mukang, 1992).

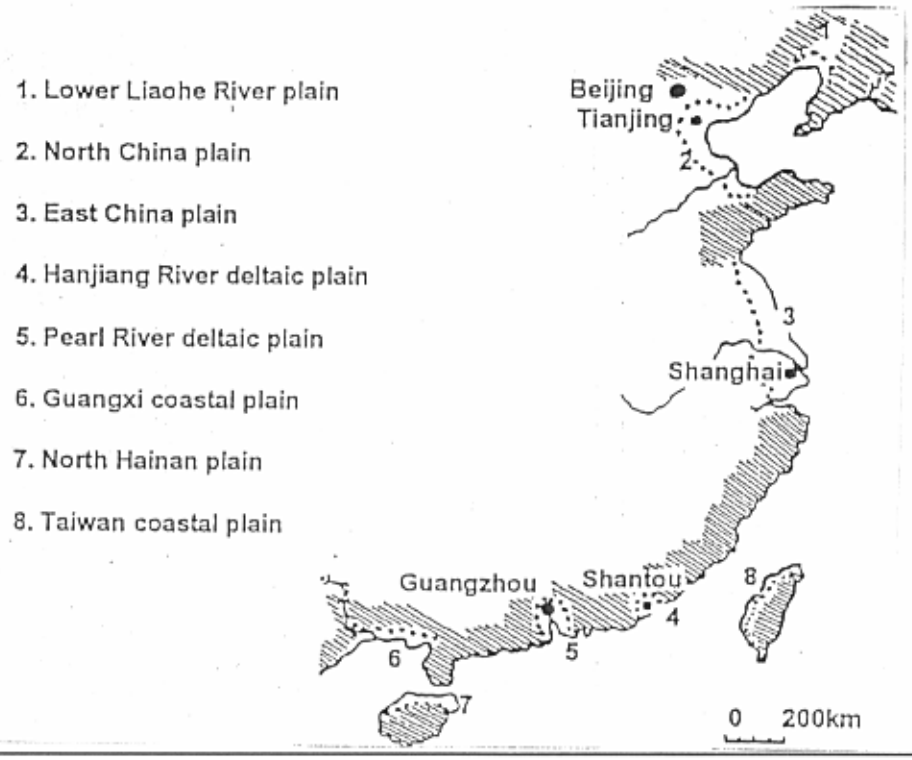
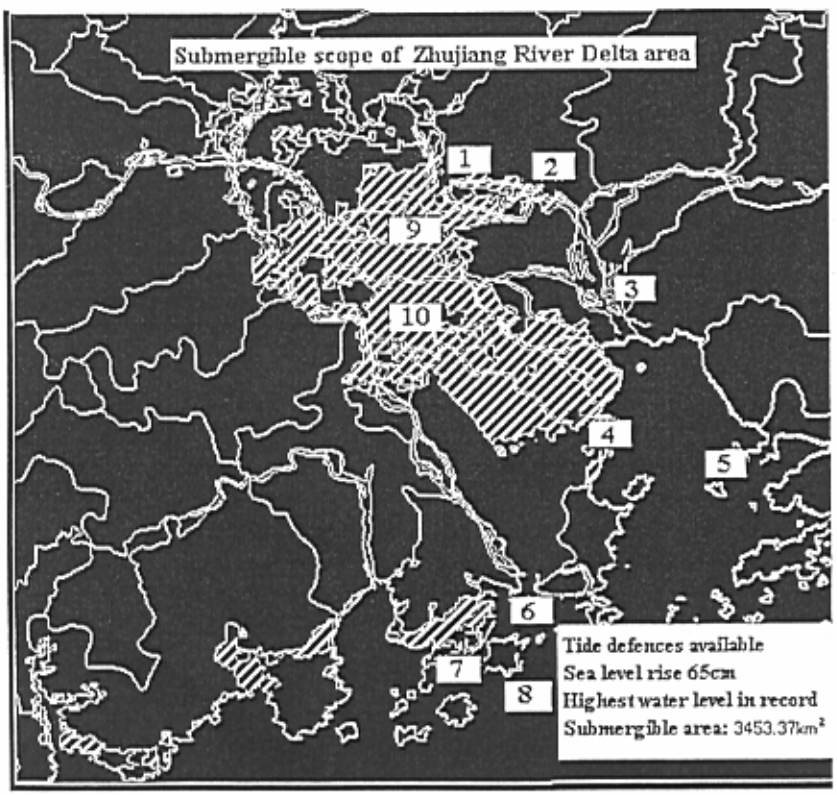


Figure 6. Potentially Submerged Areas in the Zhujiang River Delta When the Sea Level Rises 65 cm in the Case with Tide Defenses.



Note:
1. *Guangzhou*
2. *Huangpu*
3. *Sishengwei*
4. *Hengmen*
5. *Chiwan*
6. *Denglongshan*
7. *Huangjin*
8. *Sanzao*
9. *Foshan*
10. *Shunde*

The National Marine Development Program and Sustainable and Coordinated Development of the Marine Economy

Drawing up a national marine development program is an effective measure in achieving integrated coastal management. A national marine development program has been worked out with joint efforts from sectoral management agencies in 1993. The program deals with a series of important issues for marine development, such as the total strategic target of marine development, total amount of control in the development of the marine economy, rational disposition of marine resources, reasonable distribution of developing areas and structure adjustment of the marine industry, among others. Concerning space distribution, the program gives consideration to the coastal zone, offshore area, continental shelf, exclusive economic zone and offshore areas.

References

Du Bilan. 1997. The effect of the exploitation of marine resources on the sustainable development of China. Ocean Development and Management 14(3): 40-43.

Han Mukang et al. 1992. Sea level rise on China's coastal plain, p. 17-21. *In* Global warming and third world.

Han Zhongnan. 1994. An analysis of the probability of sustainable development of Chinese marine economy. Ocean Development and Management 1(4): 1-5.

Han Zhongnan. 1995. The study of the prospect of Chinese marine economy and promotive means. Ocean Development and Management 12(1):12-15.

Ni Xuan. 1991. The legislation of marine resources in China, p. 74-79. *In* A study of China's marine resources management. National Marine Information and Data Center.

State Oceanic Administration.1996. China Ocean Agenda 21. China Ocean Press. p. 37-46.

State Oceanic Administration. 1996. China marine statistical yearbook 1995. China Statistical Publishing House. 146 p.

Wang Zhaochun. 1995. Action programme of China Ocean Agenda 21. Ocean Development and Management 12(4): 15-18.

Yan Hongmo. 1995. Making great efforts to advance scientific ocean development projects. Ocean Development Management 12(1): 1-5.

Zhao Eebo. 1995. Regulations on the management of national sea area use. Ocean Development and Management. 12(1): 36-42.

Zhang Yuxiang. 1991. The resources management in China's littoral areas of coastal zone, p. 87-96. *In* A study of China's marine resources management. National Marine Information and Data Center.

A National CRM Policy in Thailand

AMPAN PINTUKANOK
Chief of Marine and Coastal Resource Sub-division
Natural Resources and Environmental Management Division
Office of Environmental Policy and Planning
60/1 Soi Phiboonwattana 7, Rama VI Road
Bangkok 10400, Thailand

AMPAN PINTUKANOK. 1998. A national CRM policy in Thailand, p. 147-154. *In* **The Regional Workshop on Partnerships in the Application of Integrated Coastal Management.** 12-14 November 1997, Chonburi, Thailand. 167 p.

Abstract

An integrated coastal resource management (CRM) project was first implemented in Thailand with assistance from the Federal Government. The project aimed to reduce the conflict use of coastal resources with a bottom-up approach and designed the pilot project at Phuket to verify the implementable National CRM Plan. The project began in 1987, but was cut short in 1991 after only 3.5 years due to funding.

Due to the short life of the project, the coastal resources related policies, which are fragmented due to various departments acting independently along with unclear law enforcement and conflict use of coastal resources, are still unresolved. However, the efforts for the development of land use guidelines for Phuket are the most important aspect of Phuket's land use planning project. Zonation of land use in harmony with the land suitability was done systematically through the technical supports such as water quality management, erosion control and coral protection. However, enforcement of these activities depends on the related laws which are being reviewed by the Department of Town and Country Planning, Ministry of Interior by the specific plan.

The specific plan will be appropriately incorporated into the Phuket Action Plan so as to gear the growth of the province effectively.

Development of the Phuket Action Plan was based on the pilot project. A set of cabinet resolutions were issued in which budget allocation was made for implementation from the top level. This still does not satisfy a bottom-up approach. As the Enhancement and Conservation of National Environmental Quality Act 1992 is enacted and the Environmental Quality Management Plan at Provincial level based on issues identified by local is provided by law, the idea to develop policies and plans with the bottom-up approach has just been made possible.

Introduction

In 1987-1991, an integrated coastal resource management (CRM) project was initiated in Thailand, with technical and budget assistance from the United States through the University of Rhode Island. In the Sixth National Economic and Social Development Plan, the CRMP strongly emphasized an issue-oriented bottom-up approach, where issues were identified by local citizens who formulated the Action Plan, Management Plan and the National Policy. Conflicts generated among interest groups acting on various agency policies were also identified.

The objective of the project was to close the gap between plan and implementation and/or to ensure an implementable policy. The bottom-up approach was first applied to Phuket, a pilot area for demonstration and verification of such planning approach, since Phuket is one of the most important foreign exchange earners in tourism and the most rapidly developed area. This project lasted for a period of 3.5 years starting from 1987 with the aim of

reducing conflict use of resources among interest groups, thus strengthening the CRM capabilities of Thailand based on Phuket's experiences.

The Phuket project added value to all the related studies for a number of projects. The ASEAN-Australia Cooperative Program on Marine Science provided a nation-wide baseline study and technical assistance for a sizable GIS database establishment. The ASEAN-US Cooperative Program on Marine Science ICLARM/CRMP provided an approach to reduce land use conflict at the regional level. Management of national marine parks which include Tarutao and Nopparat Thara was also included in the CRM Policy. This was to cope with adverse effects on an entire coast approximately 2,600 km² long.

Analysis of Institutional Framework

The preliminary study found that there was no marked difference between the system of public administration in Phuket and elsewhere in Thailand. The organizational set-up of both the Changwat (province) and local governments was practically the same as those of other provinces. No special institutional arrangements were made for the purpose of coastal resource management.

On the basis of the above findings, a number of assumptions pertaining to institutional issues were made as follows:

1. The lack of a mechanism for effective implementation of national policies and plans on resource management at province and local level is due to shortcomings in the policy-making and planning process at the national level, which failed to take into account the issues of jurisdictional conflicts and overlaps among central government agencies and enterprise concerned with coastal resource management.

2. According to the law on public administration, the Changwat government under the leadership of the governor is more representative of the central government within the limits of its territorial jurisdiction. However, because of jurisdictional conflict among representatives of the central government agencies, which form the body of Changwat administration, the governor cannot effectively resolve matters where the final decision-making is still reserved for the various departments and ministries concerned.

3. The local government is not actually autonomous on majority of the matters pertaining to coastal resource management. It is therefore virtually powerless to deal with issues and conflicts that arise.

4. Ineffective law enforcement is due to a lack of a clear-cut policy and poor coordination between resource agencies and investigatory authority as well as prosecuting authorities.

In order to make the plan implementable regarding the above issues, mechanisms for effectively supporting CRM were developed.

Mechanisms for Project Implementation

Project Administration

In building linkages between central and local governments, the project had two levels of committee including the CRM Advisory Committee and the Phuket Action Committee. The Advisory Committee was chaired by the Secretary General of the Office of Environmental Policy and Planning (OEPP) and was composed of the Governor of Phuket and members from the policy and implementing agencies such as the National Economic and Social Development Board (NESDB), Ministry of Interior, Royal Forest Department, Department of Fisheries, Mineral Resource Department, Tourism Authority of Thailand, Land Development, and Department of Technical and Economic Cooperation.

The Phuket Action Plan

Development of the Phuket Action Plan was based on the pilot project and the implementable strategies under which the Phuket Action Committee was established. The Phuket Action Committee was chaired by the Governor of Phuket and was composed of line agencies, NGOs and local businesses. The Committee was responsible for reviewing and evaluating the progress of the Phuket work tasks, meeting periodically with representatives of the National CRM Advisory Committee to discuss project experiences, successes and problems and refining the draft Phuket Action Plan before submitting it to the Advisory Committee and the Board of Environment, respectively. The draft action identified four issues including:

a. Loss and degradation of priority habitats;
b. Declines in nearshore fishery resources;
c. Degradation of water quality; and
d. Degradation of scenic qualities, cultural sites and other amenities that attract and support tourism.

To encourage the implementation of the plan, the CRM Plan is to be integrated into the Provincial Development Plan. This is so that funding can be allocated and implemented at the local level to achieve the bottom-up approach. However, coastal resources could not be systematically developed as an integral part of the Provincial Development Plan with the data collecting process. Thus, budget allocation was made through a Cabinet Resolution from the top level.

On 27 August 1991, the Government approved the cabinet resolution on the Phuket Action Plan for Patong, Kata and Karon. The budget was also set for an annual allocation for implementation at local level. As the Enhancement and Conservation of National Environmental Quality Act B.E. 2535 (1992) is enacted and the Environmental Quality Management Plan at the provincial level based on issues identified at the local level is provided by law, the idea to develop policies and plans with the bottom-up approach has been made possible.

The National CRM Policy

Issues identified in the Phuket Action Plan had been integrated into the National Policy as a case study for other areas. Relevant inputs such as the Tarutao and Nopparat Thara Marine Park Management, the Upper South Management Plan as well as ASEAN-Australia Cooperative Program on Marine Science were incorporated into the Policy Paper. Issues which were addressed in the policy paper include:

a. Long-term trends in conditions and use of resources;
b. The environmental and economic implications of the above trends, especially where degradation or loss is rapid; and
c. Local and national causes for the dilemma.

These issues made up the national paper on Thailand Coastal Resource Policies and Measures and received the Cabinet Resolution on 17 February 1992. The Cabinet Resolution also included a rational scheme for the protection of natural as well as environmental resources as follows:

Land use

a. Expand the Sanitary Districts to cover the entire watershed concurrent with the expanded Building Control Act area coverage;
b. Control the land use to meet the regulations;
c. Prepare and adopt Specific Town Plans for the tourism developed areas;
d. Prepare and adopt Master Town Plans for rural and industrial areas;
e. Designate the Tourism Developed Zonation with measures for controlling the density in beach areas and residential areas;
f. Identify zone preserved and conserved areas in each province, and identify these areas using signs and posters; and
g. Conduct a carrying capacity study in the tourism areas.

Water quality

a. Designate the Water Quality Standards in Controlled Zone for Thailand coastlines;
b. Zonate Waste Water Controlled Area for communities not serviced by the Central Treatment System;
c. Construct a collection and treatment system for the Waste Water Treatment Plant of the priority cities—Pattaya, Chonburi, Rayong, Songkhla, Hadyai, Krabi and Phuket;
d. Conduct a feasibility study of the principle pay for the Central System;
e. Encourage the participation of third party monitoring of sea water following the current accepted standard; and
f. Encourage the aquaculture's register program to regulate effluent discharge to the stream and the sea.

Solid waste

a. Provide equipment such as garbage containers, cars and related facilities and construct solid waste disposal systems for communities and tourist sites; and
b. Design and construct a landfill for a solid waste disposal system.

Mangroves

During the Phuket CRMP implementation, it was found that mangroves and corals are becoming prioritized issues and thus, the Urgent Measures for Protecting Mangroves and Corals and measures to stop the Encroachment on Mangroves has received the cabinet approval on 4 June 1991 and on 23 July 1991, respectively.

Coral reefs

On 3 March 1991, the Government approved the National Coral Strategies submitted by the Office of the National Environment Board for which all reefs in Thailand's coasts must be managed according to both ecological value and the need to promote tourism development.

Conclusion

In the past, the National Economic and Social Development Plan has provided good insight into what is needed in Thailand for managing its coastal resources. The previous plans have been impracticable even though they were well thought out plans, because they lacked the provisions required for implementation. We have learned resource management by government agencies acting on their own is not practicable, since the gap between planning and implementation is too significant. Availability of resources for exploitation and serious degradation of some coastal resources have resulted in major problems which in turn are strengthening the Office of Environmental Policy and Planning's efforts to safeguard the environment by learning from past mistakes.

In closing, cooperation among two levels of the committee, central and local government agencies, the Phuket Action Plan and the National CRM Policy was designed based on issues. The effective implementation of a plan and policy depends upon effective public awareness campaign and the CRMP authority strengthened by government agencies, NGOs and individuals, as well as involvement of the private sector.

Figure 1. CRM Project Organization and Integration of National Policy.

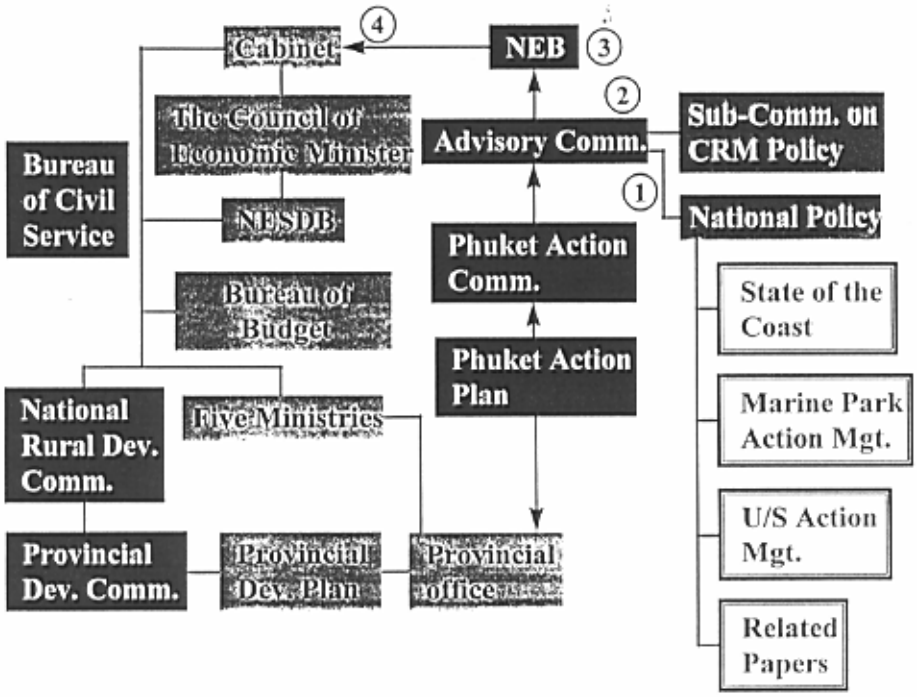


Figure 2. Thailand Coastal Resources Management.

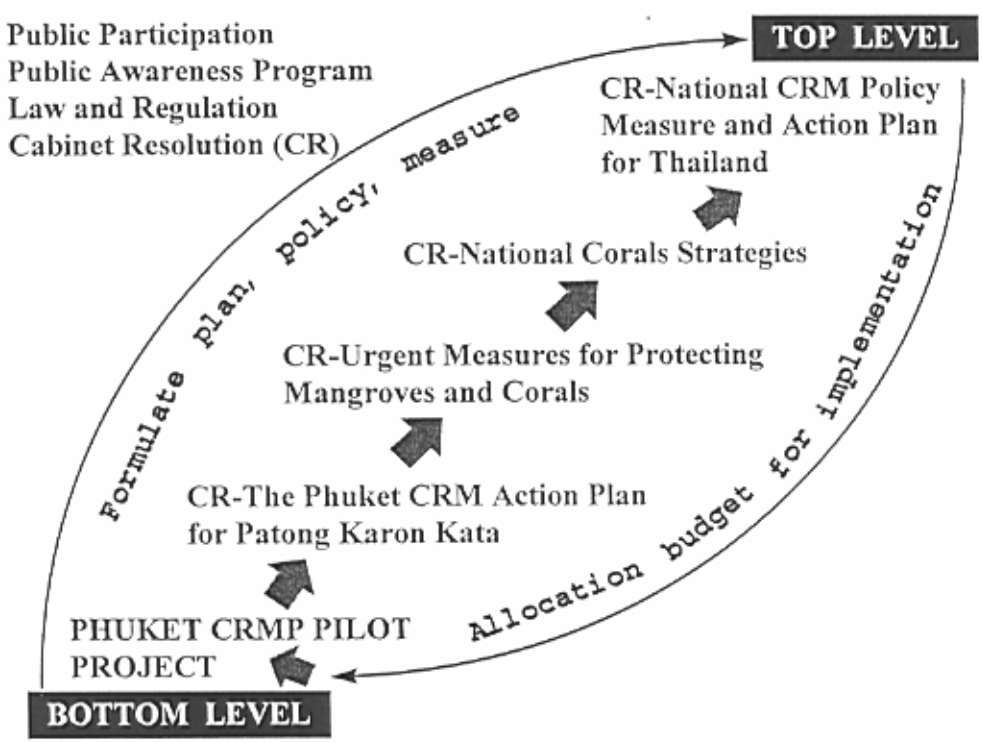


Figure 3. Tools for Managing Thailand CRMP.

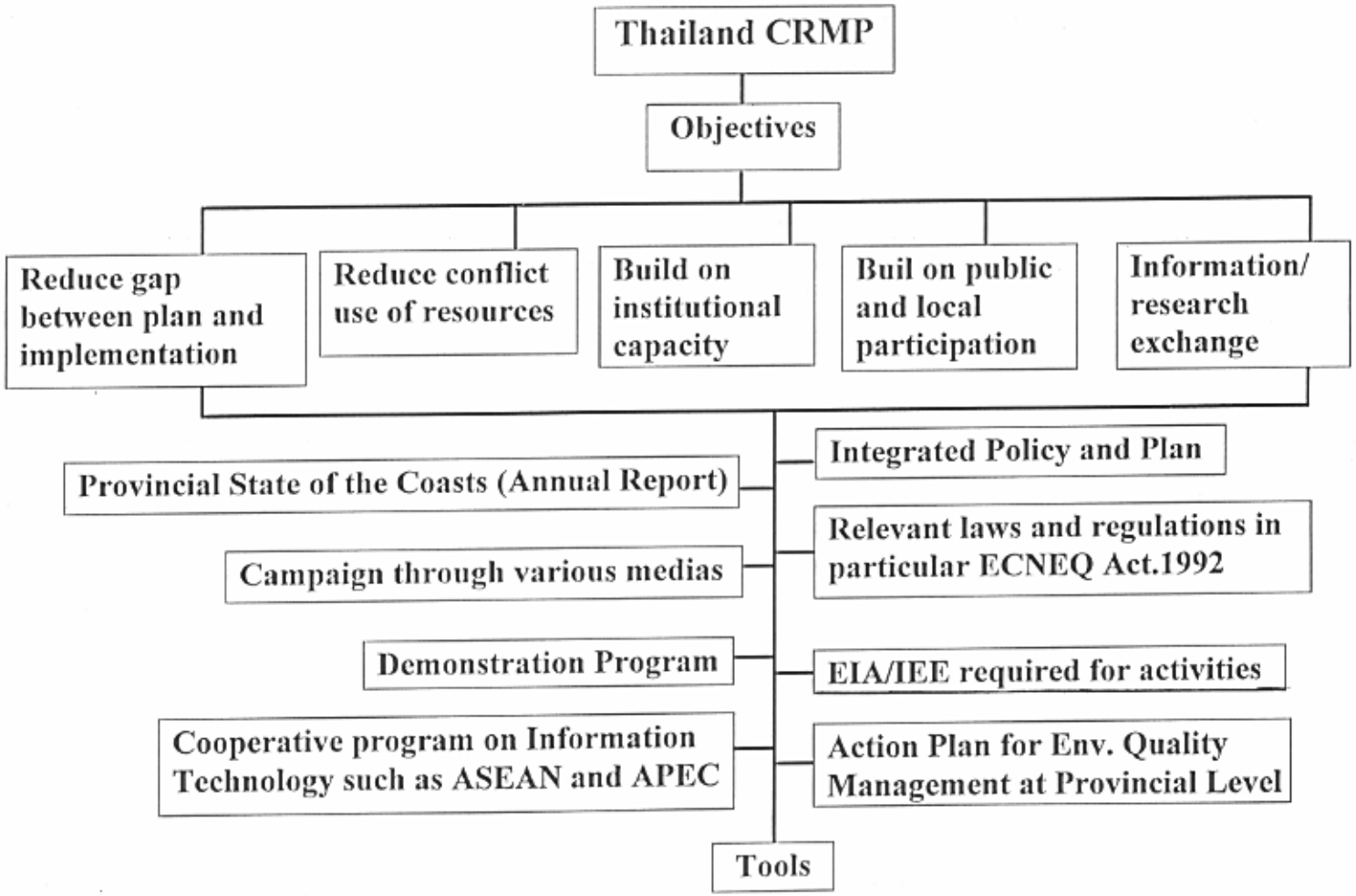
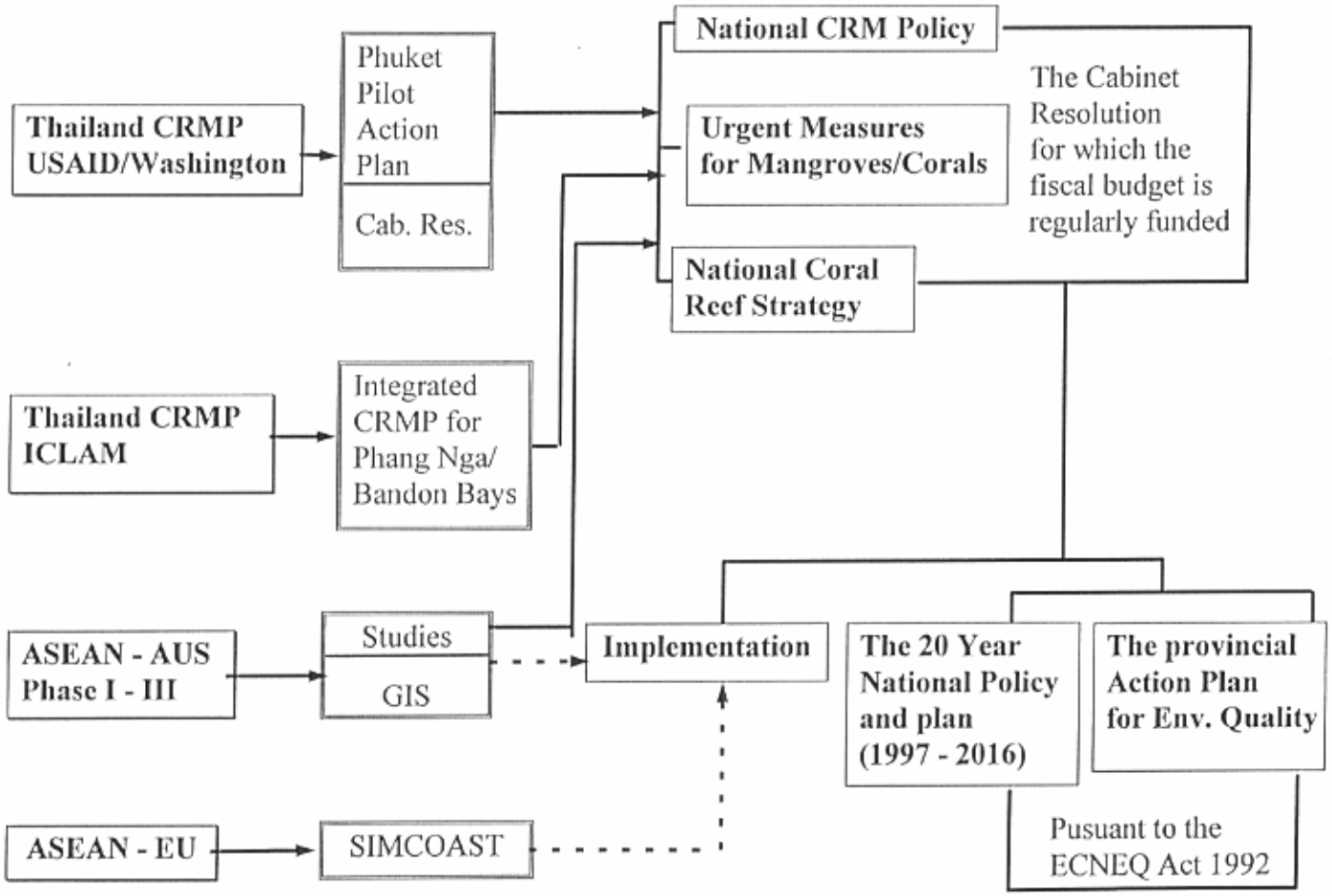


Figure 4. CRMP Flow Diagram for Thailand.



Coastal and Marine Policy in Malaysia

ALMAH BT. AWALUDDIN
MIMA Visiting Scholar
Maritime Institute of Malaysia
16th Floor, Wisma Sime Darby
Jalan Raja Laut, 50350 Kuala Lumpur
Malaysia

ALMAH BT. AWALUDDIN. 1998. Coastal and marine policy in Malaysia, p. 155. *In* **The Regional Workshop on Partnerships in the Application of Integrated Coastal Management.** 12-14 November 1997, Chonburi, Thailand. 167 p.

Abstract

Coastal and marine policy is of vital significance for a maritime country like Malaysia which is located in the tropical archipelagic region of the Indo-Pacific and has a coastline as extensive as 4,809 kilometers. With the promulgation of 200 nautical miles (320 kilometers) of Exclusive Economic Zone, the country has gained 138,700 square kilometers, giving it a total of 332,673 square kilometers of sea area which is more than its land area. In order for the marine heritage to play an increasingly important role in the country's economy, formulation of national policies is imperative to address the local problems and to serve as instruments of compliance with international conventions. Although the need for managing the marine environment was realized a long time back, it received due attention only in recent years. Management of marine resources received a major thrust in the Sixth Malaysia Plan, 1991, which gave special emphasis on this aspect and increased the budgetary allocation for research and training. A fisheries legislation already exists which while promoting the fisheries development, also contains mechanisms for marine conservation and environmental protection. The country has a national policy for marine protected areas. Some of the mechanisms already in place include Parks Enactment 1984 (for marine parks), Forest Enactment (to conserve mangroves), Land Ordinance 1930: Reserve for Public Purpose which gazetted Sipadan island, and Native Reserve which serves to indirectly protect the marine environment. In fact the development of integrated coastal zone management plan effectively picked up this year, with the identification of Sabah, Sarawak and Penang as the target regions. This paper discusses the existing framework for management of coastal and marine resources and identifies important elements of a holistic program for their sustainable management.

Building Partnerships for the Protection and Management of the Marine Environment of the East Asian Seas

CHUA THIA-ENG
Regional Programme Manager
GEF/UNDP/IMO Regional Programme for the Prevention and Management of Marine Pollution in the East Asian Seas
P.O. Box 2502, Quezon City 1165
Philippines

CHUA THIA-ENG. 1998. Building partnerships for the protection and management of the marine environment of the East Asian Seas, p.156-167. *In* **The Regional Workshop on Partnerships in the Application of Integrated Coastal Management**. 12-14 November 1997, Chonburi, Thailand. 167 p.

Abstract

The East Asian Seas Region faces national and transboundary environmental challenges and use conflicts. Over the years, some national environmental action programs have been developed and regional action plans formulated (e.g., East Asian Seas Action Plans, ASEAN Strategic Plan of Action on the Environment, ASEAN Cooperation on Transboundary Pollution, Regional Action Programme for Environmentally Sound and Sustainable Development, 1996-2000). Several marine environment-related international conventions have also been developed and ratified by a number of countries in the region. A number of major international initiatives have been launched, mainly by some UN specialized agencies, regional institutions and bilateral programs. Most activities focused on improving the knowledge base of the ocean and the ecosystems, increasing fishing efficiency, improving fish farming techniques, enhancing marine science capacity and compiling a knowledge base on the marine environment.

These national and international initiatives have laid a sound foundation and created the opportunity for putting together the various sectoral and interdisciplinary efforts, outputs and experience into a regional marine environmental management program to systematically and collectively address the threats of pollution in the East Asian Seas.

Thus, building intergovernmental and cross-sectoral partnerships represents a fundamental strategy for regional capacity-building in the protection and management of the marine environment. Measures to implement this strategy would include building planning and management capacity, increasing environmental investments, advancing scientific inputs for environmental management decision, establishing integrated information management systems, enhancing the knowledge and technical skills of NGOs and related groups, facilitating the formulation or strengthening of national coastal and marine policies and strategic action programs, and augmenting regional commitment to implement international conventions.

Background and Context

The East Asian Seas Region faces serious national and transboundary environmental challenges to the sustainable development of its coastal areas. Globalization of the economy and changes in production and consumption patterns not only have had a profound impact on the growth of the region, but also have emphasized the interdependency of countries of the region on the welfare and health of the people and their environment, as evidenced by the recent haze emergency and currency crisis in Southeast Asia.

These environmental problems are further aggravated by the predicted increased population and economic pressures towards the 21st century. The region has already the world's largest population of 1.8 billion, 60% of which live in the coastal areas. Three hundred million people currently live in coastal urban areas and cities and many more in the coastal rural areas largely depending on the sea for food and employment (more than half of which are women and children especially those in islands of the archipelagic states). A large number of rural coastal population are still living below the poverty line.

The East Asian Seas are made up of five large marine ecosystems (LMEs) having a total area of about 5.9 million km^2 and producing about 40% of the world's fish catch. The region has the world's richest biodiversity and supports one-third of the world's coral reefs and mangroves. Unfortunately, these valuable resources are seriously threatened by pollution and other economic activities. The region produces about 60 million tons of hazardous waste and 30 billion tons of sewage, most of which are discharged directly into sea. As the region is also a major hub of maritime trade, with a significant number of international and domestic sea ports situated along the 150,000 km coastline, maritime accidents have resulted in oil and chemical spills which further degrade the marine environment.

Environmental degradation in the region is already threatening food security, reducing employment opportunities, creating social unrest and offsetting past economic gains. This will affect the sustainable development of the coastal and marine areas which currently contribute no less than 40% of the cumulative GNP of the region. The situation highlights the urgent need for a collective regional program to address these marine environmental problems.

In the last two decades, countries in the region have set up central environmental agencies; some have developed national environment and sustainable development action plans; a few have developed national Agenda 21 action plans; and increasing numbers have ratified major international conventions. At the regional level, some regional action plans have been formulated (e.g., East Asian Seas Action Plans, ASEAN Strategic Plan of Action on the Environment, ASEAN Cooperation on Transboundary Pollution, Regional Action Programme for Environmentally Sound and Sustainable Development, 1996-2000). Other regional action programs for land-based sources of marine pollution are currently being developed.

Unfortunately, coastal and marine environmental problems are still not on the priority agenda of most countries. Management approaches by various resource governing and environment management agencies are still sectoral and mostly limited to regulatory control. Government actions tend to focus on problems that are visible and of immediate concern, and are thus geared towards responding to environmental crises. Regional action plans have yet to be effectively implemented. As a result, pollution loading in the East Asian Seas, especially the coastal waters, is in fact increasing instead of decreasing. Consequently, the existing national and regional efforts are not adequate and effective in arresting the continued deterioration of the marine environment.

The proposed GEF intervention is to build upon the approaches, methodologies, networks and working models, as well as the experiences and lessons learned from the pilot phase which opened up opportunities for advancing intergovernmental and intersectoral partnerships. The project shall promote closer collaboration between stakeholders, central and local government agencies, private sector, communities, donors and the international communities in addressing environmental problems of the East Asian Seas.

GEF intervention is expected to lead to a major paradigm shift in the concept, approach and methodologies for addressing environmental and sustainable development problems of the

coastal and marine areas, thus removing or lowering critical policy, investment, capacity and other related barriers to environment management. There will be a major buildup of environmental management capacity in the region, an increase in national efforts to undertake a more holistic and integrated management approach in addressing environment and resource management problems, an increase in environment investment opportunities and more effective use of scientific resources and information technology for addressing management "bottlenecks" and transboundary issues. There will be stronger national and regional commitments in the implementation of international conventions, enhanced by national coastal and marine policies.

A functional and sustainable regional mechanism will be a cornerstone of environmental management of the East Asian Seas. It shall mobilize external resources and effectively coordinate the above-mentioned national and international efforts through stronger partnerships with governments, stakeholders and the international agencies, and serve as the resource center for marine environment protection and management of the East Asian Seas.

A number of socioeconomic and environmental factors favoring GEF intervention will contribute to the successful implementation of the proposed activities and the attainment of the project goals. First, the economy of the region is closely linked with the sea. Second, the economic conditions of many countries have improved with some countries having attained the status of developed economies, thus enabling them to mobilize national resources, though still limited, for addressing environmental issues. Third, there are increased public pressures for a cleaner environment and safer seas as a result of an improved standard of living and increased understanding that protecting the marine environment is in their own interest. The timely GEF intervention will help arrest the continued decline of environmental quality, followed by steady progress towards recovery, at least in areas where management interventions are in place. The pollution monitoring results of Xiamen demonstration site under the pilot phase has proven that this is possible. The incremental but cumulative environmental benefits will, therefore, contribute to the global improvement of the marine environment.

The project will be complementing rather than substituting baseline activities and other existing regional or international GEF projects. In fact, the project supports the Washington declaration on land-based pollution by demonstrating comprehensive, integrated coastal management working models for marine pollution prevention and management; it also complements the recently GEF approved GIWA project through the work of the pilot phase.

The project puts emphasis on the demonstration of actual management actions on the ground, the success of which will strengthen government confidence and increase the commitment and investment in addressing environmental problems. The project provides an opportunity for the exchange of staff among participating countries to learn from each other. In this connection, the project will also complement or even strengthen the proposed activities under the International Waters (IW) Learned Project through information exchange and lessons learned with other GEF projects.

Rationale and Objectives

The lack of environmental and ecosystem management capacity, especially at the local level, is an impediment to the effective resolution of multiple use conflicts, resource overexploitation and other environmental threats related to biodiversity, sea level rise and

marine pollution. Most national policies are not keeping with the fast-developing maritime economy. For example, conventional, resource-dependent, economic development planning stops at high water mark and, thus, is ineffective in addressing many marine and coastal development problems. In addition, most countries lack the financial resources and technical know-how to mitigate and manage the adverse impacts of coastal development. Although many countries are parties to a number of important environment-related international conventions, difficulties in effectively meeting the stipulated obligations are a common problem.

The GEF/UNDP/IMO Regional Programme for the Prevention and Management of Marine Pollution in the East Asian Seas was designed to address some of the above-mentioned inadequacies. The Programme focused on developing and proving a number of innovative approaches for preventing and managing pollution in marine and coastal areas, including the application of integrated coastal management (ICM) at pilot sites in Batangas Bay (Philippines) and Xiamen (China). It adopted a pollution risk assessment/risk management strategy and developed a management framework for dealing with marine pollution arising from both land- and sea-based sources (including transboundary issues) in the Straits of Malacca. It integrated environmental monitoring into the local management framework, harmonized legislative conflicts, explored sustainable financing mechanisms and involved stakeholders, especially the private sector and the local communities, in development and execution of site-specific or issue-related action plans. Through networking of environmental legal personnel, the Programme was able to create better awareness of the benefits, rights and obligations of international conventions.

The major challenge for the countries in the region is to develop the necessary management capacity to apply the tested working models, approaches and typologies of the pilot phase project for the planning and management of their coastal areas as well as the subregional seas. This will, however, require stronger national commitment in terms of policy and financial allocation to strengthen the environmental management functions of the local governments, implement international conventions, create environmental investment opportunities and increase confidence and cooperation among stakeholders.

The GEF pilot project provides the timely opportunities for developing stronger and effective intersectoral partnerships for addressing site-specific environmental issues and multi-country partnerships for addressing transboundary issues which reinforce the GEF programmatic approach for resolving cross-country environmental problems.

Major international and regional initiatives in the past years have certainly contributed to increased public awareness and greater national attention on the marine environmental problems. Most activities focused on improving the knowledge base of the ocean and ecosystems, increasing efficiency in resource exploitation, improved technologies in fish farming, as well as enhancing capacity in marine science research. Together with national efforts over the years, these initiatives have laid a sound foundation and created the opportunity for putting together the various sectoral and interdisciplinary programs to systematically and collectively address environmental challenges.

The general objective of the project, therefore, is to enable the East Asian Seas Region to collectively protect and manage its coastal and marine environment through intergovernmental and intersectoral partnerships. This entails collective and systematic modes of addressing environmental challenges, and the implementation of a series of well-coordinated, thematically integrated, issue-driven programmatic activities. Through partnership building, the project will help countries to develop scientifically-based environmental management strategies and action plans to deal with land-based pollution, promote closer regional and subregional collaboration in combating environmental disasters

arising from maritime accidents, and increase regional commitments in implementing international conventions which they ratify (e.g., Climate Change, Biodiversity, London, Basel, UNCLOS, CLC/FUND, OPRC and MARPOL). The integrated management approach also ensures that the socioeconomic and cultural concerns of the coastal population are important considerations in any environmental management intervention.

Project Activities/Components and Expected Results

The key results of the project include: a network of various national and subregional integrated environmental management programs throughout the East Asian Seas; viable financing mechanisms for enhancing environmental investment from multilateral banking and financial institutions and the private sector; a critical mass of national and regional multidisciplinary technical expertise in environmental and marine and coastal management; a pool of local NGOs, religious groups and environmental journalists to champion and reinforce environmental protection initiatives; a structured, integrated information management system (IIMS) that accelerates the delivery of environmental management objectives, including EIA processes; and a sustainable and effective regional mechanism to coordinate and mobilize resources for effective implementation of international conventions and promote subregional cooperation especially on priority transboundary issues.

Project activities are centered around seven major strategic components:

1. build capacity to effectively manage the coastal areas and the subregional seas;
2. increase environmental investments in coastal and marine projects and initiatives;
3. advance scientific inputs to coastal and marine environmental management decision-making;
4. establish integrated information management systems for coastal management and integrated environmental impact assessment;
5. enhance collaboration of local NGOs, community-based organizations, religious groups and environmental journalists in marine environmental protection and management;
6. facilitate the formulation or strengthening of national coastal and marine policies and strategic action programs; and
7. support a sustainable regional mechanism to augment regional commitment for implementing international conventions, to serve as a regional marine environment resource center for the protection and management of the coastal and marine environments of the East Asian Seas.

Component 1—Build capacity to effectively manage the coastal areas and the subregional seas.

The main outputs shall be a critical mass of expertise in participating countries and a network of local governments in the region to implement ICM programs as well as regional networks of multidisciplinary experts to participate in environment risk assessment and management of subregional seas, especially at pollution "hot-spots".

1. *Establish national ICM demonstration sites, ICM parallel sites and develop fast track ICM programs.*

Based on the working models of Xiamen and Batangas Bay, countries are encouraged to establish at least one national demonstration site for the application of ICM throughout the region. In order to maximize the benefits from such demonstration projects, each of the eight national demonstration sites (i.e., in Cambodia, China, Indonesia, Philippines, Malaysia, Thailand, DPR Korea and Vietnam) shall focus on the application of the ICM framework to resolve at least one of the major environmental and sustainable development concerns of the region, namely: sustainable fisheries/aquaculture development; sustainable coastal tourism; habitat protection (biodiversity); port and harbour development; marine pollution; multiple use conflicts; and sea level rise. The sustainable development goals of ICM ensure that the sociocultural and economic benefits of the indigenous coastal people are essential considerations in the overall management framework. The Xiamen and Batangas demonstration sites will be further strengthened to serve as ICM training centers for the region.

Based on the experience of the pilot phase, the ICM planning and information gathering processes for such activities can be shortened to about 18-24 months, instead of the conventional cycle of 5-8 years. This fast track ICM approach shall be refined for replication.

The project will also encourage coastal countries to develop ICM parallel sites to implement national ICM programs. At least ten parallel ICM sites shall be developed with national funding or co-financing from other donors.

2. *Develop regional capacity to implement environmental risk assessment and anagement programs in subregional seas/large marine ecosystems (LMEs).*

Environmental risk in one of the sub-areas (e.g., Gulf of Thailand) of a subregional sea/LME (e.g., South China Sea) and two national, cross-boundary pollution hot-spots (e.g., Bohai Sea, Manila or Jakarta Bay) will be assessed and the appropriate management programs will be developed. This approach will enable the concerned states or the various administrative units bordering the semi-enclosed seas to develop and implement management measures collectively. Examples of such cooperation include implementing oil spill contingency plans, implementing Port State Control, improving navigational safety, protecting sensitive areas and sharing of pollution monitoring databases. The working model on the Malacca Straits will be further strengthened and used as training model for the replication of assessment and management approaches and methodologies in other subregional seas.

3. *Organize a special training program for upgrading technical skills.*

The program shall include specialized short-term training courses, through co-financing, on concepts and strategy development, analytical tools and methodologies, risk assessment and good practices, all of which are related to integrated management of the coastal and marine environment. These specialized training courses complement existing environmental training efforts and are largely based on the experience and outcomes of the pilot phase. Major training courses will include Practical ICM training, Integrated Environmental Impact Assessment, Oil Spill Response and Coordination (OPRC), Port State Control, implementation of international conventions (e.g., Civil Liability for Oil Pollution Damage [CLC]; Establishment of an International Fund for Compensation for Oil Pollution Damage [FUND]), Environmental Risk Assessment and Management and Natural Resource Evaluation and Damage Assessment. In addition, special attention will be placed on the training of trainers.

Fellowships will be awarded for degree training in essential environmental management skills such as maritime law, resource valuation, environmental accounting and environmental management. Efforts will also be devoted to networking of centers of excellence in the region, which can contribute to human resource development, especially in the field of marine environmental management.

4. *Build capacity through regional networks and task forces.*

Existing regional networks established through the GEF pilot phase will be maintained and further strengthened to provide a pool of expertise to support regional activities. A multidisciplinary task force will also be established to provide prompt response to governments requesting technical assistance in environmental management.

Component Two—Increase Environmental Investments in Coastal and Marine Projects and Initiatives.

The main output is increased environmental investment from multilateral banking and financial institutions (e.g., World Bank; ADB; IFC) and the private sector who can exploit the enormous business opportunities which will be created by the shift of national policies and strategies in environmental management and sustainable development. The project shall promote regional transformation, from a highly public sector-driven environmental management regime, to a public and private sector-driven environmental industry. The private sector will be encouraged to invest in the application of clean technology, waste minimization and ISO certification. A pragmatic approach will include packaging environmental management action programs into discernible, bankable projects. Thus, the initiative will foster greater business linkages and technology transfer between the North and the South, as well as among countries in the region.

1. *Promote public-private partnerships (PPP).*

Specific activities include: delineation of environmental management options; technical and financial feasibility studies on identified options and preparation of "opportunity briefs" which detail the potential viability of financial mechanisms such as joint ventures, commercialization and public-private corporations. Many of the environmental facilities (e.g., shore reception facilities; sewage treatment plants), environmental services (e.g., solid waste collection; training and certification; oil spill response centers) and information management systems (e.g., marine electronic highway for congested navigational sea lanes; database management and distribution network) are areas where public-private partnerships can be developed. For example, the establishment of a marine electronic highway (MEH) contributes directly to maritime safety. Indirectly, it is a preventive measure to minimize pollution arising from vessel groundings, collisions and other mishaps. The MEH is, therefore, an investment project which can be established initially to cover a small area within a subregional sea, such as a port-to-port sea lane within the Strait of Malacca. Eventually the technology may be expanded to cover both the Malacca and Singapore Straits, and then gradually covering the East Asian Seas Region.

In order to demonstrate the feasibility of public-private partnerships, efforts will be made to draw financial investments to bankable projects, including Xiamen and Batangas environmental improvement projects.

2. ***Package and expedite project proposals.***

The project shall play a strategic and catalytic role in helping participating countries to package technically sound and financially convincing proposals that will attract environmental investments from donor agencies, lending institutions and the private sector. A pool of technical experts will be drawn from the regional networks to package such proposals in collaboration with the subregional resource center of UNDP. A revolving fund shall be set up and maintained through income generated from such services.

Component Three—Advance Scientific Inputs to Coastal and Marine Environmental Management Decision-Making.

The main outputs will be sources of scientifically sound information which can be used to strengthen coastal and marine policies and management interventions. The component will focus on the application of scientific methods and approaches to generate reliable socioeconomic, ecological and technological information which can be used for policy and management interventions. The project shall undertake and/or package carefully designed, issue-oriented, interdisciplinary scientific investigations to resolve outstanding common information gaps which are "bottlenecks" to policy or management decision-making. Specifically, the project shall provide scientific information and tools pertaining to: (a) the determination of ecosystem carrying capacity; (b) trade-offs between development and ecological benefits; (c) impacts of maritime trade on endangered species; (d) benefit-cost appraisals and models of management interventions; and (e) socioeconomic and ecological impacts of ICM.

Component Four—Establish Integrated Information Management Systems (IIMS) for Coastal Management and Integrated Environmental Impact Assessment.

The major output is a microcomputer-based integrated information management system within the ICM framework at each national demonstration site. By taking advantage of recent advances in information technology, an environmental knowledge base can be more effectively compiled, managed, disseminated and applied. IIMS will combine baseline information (ecological, socioeconomic, geographic, legal and institutional) with environmental quality monitoring information. The IIMS will incorporate a geographic information system and a database management system, thus enabling storage, editing and retrieval and facilitate analysis and presentation of monitoring information. The validated version of the IIMS shall be incorporated as a planning and management software at each ICM demonstration site. Each site-specific database can be used for management and regulatory control functions, especially for integrated environmental impact assessment (EIA) greatly reducing the time and resources for undertaking the conventional EIA. The value added is the establishment of intra- and inter-country networking of IIMS at each ICM demonstration site, leading to a more systematic exchange of information at the ground level. The regional GIS and database developed for the Malacca Straits during the GEF pilot phase will be strengthened.

Component Five—Enhance Collaboration of Nongovernment Organizations, Community-Based Organizations, Religious Groups and Environmental Journalists in Marine Environmental Management.

The main outcomes are more environmentally committed above-mentioned interest groups to work together with the local government in addressing coastal and marine environmental problems. The project shall strengthen the knowledge and technical skills in

marine environmental management of the interest groups. This will enable them to be more effective in championing and advocating the cause for environmental protection, and to serve as a catalyst for affecting the government and people to work together. Religious groups and environmental journalists will also be included in the component because of their effectiveness in influencing the people and policy-makers, respectively.

Component Six—Facilitate The Formulation or Strengthening of National Coastal and Marine Policies and Strategic Action Programs.

The essential policy elements in coastal and marine environmental management will be evaluated in the context of their importance and effectiveness in relation to the socioeconomic, political and cultural characteristics of the countries. The verified elements shall be incorporated into guidelines that can be used for developing national policy. These elements include: the integration of sea-use planning into the physical framework plans at national and local levels; allocation and use of marine resources; harmonization of legislative conflicts; surveillance and monitoring; environmental risk responses; role of local governments; resource management approaches; and national obligations to ratify international conventions. Model coastal and marine policies will also be developed based on examples from the region.

National workshops will be organized to increase public awareness in the benefits of coastal and marine management, including benefits arising from marine environmental management-related international conventions and a better understanding of government obligations and commitments.

Component Seven—Support a Sustainable Regional Mechanism to Augment Regional Commitment for Implementing International Conventions and to Serve as a Regional Marine Resource Center for the Protection and Management of the Coastal and Marine Environment of the East Asian Seas.

The most important output is a sustainable regional mechanism which plays a critical role in coordinating national efforts in the implementation of international conventions related to the marine environment, as well as serve as a regional marine environment center for technical support. The purpose is to assist interested governments to realize the net benefits through implementation of global agreements such as UNCLOS, London, Basel, MARPOL, OPRC, Fund, CLC, Climate Change and Biodiversity. Most countries in the region will have already ratified these conventions. However, each country is addressing implementation separately. The cumulative economic and environmental benefits can be expected to be several fold greater when reinforced with the help of a regional mechanism. The mechanism will serve as the regional focus for mobilizing external resources to support national efforts in implementing global conventions and to undertake collaborative programs to address transboundary issues.

The major thrust of the project component is to establish a functional operational modality which allows the organization of technical workshops and policy fora to debate on the concept, functions and operation of such a mechanism; develop a pool of regional expertise; use regional networks to support national efforts in addressing transboundary environmental problems of the subregional seas or LMEs; assist national governments in developing and implementing integrated management projects and programs for the coastal and marine areas; and explore and develop sustainable financing mechanisms (such as revolving funds) to support the daily operation of the regional institutional structure.

As a regional marine environment center, it shall develop and strengthen multi-country collaboration for more effective protection and management of subregional seas such as the Yellow Sea, East China Sea, South China Sea, Sulu-Celebes Seas and the Indonesian Seas. These LMEs provide unique opportunities for the countries to work together, to increase their thrusts and cooperation in the sustainable use of the marine resources and to enhance the protection of their environment.

Risks and Sustainability

The possible political risks are greatly minimized as the present political climate and economic achievements in the region are in favor of environmental protection and sustainable use of the marine and coastal resources despite the recent currency crisis in Southeast Asia. The project, in fact, responds to the common environmental concerns of the countries in the region.

The project is built upon the technical achievements and methodologies developed by the GEF pilot project and other past projects and programs, thus ensuring technical soundness and reducing vulnerability during project implementation. The GEF pilot project not only provided tested techniques and methodologies but also made available a pool of regional expertise to undertake most of the described activities. The success of implementing such a complex project depends a great deal on a strong and dynamic project leadership and flexibility given to its management. In this manner, the risks associated with political, economic, institutional and technical constraints are greatly reduced. This issue will be addressed in detail during the project design phase.

Through the national demonstration sites, the tested methodologies, lessons learned and new approaches will be replicated at parallel sites throughout the region. The continued operation of the various regional networks shall enable the dissemination, improvement and consolidation of project results. The regional network of educational and research institutions will be able to continue the role of building national and local capacity in each participating country. Each participating country will have acquired the basic capacity to design, develop and implement ICM programs effectively. Intergovernmental cooperation at regional and subregional levels shall be greatly strengthened, and effectively address transboundary issues through an efficient regional mechanism. Thus, the activities under this project have built-in sustainable financing mechanisms such as public-private partnerships, revolving funds and integration of the ICM system into local government mechanisms, among others.

Stakeholder Participation and Implementation Arrangements

The draft concept brief was discussed and endorsed at the Third Programme Steering Committee of the GEF pilot phase project. A draft concept proposal was also discussed and agreed to at an experts' workshop in Subic, Philippines in July 1997. The workshop was attended by eminent marine scientists from ten countries of East Asia. The concept proposal was later presented by the delegation from the Philippines at the ASOEN meeting in Cebu, Philippines in August 1997. Subsequently, this draft project brief is presented and discussed at this regional workshop, attended by government officials, NGOs, scientists, management practitioners and representatives of international agencies. Finally, the project brief will be discussed and endorsed at the 4th Programme Steering Committee of the GEF pilot phase project in Hanoi, Vietnam, in December 1997.

The majority of project components are designed to ensure self-reliance and sustainability through the development of policies and long-term action programs, institutional arrangements, capacity building, strengthening of NGOs and promotion of the involvement of civil society. More importantly, the project promotes environmental investments and involves the private sector to share the responsibility of environmental management.

The project places considerable emphasis on the application of appropriate indigenous and emerging technologies by local, national and regional stakeholders. The various technologies considered include information management, remote sensing and geographical information systems (GIS), which can improve project performance, user efficiency and reliability of information.

Incremental Costs and Project Financing

In accordance to the GEF Procedure on Incremental Cost Assessment, most of the proposed activities fall under complementary. The main focus of the project is to enable the region to undertake integrated programmatic management activities to addressing environmental problems. This will be accomplished through specialized skills training, regional networking and demonstration projects, as well as forging intergovernmental and intersectoral partnerships to achieve cost-effective environmental management at the local and subregional levels. The project does not replace or substitute baseline activities, recognizing that existing national marine environmental activities are sectoral in approach, while existing regional environmental programs remain at the planning or information gathering stage.

This project proposal is focused on removing or lowering policy, investment, capacity and other environmental management barriers which otherwise impede the application of innovative and pragmatic management interventions. Countries of the region have made a substantial investment to address marine pollution and other environmental problems, including combating pollution, habitat rehabilitation, cleaning of rivers, pollution monitoring, resource management, etc. With the support of donors and international agencies, they continue to undertake projects and programs to address these issues. Baseline costs that are relevant to the proposed project components are estimated to be about US$500 million over the period from 1999 to 2003. This estimate is by no means absolute, but reflects the levels of effort and commitment of the participating countries. The proposed project activities which build upon the baseline efforts aim to improve efficiency and cost-effectiveness in achieving target objectives, by lowering or reducing barriers and constraints to effective environmental management.

Monitoring, Evaluation and Dissemination

The project monitoring and evaluation plan includes milestones for each major activity to be completed within a specific timeframe. Project outputs and impacts by each component and the project as a whole will be evaluated in accordance with key performance indicators against each objective of the project.

The milestones and performance indicators will be evaluated each year through an annual Project Steering Committee Meeting which includes a technical session to discuss the technical progress and achievements of the project and a tripartite meeting with the

participating governments and the implementing and the executing agencies to assess progress and performance and to provide policy and management guidelines to the executing agency.