REGIONAL COORDINATING UNIT
EAST ASIAN SEAS ACTION PLAN

UNEP UNITED NATIONS ENVIRONMENT PROGRAMME

INTEGRATED COASTAL ZONE MANAGEMENT

TRAINING MANUAL

Edited by
Richard Kenchington

RCU/EAS TECHNICAL REPORTS SERIES NO. 12

Prepared in cooperation with:

Great Barrier Reef Marine Park Authority

INTRO MARC
International Tropical Marine Resource Centre

AusAID

MOSTE
of Science, Technology and the Environment, Malaysia

UNEP
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FOREWARD

The coastal areas of the East Asian Seas, in particular those of the Southeast Asian countries contain one of the most rich and diversified ecosystem in the world, characterized by extensive coral reefs and mangrove strands. The coastal resources in the region is a valuable asset that can effectively contribute to sustainable development.

The coastal zones of these countries are subjected to increasing population and economic pressures evident in the array of economic activities that prevail in the area: urbanization, oil and gas exploration and exploitation, aquaculture, industrialization, shipping, fishing and tourism development. The resultant degradation of the environment due to these large scale exploitation of the region's valuable resources is a cause of concern to the region.

Several of the countries in the East Asian Seas region have formulated regulatory management measures to manage the resources in the coastal zone. However, these measures have proved ineffective, mainly due to a management regime which ignores and does not give due regards to the intersectoral relationship among activities and the complex physical and biological processes that attest to the close terrestrial-aquatic links in the coastal zone.

Agenda 21, an action plan that has emerged from the United Nations Conference on Environment and Development (UNCED), calls for coastal States to commit themselves to integrated management and sustainable development of coastal areas and the marine environment under their national jurisdiction.

Pursuant to the obligations imposed on coastal States for the protection and sustainable development of the marine and coastal environment and the call of Agenda 21 to cooperate with coastal States in their capacity-building efforts, UNEP has encouraged the development of these training modules in integrated coastal zone management for the use of States in the East Asian Seas region.

They are designed to be used by trainers throughout the region. Materials for specific training tasks can be selected from the training manual and adapted for use in the local context. These materials are also designed to allow a wider usage: to address all level of stakeholders, from the local community to top policy decision-makers in the region.

Terttu Melvasalo
Director
Water Branch
United Nations Environment Programme
Nairobi, Kenya

PREFACE

A SHORT HISTORY AND ACKNOWLEDGEMENTS

These modules are the result of an urgent programme of work by a number of coastal management specialists with experience in South East Asia. Their development began with a workshop held in Bali, Indonesia in late 1994 at which a range of specialists presented their proposals concerning the training materials to meet the priority needs of South East Asia. On the basis of the discussions at this workshop individual specialists then developed training modules which were subsequently edited by the Great Barrier Reef Marine Park Authority (GBRMPA) and the UNEP Regional Coordinating Unit for the East Asian Seas Action Plan (EAS/RCU) to produce a consistent package of modules. Major contributions were provided by **Kim Looi Ch'ng** (EAS/RCU) and **Deborah Cavanagh** (GBRMPA) during editing. The bibliographic citations for the volume and for the individual modules identify those who played major roles in their development and in preparing writing and editing the materials. However the contributions of those who participated in workshops or otherwise provided material, suggestions or comments are greatly acknowledged. They include:

Dr Chou Loke Ming (National University of Singapore), **A. Rahim Gor Yaman** (Dept. of Fisheries, Malaysia), **Dr Zulfigar Yassin** (University of Science Malaysia), **Jim Davie** (University of Queensland, Gatton College), **Ina Pranoto** (Ministry of State for Environment, Indonesia), **Mohamed Darus B. HJ. Mahmud, Dr J.R.E. Harger** (UNESCO), **Listya Kusumawardihani** (Ministry of Forestry, Indonesia), **Michel B. Larue** (SOPAC, Fiji), **Olof Linden** (Stockholm University, Sweden) and **Haron B. HJ. Abu Hassan** (Forestry Department Headquarters, Malaysia). The support staff of GBRMPA and EAS/RCU who helped in the production process include **Allison Pearson, Kylie Glasgow, Moira Turner, Elizabeth Hall, Michelle Morrison** (GBRMPA) and **Unchalee Kattachan** (EAS/RCU).

To any contributors omitted from the list, please accept our apologies and thanks.

Finally, the major contribution of **Dr Reza Amini,** former Coordinator, EAS/RCU is particularly acknowledged. His support, encouragement and arrangements have made it possible to complete these modules and to contemplate courses and workshops to enable them to play a substantial role in development of coastal zone management in the East Asian Seas.

TABLE OF CONTENTS

STAFF TRAINING MATERIALS FOR INTEGRATED COASTAL ZONE MANAGEMENT

INTRODUCTION

More than 70% of the population of South East Asia lives on the coast and most of the coastal inhabitants depend upon the coastal environment for food. With rapid economic development and steady population growth, integrated coastal zone management is becoming one of the most important issues in South East Asia. Coastal management is an issue of the greatest economic, social and environmental importance to the future of South East Asia and particularly to those countries which border the South China Sea.

These modules have been prepared to meet a need which became apparent as the Staff Training Modules for the management of marine protected areas were being completed in 1994 (RCU/EAS Technical Report Series N° 4, 1994).

The idea behind these modules is to bring together information developed through first-hand experience at developing and implementing integrated coastal zone management in South East Asia. Much of the information will have wider application but the primary purpose of these modules is to support the immediate needs for implementing programmes of training and professional development in South East Asia.

The first phase of the development of these modules consisted of a workshop held in Bali, Indonesia where management specialists considered draft materials, and with substantial South East Asian experience, decided on the key issues which should be addressed. They also agreed on an overall style and approach which would make the resulting modules of particular value to trainers of managers in South East Asia. Following the workshop, the authors then prepared modules in the agreed style and format, after which the materials were edited to provide a consistent style and minimise unproductive duplication. We are confident that these modules provide a good snap shot of the key issues, priorities and principles of coastal zone management in South East Asia in the mid 1990s.

There is much activity in coastal zone management in South East Asia and the science and practice of coastal zone management is developing rapidly. Against that background, this manual provides support material for trainers.

Workshop sessions have been emphasised throughout the materials. The workshop should encourage debate, independent thinking and should assist participants in applying lecture-based information to their own management areas and responsibilities.

The material is designed to be used in training a wide spectrum of coastal management personnel ranging from field and planning staff working in local offices to managers and directors responsible for long term planning of activities which occur in the coastal zone. Many key decisions which affect coastal environments are made by land-use planners, development ministries, developers, transport planners and civil engineers. Because of this, we hope that relevant materials from this manual will find their way into a very wide range of short-term and longer courses for the broad spectrum of professional and technical specialists whose work affects the coastal zone and its resources. It is emphasised that the intention of these modules is to identify information which should be covered in training for a wide range of management roles. For most topics trainers will need to use materials from these modules to help them develop programmes which are tailored to the specific needs of their trainee audience. They will generally need to add local examples, materials and case studies to include and take account of local cultural, social and legal factors. For some audiences the training needs are likely to require translation of materials into the language(s) used by the trainees.

At one level these materials may contribute to formal courses in colleges and universities but their primary purpose is to support training within a broad spectrum of planning and management organisation. Because many of the key concepts of integrated coastal zone management are inter-disciplinary, we would expect that these materials can contribute to the in-service training of a wide range of professionals in aspects of other disciplines which affect their work in the coastal zone.

The basis of these modules is to draw upon and share experience with others in South East Asia and further afield. We hope that it will be possible to update these materials to keep pace with the development of coastal zone management, so that they can continue to reflect the urgent priorities of the region. We invite users of these modules to share their experience and comments with us, to send copies of materials developed from this book and to provide suggestions of ways in which the modules can be further developed to be more useful to others.

The materials are particularly designed for the training of multidisciplinary teams. They are intended to provide the necessary overview of a range of areas from ecological, social and management science so that trainers receive a broad overview to complement more advanced training in one or more of the specific disciplines which make up coastal management.

Explicit educational objectives have been used by the designers and writers of this package. As trainers use and adapt the material to local circumstances, they will undoubtedly alter some objectives and incorporate their own materials. Where this is done the authors would particularly welcome feedback which should be directed to UNEP Regional Coordinating Centre for the East Asian Seas Action Plan (RCU/EAS).

As a continuation of this project, RCU will be offering additional work programmes. These will help trainers use these modules and combine them with local topical information to develop specific materials for their local or

regional training audiences. We hope that trainers will be able to work with personnel at training centres in South East Asia and Australia to refine the information and course presentation for use in their home country. It is hoped that people from a number of countries will be able to attend workshops which will give participants the opportunity to meet and compare experiences and to build a professional peer support network of trainers involved in the important task of building the capacity for coastal zone management in South East Asia.

How to use this manual

- The information in each module is presented as:

  - notes for trainers; overheads; supplementary materials; and
  - workshop instructions for students.

- We have provided enough information in each module to enable a trainer to design a training programme that will cover the topic thoroughly. The trainees are expected to read the notes and add to this material to suit local circumstances.
- Overheads presented in the modules are ready to be photocopied onto overhead transparencies for use in the classroom.
- Supplementary materials are designed to be photocopied and handed out to students as additional reading.
- Workshop instructions for students are also ready to be photocopied and handed out to students.

Ideally, trainers working with these materials will have considerable training experience. They will not necessarily present all of the materials personally. It is expected that trainers will coordinate the training sessions, asking experts in the field to teach appropriate modules. Thus, in some cases the trainer may present an entire module while in others it may be more effective for a trained person to present the entire module.

These modules are two-way training materials. Staff who are asked by the trainer to assist in presenting specific modules will gain training experience while trainers are exposed to professionals in the field under discussion.

Some modules may be taught over an intensive, two-week period while others may be offered as a series over an extended period of time or packaged as remote learning, self-administered materials. It may take a year or more for a student to take all the modules presented here.

These materials have been prepared to reflect the best contemporary understanding of integrated coastal zone management in 1995. Users will develop their own materials including translation into local language, incorporation of local examples and topics not covered in the modules. We would like to share these with others as appropriate.

We intend to keep the modules up-to-date and to share comments or experience of the materials with other users. We therefore invite you to send translations, comments and suggestions on the content and usefulness of the materials to:

UNEP Regional Coordinating Centre for the East Asian Seas Action Plan
(RCU/EAS)
10th Floor
UN Building
Rajadamnern Avenue
Bangkok 10200
THAILAND

MODULE 1

WHY MANAGE THE COASTAL ZONE?

Author: Dr Peter Burbridge

OBJECTIVE

To introduce students to the global importance of Coastal Zone Management, the complexity of issues facing Coastal Zone Managers and the possible processes they may consider in tackling Integrated Coastal Zone Management.

BACKGROUND

The coastal zone contains some of the world's most biologically productive, diverse, complex, yet fragile ecosystems. This productivity and diversity is matched in many regions by a concentration of human populations and diversity of economic activities.

Coastal regions are vulnerable to the mismanagement of resources. This may reduce the flow of resources from the coastal zone and have a negative impact on the environmental services they perform, such as providing breeding, spawning, feeding and nursery areas for a wide range of fish species. Mismanagement of resources both outside the coastal zone and in areas bordering it, may also increase the incidence and severity of natural events such as flooding and coastal erosion. This makes people using and living in the coastal zone more susceptible to natural hazards. This range of factors influencing the coastal zone makes management and sustainable development of coastal zone resources one of our most complex challenges.

The complexity of Integrated Coastal Zone Management projects requires careful integration of knowledge about coastal ecosystems, local social, cultural and economic factors, and national, regional and local planning and administrative arrangements. Coastal managers must also give greater attention to the conservation of ecosystems generating the renewable natural resources that sustain economic activities.

Experience to date in the design and implementation of Integrated Coastal Zone Management programmes and projects has taught us that it is a very complex form of activity. To be successful, such programmes and projects must be well funded to cope with the time required to fully understand the diverse social, cultural, bio-physical and economic elements involved, to develop a design which is both comprehensive and robust, and to gain the support and active

participation of people at the community level and at all levels of government who will be responsible for implementing any lessons learned in the conduct of the programme or project. Three to five years is a minimum period of time that should be devoted to the formulation, implementation and evaluation of any ICZM project.

Many methodologies are available for addressing individual resource evaluation and management issues. However, there is considerable work to be done in developing robust and effective techniques for integrating social, cultural, bio-physical and economic considerations in planning for and managing the wise and sustainable use of renewable coastal resources.

Module 1 is designed to provide a brief overview of the issues faced by coastal zone managers and a broad picture of both the socio-economic and demographic importance of the coastal zone and its significance for future urban and industrial development. It also aims to introduce participants to the complexity of resource use in the coastal zone and briefly provide examples of how Coastal Zone Management has been tackled in various countries.

Throughout Module 1 you are asked to involve participants in the discussion by introducing examples from their regions to illustrate your points. By the end of the module participants should be aware that the broad issues discussed here also apply directly to their regions and to themselves as coastal zone managers and decision makers.

TRAINING SESSIONS

1.1 Introduction To Management Of The Coastal Zone

1.2 What Do We Mean By The Coastal Zone?

1.3 Sustainable Development Issues

1.4 ICZM, A Tool For The Future

MODULE	**1.** **Why Manage the Coastal Zone?**
TRAINING SESSION	**1.1** **Introduction to Management of the Coastal Zone**
OBJECTIVE	To provide a broad overview of ICZM issues and conflicts.
SIGNIFICANCE	Managers need to be aware that challenges faced in promoting a more sustainable form of development of coastal areas and resources are more complex than those associated with an essentially marine or terrestrial environment where the mix of activities is less diverse. Developing the political will to change the process of planning from a sectoral approach to that of integrated management of the coastal and marine resource and associated ecosystem is a primary challenge to the managers.
PRESENTATION	Lecture, slides, video
TIME	1 hour
EQUIPMENT	Slide projector, VCR,monitor

TRAINING SESSION 1.1

INTRODUCTION TO MANAGEMENT OF THE COASTAL ZONE

Author: Dr Peter Burbridge

INTRODUCTION

Welcome participants to the session and explain that you will be providing an overview of Integrated Coastal Zone Management (ICZM) and the challenges facing managers.

Throughout the programme participants will be expected to apply what they are learning to their own region. Participants will make presentations about their areas.

SESSION CONTENT

The management of human activities in the coastal zone is more complex and challenging than managing activities in essentially marine or terrestrial areas because of the greater diversity of activities in the coastal zone. Rapid advances in integrated management and sustainable use of the coastal zone are difficult to achieve for a number of reasons.

- Discuss the issues listed below and ask participants to give examples from their regions to illustrate these points. Also ask participants to think about the difficulties of managing sustainable use of the coastal zone in their regions, and add their points to your list.

    - Coastal zones generally contain a greater diversity of ecosystems than purely terrestrial or marine environments.
    - People value the coast for food, shelter, clothing, trade goods, as well as for cultural, aesthetic and spiritual reasons.
    - Coastal zones support very complex patterns of human activity, often more complex than in the purely terrestrial or marine environments
    - In many nations more than half the population lives in the coastal zone. Future population growth is expected to concentrate in the coastal zone.
    - The greatest population growth will occur in developing nations which are least well equipped to plan for and manage sustainable development in the coastal zone.
    - Legal, administrative, planning and management arrangements have generally evolved to represent sectoral economic interests. They do little

to avoid conflicts of interest despite their common dependence on the coastal zone ecosystems;

- These sectors tend to treat the marine and terrestrial components of the coastal zone as separate and unrelated entities when, in fact, they are interdependent.
- Sectoral agencies rarely cooperate to develop coordinated policies and management programmes because they see no clear benefit and fear the loss of their decision-making authority.
- Policy makers are often ill informed about the present and future strategic value of the coastal zone.
- Without the political will to improve the planning and management of coastal development, it is very difficult to achieve wise and sustainable coastal resources use.

Developing the political will to improve the process of planning for and managing, the sustainable use of the coastal zone is one of our primary challenges. Steps that need to be taken to develop the political will include:

- improved communication between scientists and policy makers concerning the ecological, economic and social significance of the coastal zone;
- an improvement in our scientific understanding of the functions performed by different coastal ecosystems and the resources they generate in the coastal zone;
- developing awareness among decision makers, planners and mangers from different sectors/agencies of their common interest in promoting the sustainable use of the coastal zone;
- shifting emphasis away from coastal development based on controlling the end use of coastal ecosystems, toward a more balanced approach emphasising sustainability of the coastal zone ecosystems;
- developing multiple use management approaches for the coastal zone which allow different sectors to meet their objectives in a mutually compatible and sustainable manner;
- developing policies, plans and management strategies that seek to optimise the use of the coastal zone and meet social and economic development objectives.

Given the broad and diverse array of human activities that are directly or indirectly supported by the coastal zone, there is more to be gained in both economic and social terms by maintaining the health and productivity of the coastal zone than can be normally achieved through their allocation to single purpose and exclusive uses or their conversion to alternative uses. This does not mean that all coastal systems must be left in an undeveloped state, free from human disturbance. In some cases there will be no alternative but the conversion of natural coastal systems to some alternative purpose.

- Ask participants to discuss examples from their regions where the coastal zone has been allocated to a single purpose use and multiple use. Discuss the advantages and disadvantages of these strategies.

Sustainable development of the coastal zone depends on whether the following management and planning issues have been addressed. Discuss these points and ask participants to add to the list.

- Recognition of the economic and social significance of the coastal zone;
- The ability of decisions makers to plan for and manage sustainable use of the coastal zone;
- Integration of multiple use management into the social, cultural, legal and administrative fabric of the coastal zone;
- Maintenance of the functional integrity of the coastal zone and its component ecosystems.

"Agenda 21 reflects a global consensus and political commitment at the highest level with respect to new approaches to marine and coastal area management and development, at the national, subregional, regional and global levels, approaches that are integrated in content and are precautionary and anticipatory in ambit". Agenda 21 embraces the concept that the "marine environment - including the oceans and all seas and adjacent coastal areas - forms an integrated whole that is an essential component of the global life-support system and a positive asset that presents opportunities for sustainable development'. Agenda 21 also calls upon coastal states to "commit themselves to integrated management and sustainable development of coastal areas and the marine environment under their national jurisdiction".

Major advances in promoting the concept of wise and sustainable use of coastal systems have been achieved through the adoption of a number of agreements including the Ramsar Convention, the Convention on Biodiversity, UNCLOS, Declaration on the Principles of Forests to name a few. Individual nations have also instigated coastal system protection measures. Broad political agreement concerning international and national sustainable development goals has followed UNCED and resulted in administrative opportunities for sustainable development of the coastal zone. In signing Agenda 21 (UNCED, 1992) nations agreed to Chapter 17. This means that they have undertaken to provide for sustainable use and conservation of marine and coastal resources (see Module 5 for Agenda 21, chapter 17).

The implementation of wise and sustainable use of the coastal zone continues to be constrained by a variety of factors including:

- low levels of awareness of the social and economic value of the coastal zone;
- a shortage of people trained to plan for and manage the sustainable use of the coastal zone; and
- significant levels of investment that are required to develop a broader understanding of the strategic value of the coastal zone and to train people to apply improved planning and management tools.

- Ask participants to discuss whether these constraints apply to their regions and list ways in which they may be addressed and overcome.

MODULE	**1.** **Why Manage the Coastal Zone?**
TRAINING SESSION	**1.2** **What do we mean by the Coastal Zone?**
OBJECTIVE	For participants to understand that the coastal zone is a dynamic socio-economic region as well as a complex mixture of interdependent ecological systems.
SIGNIFICANCE	To create awareness of the interconnectivity of the coastal zone with the hinterland and the adjacent coastal waters. In establishing policies and management plans for the coastal zone this broader aspect of the coastal zone must be considered.
PRESENTATION	Slides, videos illustrating growth in the Coastal Zone. Mapping exercise outlining the broad boundaries of their region's coastal zone.
TIME	One hour lecture One hour workshop
EQUIPMENT	Overhead projector, video recorder and TV, slide projector, paper and transparent overlays for mapping exercise. Participants to supply maps of their regions. *Participants must have materials they will need to make a presentation about their regions.*

TRAINING SESSION 1.2

WHAT DO WE MEAN BY THE COASTAL ZONE?

Author: Dr Peter Burbridge

INTRODUCTION

Welcome participants and explain the subject of the training session. Through slides, short videos and a lecture, the group will look at the rapid expansion of human populations into the coastal zone.

This training session will concentrate on human use of the coastal zone. Information about biological aspects of the coastal ecosystem is presented in Modules 2 and 3.

Using slides and (if available) video clips from your own collection, describe coastal zones around the world as well as the international experience of human expansion into the coastal zone. Your slides should be used as background for the points discussed in this and other training sessions. Include photographs of different coastal zone ecosystems, coastal urbanisation, environmentally obtrusive development, aquaculture, waste disposal, land reclamation, tourism, recreation, religious ceremonies, etc.

Participants are asked to draw a large-scale map of their region, covering the entire region affecting the coastal zone (i.e. catchment area, offshore reefs etc.).

Participants are also asked to make a presentation about the coastal zone in their region and human impact on that area.

SESSION CONTENT

- Explain what we mean by a coastal zone

The term coastal zone has been adopted to describe an area or zone of transition between the land and the sea. The "coastal zone" embraces inshore waters, intertidal areas and extensive tracts of land where habitats and species are specially adapted to these unique environmental conditions. The coastal zone also encompasses at least part of the territorial seas and in some countries it may extend to the Exclusive Economic Zone.

- **OH 1.2.1: The coastal zone**

- Management of the coastal zone takes in a much larger area than the coastal zone itself.

Emphasis is often placed on defining the "coastal zone" for legal and administrative purposes with the result that environmental processes linking terrestrial and marine components of the coastal zone are often ignored. Hydrologic linkages between upland catchments and coastal wetlands, for example, are essential if the wetlands are to continue functioning as feeding, nursery and spawning grounds for commercially valuable fish species. Most of the processes associated with the coastal zone, therefore, extend a long way beyond any convenient administrative definition of "coastal zone".

We should therefore use the concept of the coastal zone as a means of focusing attention on the need for new and innovative planning and management arrangements that take into account the interconnectedness of marine, coastal and terrestrial systems.

The coastal zone, a global perspective

- Using slides and short video clips, give participants an overview of coastal zones around the world and the different ecosystems associated with them (mangroves, seagrasses, estuaries, sand dunes, beaches, reefs etc).

The coastal zones of the world contain a wide array of biologically productive and diverse ecosystems. Associated with the coastal lands and continental shelf waters of many nations are correspondingly rich and varied resources. Traditionally these have been exploited for the production of food, energy, minerals and other raw materials, as a basis for industrial development. The coastal zone is used for recreation and tourism, transport and communications, commerce and international trade.

- Use slides to illustrate human expansion into the coastal zone.

The dynamic nature of the coastal zone

For the foreseeable future, these same coastal zones and natural resources will come under increasing pressure to sustain rapid human population growth and the corresponding expansion and diversification of national economies.

A major feature of the world's coastal zones is the complex and dynamic nature of human activities. Some of the more important factors that contribute to this dynamic situation include:

- Population concentrations in coastal zones: various estimates suggest that the population of the world's costal zones represents between 50% and 70% of the estimated 5.3 billion (thousand million) people alive today.

- Concentration of economic activity in coastal areas parallels that of population concentrations. For example, in Indonesia some 70% of the

population is located in coastal areas and activities such as shipping and transportation, oil and gas development, capture fisheries, aquaculture, agriculture, forestry, mining, industry, and tourism account for 22% of Gross Domestic Product and directly employ about 13.6 million people (CIMTPSP, 1988).

- Population Growth: The United Nations projection of growth suggests that the world's population will reach 8.5 billion by 2025. It is estimated that 70% of the increase will occur in 20 of the less developed countries. UNCED Agenda 21, Chapter 17 (see Module 5) suggests that up to three quarters of the world's population could be living within 60 kilometres of the shoreline by 2020. This growth and concentration of people in coastal areas is expected to exacerbate already severe competition for access to coastal resources and conflicts among activities from different economic sectors.

- Urbanisation: Most of the demographic growth in developing nations is expected to occur in urban settings concentrated in broadly-defined coastal zones. Of the 134 nations surveyed in the World Resources Institute's World Resources 1990-91 report (WRI, 1992), 65 countries had more than 50% of their urban population living in large coastal cities. From 1980 to 2000 it is estimated that the coastal urban population will increase by 380 million (WRI, 1993).

- Urban populations tend to have higher consumption levels than their rural counterparts as well as different consumption patterns. To meet the demand for food from increasing concentrations of people in urban areas, there has to be increasing productivity in fisheries and agriculture. This is often made difficult due to the consumption of good quality agricultural land to meet urban expansion and the reduction of fisheries potential as a result of loss of coastal fisheries habitats and pollution of rivers and coastal waters from urban and industrial wastes.

- Migration: The economic base of many rural coastal communities is destabilised by declining fisheries and loss of access to resources due to development pressures from competing economic activities such as tourism. Destabilisation of rural coastal communities can lead to migration to urban areas where rural people have few skills to allow them to adapt to urban economic opportunities. The resulting pressures from rural to urban migration exacerbate problems faced by urban planners and managers in improving - or even maintaining - housing, water supplies, sanitation and other basic services.

The strategic role of the coastal zone

- Discuss the strategic role of coastal resources in meeting the needs of current and future generations. You may use the following example of aquaculture to illustrate the issues involved with resource development, or examples of your own.

For many nations the coastal zone is the last frontier in terms of relatively undeveloped land to use to accommodate population growth and to expand activities such as agriculture to feed their people. Coastal zones contain some of the few remaining areas with low concentrations of activity because of the marginal nature of some soils, natural hazards such as flooding or the sheer effort required to reclaim coastal forests to create agricultural land. Until recently there have been easier options available in upland areas. However, with increasing scarcity of land, many countries are now turning to their coastal areas in search of new sites for development and are having to find new and innovative solutions to problems which have made people avoid such areas in the past.

Coastal areas are also being developed to diversify the economic base of nations. Associated with the concentration of population in many coastal areas there have been early innovations in land and water uses that today form the foundation for the relocation of people from overcrowded areas inland, and for major thrusts of investment. The development of brackish water fishponds many hundreds of years ago in South East Asia is an example. This technology permitted the polyculture of wild species of finfish and crustaceans and improved food security and opportunities for diversifying rural economies. This technology has been refined and attention has been focused on the culture of penaeid shrimp for export. This now forms a major thrust of economic investment throughout Asia, Latin America and more recently in Africa.

The socio-economic impact of coastal aquaculture developments which require major alteration of coastal ecosystems can be far reaching and is also an example of short sighted approach to coastal zone development. Apart from the direct loss of mangrove and other valuable coastal systems, there have been a number of corresponding impacts such as land subsidence, acidification of soils and estuarine waters and salinisation of groundwater and agricultural lands and the subsequent loss of economic and environmental goods and services generated by natural resources systems (GESAMP, 1991). This has led to the loss of agricultural productivity and farm incomes, reduced water supplies, loss of income from fishing and forestry and increasing hazards of coastal flooding (Hung, 1990; Chua and Scura, 1992).

As is the case for agricultural conversion of coastal systems, great attention must be paid to planning and managing coastal soils, tidal ranges, freshwater supplies, and natural hazards such as flooding if the investment is be sustainable. Where these factors are not built into management plans, investment capital is lost, natural resources degraded and coastal communities destabilised.

Unfortunately, extensive areas converted for pond development now lie abandoned and many people have lost their capital, others are adversely affected by the degradation of the mangrove and have lost the economic basis for their survival in traditional occupations such as fishing. As these people become impoverished the less incentive they have of investing in environmental management measures to sustain their activities. Survival becomes problematic and the incentive to seek short-term results is much greater (World Bank, 1992).

This leads to a breakdown of risk reducing, traditional approaches to the management of coastal areas and further exacerbates problems of environmental degradation. Because of rapid population growth and the transition toward single purpose forms of development, it is not feasible to mimic traditional management practices and achieve sustainable development. Innovative management solutions will have to be developed that adapt the best available practice from a range of nations to the social, economic and bio-geophysical conditions in individual nations.

For the foreseeable future, most coastal nations will remain heavily dependent upon coastal resources to meet the needs of expanding populations and the need to expand and diversify their economies.

- Ask participants to make presentations describing coastal zone development failures and successes in their regions.

SESSION ACTIVITIES 1.2

- Divide participants into working groups of five or less. Ask them to draw a large-scale map of their region and show the boundaries of the furthest areas which have an impact on the region's coastal zone. Overlays of this map will be used in training sessions throughout this manual.

- Ask participants to discuss coastal development in their regions, giving examples of how people are utilising coastal resources and moving into the coastal zone.

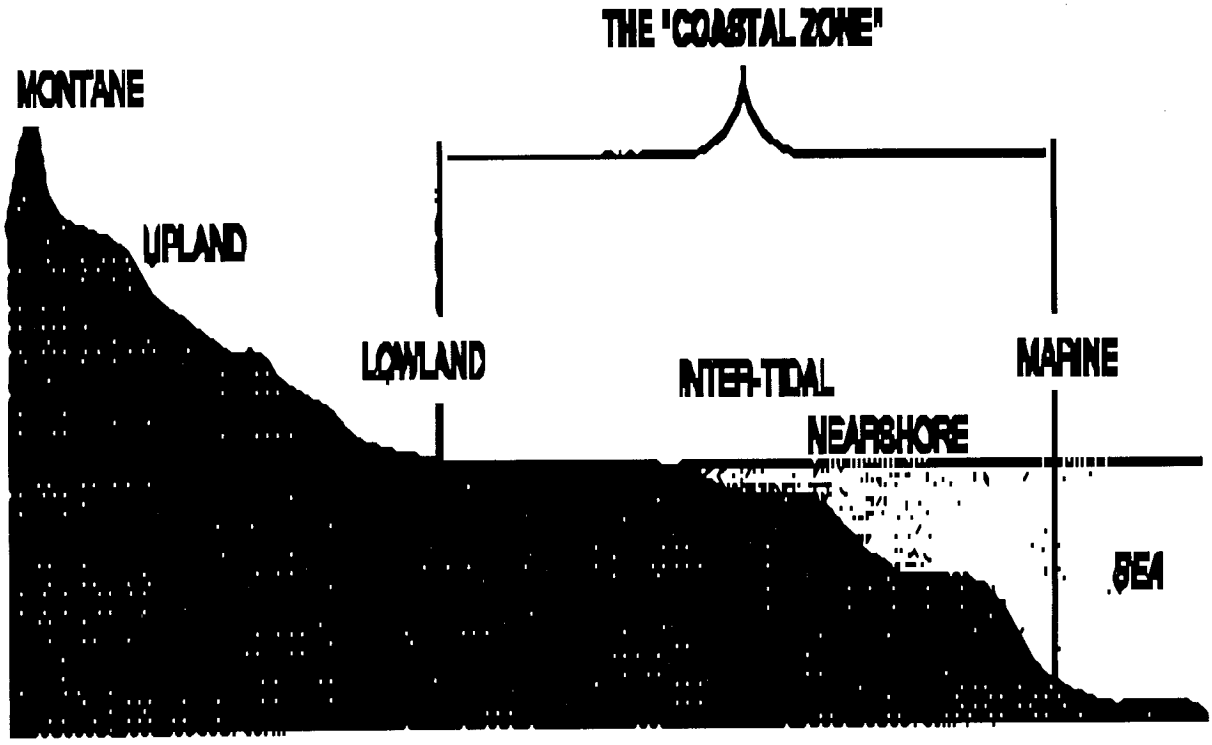
SESSION MATERIALS 1.2

- Slides and short video tapes illustrating human movement into the coastal zone and use of resources

- Paper and transparent overlays for the mapping exercise

- **OH 1.2.1 The Coastal Zone**

The Coastal Zone



MODULE	**1.** **Why Manage the Coastal Zone?**
TRAINING SESSION	**1.3** **Sustainable Development Issues**
OBJECTIVE	To describe some of the initiatives that have been designed to tackle the increasing pressure on the coastal zone.
SIGNIFICANCE	Increasing pressure on the coastal zone requires improved management systems to promote sustainable development. Participants must be aware of existing initiatives if they are to develop policies for their own regions.
PRESENTATION	Lecture
TIME	1 hour
EQUIPMENT	Overhead projector, blackboard or whiteboard.

TRAINING SESSION 1.3

SUSTAINABLE DEVELOPMENT ISSUES

Author: Dr Peter Burbridge

INTRODUCTION

Welcome participants and explain that in this session you will describe a number of Integrated Coastal Zone Management (ICZM) initiatives, international perspectives on ICZM and constraints to successful ICZM programmes.

SESSION CONTENT

- Outline sustainable development issues in the coastal zone.
    - Rapid growth of populations in coastal regions, rapid urbanisation, competition for land and water resources, and pollution are all undermining the potential of coastal zones to sustain social and economic development objectives (AWB, 1992; Chua et al, 1991; CIMTPSP, 1988; Burbridge, 1993).
    - Prospective sea level rise will make many coastal nations become more susceptible to coastal flooding which will endanger lives and economic activities.
    - Poor resource management will increase the incidence and severity of natural hazards such as flooding and will make people and investment more susceptible to these hazards.
    - Natural marine and coastal resources are likely to be overexploited (e.g. fisheries) and inappropriate use of resources such as mangroves for shrimp culture will lead to habitat destruction.
- Discuss ways in which managers are addressing these issues

Most of these issues have come about as a result of a gross underestimation of the value of coastal land and water resources and the sophisticated policy-making, planning management skills required to fulfil development objectives without destroying renewable resources. Some nations have recognised the worth of the coastal zone and are gearing their management strategies to allow for sustainable development:

- The economic value of natural systems such as coral reefs, mangrove or salt marshes in ameliorating coastal flooding hazards is gaining

recognition. For example, a 10-metre-wide apron of salt marsh along parts of the coast of Britain is considered to serve the same purpose as a 1-metre-high artificial sea defence. In the Maldives, destruction of coral reefs has had to be compensated for by the construction of a breakwater at a cost of $US12,000 per linear metre to protect the land from flooding and destruction from storm surges (Pernetta and Elder, 1993).

- Recent reviews of development pressures and the potential effects of major climatic and sea level changes conclude that predicted social and economic changes in coastal areas may outweigh the impact of climate change in the Mediterranean (Jeftic et al, 1993).

- Development pressures are certainly affecting the coastal zone but they are not the key issue. Instead, the question is, how do we promote greater investment in developing the management skill, policies and institutions to meet the challenge of sustainable coastal zone development? Explain that you will be outlining developments in ICZM in the remainder of this training session.

- Give examples of successful coastal zone management strategies, including your own examples and some from the participants.

The concept of Coastal Zone Management has been adopted in a number of countries:

- Thailand developed a Master Plan for Coastal Development in the mid 1970s and has gone on to formulate regional coastal management plans and to train people in the basics of coastal area management and planning.

- The main responsibility for looking after the Great Barrier Reef on Australia's north-east coast rests with the Great Barrier Reef Marine Park Authority. Many other organisations are involved in managing the Reef, which rely on its resources and care about its future. Over the past three years, the Authority has been the lead agency in coordinating the development of a 25 year Strategic Plan for the Great Barrier Reef World Heritage Area, involving over 60 user and interest groups, government agencies and Aboriginal and Torres Strait Islander communities in a process of setting jointly agreed objectives. The Strategic Plan describes an agreed 25 year vision for the World Heritage Area and the long- (25 year) and short- (5 year) term objectives and strategies to achieve that vision. The Plan provides direction and guidance for organisations, such as the Authority, in developing corporate, business and management plans.

  Two issues that could not be completely resolved during the planning process, were mining in the World Heritage Area and Aboriginal and Torres Strait Islander interests. These will be negotiated on a continuing basis. However, late in 1993, resolution of one significant aspect of the mining issue was achieved with the decision of the state government of Queensland to ban oil drilling and exploration in areas of its jurisdiction

in the World Heritage Area. Subsequent to the Plan's development, the Commonwealth and State Native Title Acts were passed which addressed many of the Aboriginal and Torres Strait Islander concerns. The Strategic Plan was officially launched by the Prime Minister, the Hon. Paul Keating, and distributed in July 1994.

- The model established by the United States *Coastal Zone Management Act of 1972*, and the management and planning techniques which have evolved have helped many nations to improve the development of their coastal resources.

- Under a proviso for an Asian Development Bank Loan for addressing the problems of coastal erosion in Malaysia, the Government of Malaysia has initiated action to establish national policy and guidelines for integrated coastal resources management. Lessons and experiences learned from the establishment of an integrated coastal resource management plan in South Johore, Peninsular Malaysia under an ASEAN-US Coastal Resource Management Plan Project, formed the basis for the establishment of the national policy and guidelines for integrated coastal resources management. Some of the recommendations for the coastal resources management plan for South Johore have been adopted by the Johore State Government. The Economic Planning Unit of the Prime Minister's Department of the Government of Malaysia, which is the national central authority responsible for planning and development, has been designated as the authority responsible for the coordination of the establishment and implementation of integrated coastal resources management plans. At the same time the Government of Malaysia has, under a bilateral agreement with the Government of Denmark, established pilot site projects under the Danish Environment and Development Fund (DANCED) for integrated coastal resources management in the States of Sarawak, Sabah and Penang. The experiences in these three East Malaysian States will also contribute to the national policies and guidelines for integrated coastal resources in Malaysia (Ch'ng, K. L. pers comm 1995).

A number of basic issues face both developed and developing nations and need urgent attention if sustainable and socially equitable development of coastal resources is to be achieved. Among the most pressing are the need for:

- improved assessments of the natural functions of complex coastal resources systems such as wetlands;
- the appraisal of the value of economic and environmental goods and services provided through those functions; and
- the development of practical techniques for promoting the conservation of the systems and the sustainable use of their resources:

    - Adoption of a multidisciplinary, integrated and holistic approach for management of coastal and marine resources as opposed to the current sectoral approach;

- Establishment of mechanisms for coordination and integration horizontally between sectors and vertically between governments (central, regional and local); and
- Establishment of public awareness and education of resource managers, decision makers and politicians in the benefits and intrinsic benefits of ICZM.

All three of these needs can be addressed through the use of multiple-use approaches to the management of coastal environments. The basic concept would be to complement the multiple functions served by coastal ecosystems with resource assessment, allocation and management approaches which accurately reflect the value of different functions in sustaining multiple forms of resource use.

- Describe Integrated Coastal Zone Management (ICZM)

Integrated Coastal Zone Management is a relatively new activity compared to more traditional, sectorally-based management activities such as forestry, fisheries, shipping and urban development. The latter still dominate the organisation of development planning in the majority of coastal nations. The concepts and principles of ICZM are by no means fully developed and there are few successful examples of integrated coastal management plans that are currently being implemented. Those that are in operation are generally associated with small geographic areas and/or a limited range of activities. There are three notable examples of new initiatives to develop larger-scale, integrated coastal zone management solutions to the sustainable use of fisheries and other renewable resources that involve more than one nation. They are:

- The Tri-Lateral Convention for the Management of the Wadden Sea in Europe. Denmark, Germany and the Netherlands have recently taken steps to establish a more integrated strategy to protect the Wadden Sea. A tri-lateral agreement has been signed whereby the three sovereign nations actively promote the harmonisation of their policies and management objectives. A Wadden Sea Council has been formed. This is made up of representatives from the three Wadden Sea states, including local government representatives. This ensures that the necessary political will is in place for the promotion of common principles for sustainable use of the Sea's resources and a broadly based, unified planning and management boundary that treats the Wadden Sea as an ecological entity including the elements of the North Sea and mainland areas.

- The ASEAN-US Coastal Resources Management Plan Project (1986-1991) fostered cooperation among the six ASEAN nations in the establishment of ICZM plans in pilot sites in the six countries. During the project phase, the 6 countries shared scientific information through a network set up between the project teams in each of the countries. They cooperated in developing regionally agreed management solutions to common marine and coastal resources management problems, exchanged experiences

learned in the development of management plans for the pilot sites and cooperated in the establishment of regional training courses/seminars for decision makers, resource managers and the coastal community during the project's life time. All the countries involved are undertaking follow-up activities to facilitate the adoption and implementation of ICZM policies in the region.

- In the United Kingdom the House of Commons Environment Committee Report on "Coastal Zone Protection and Planning" has called for a more comprehensive integrated approach to the protection and planning of coastal areas, the consolidation and upgrading of legislation, new coastal policies, and a review of planning systems affecting the coast.

However, it will be some years before well developed and properly implemented integrated coastal management strategies, plans and management arrangements are a common feature of the world's coastal regions.

International conventions and European Community Directives have stimulated official and general public awareness of coastal development issues. Experience world wide suggests the need for strong political will and clear policy guidance at a national as well as a regional level for the sustainable development of coastal land and water areas and renewable resources. Such policy direction will help to stimulate increased intersectoral cooperation in the formulation of management and development policies for ICZM.

Current approaches to ICZM have been developed based upon work that has been carried out over the last 30 years. During this time there has been a growing international acceptance of Coastal Zone Management (CZM) as a means of addressing complex development issues, such as the wise use of common property resources, through the combination of good science, integration of sectoral policies and management initiatives, and the formulation of new and innovative legislation.

The need for increased integration of sectoral development policies, programmes, investment strategies and projects is gaining support as a result of recognition of the following issues:

- Coastal ecosystems provide a great diversity of functions that help to sustain a multitude of economic and environmental goods and services.
- Developing countries often have a greater dependency than developed countries on food and other basic human needs derived from the coastal zone.
- The sustainability of traditional coastal resource management practices can fail due to rapid population growth and/or strong external economic demands for specific resources.
- Different economic sectors can have a high degree of mutual dependence upon specific coastal ecosystems. Therefore, it is in the common interest to promote policies, plans and investment strategies that maintain the health and productivity of coastal ecosystems.
- Sectoral approaches to resource development normally seek to maximise the financial returns from a narrow range of renewable resources, effectively

discounting all other uses to zero. This often leads to non-sustainable and/or economically inefficient forms of development that may disenfranchise other groups from the natural resources base. This is a major contribution to the decline of the welfare of coastal communities and a consequent rise in rural to urban migration.

- A balance is required between "top-down and bottom-up" approaches to development planning and management. Top-down are unlikely to change unless there is an awareness on the part of government officials that integrated approaches will help them fulfil national development objectives more effectively. At the same time, local economic and social interests need to be effectively represented in government decision making at all levels if wise and sustainable forms of coastal resource development are to be achieved.

A recent review of progress in achieving integrated coastal zone management identified a number of important lessons.

- Nearly all renewable coastal resources worldwide are suffering rapid depletion (a prime example is the mangrove forest), some to the point of irreversibility. Conventional sectoral management programmes have failed to deal effectively with these problems.
- ICZM must be seen as an iterative process in which incremental improvement in cooperation among agencies is one of the most important achievements. Cooperation then forms the basis for coordination and integration.
- The lack of scientific information and/or trained personnel is not a barrier to the initiation of a coastal management programme. Sufficient information and experience exists at the international level to provide basic concepts, principles and techniques for establishing an ICZM programme. Great care must be taken to adapt these to the social, cultural and economic conditions within individual nations.
- ICZM must be seen as a practical means of meeting short-term development objectives (e.g. helping to diversify economic activities in rural areas). If ICZM is perceived to exert a negative impact on jobs, revenue, or foreign exchange, it is unlikely that it will be adopted.

Although there is no universal model for ICZM there are basic elements that are essential to any ICZM:

- clearly articulated integrated coastal resource management development policies which meet national development objectives;
- a lead agency to coordinate the planning and establishment of coastal development and management plans, and to coordinate their implementation;
- powers to promote intergovernmental coordination;
- sufficient funds to implement an ICZM programme;
- strong political will to formulate and implement coastal area management policies, and to see that controls over development are implemented effectively;
- the support of the various interest groups whose activities and welfare will be influenced by the ICZM activities. This must be in the form of a combined

"top-down" and "bottom-up" approach to ICZM and adequate provision for the representation of the interests of all parties;

- effective coordination and integration of donor assistance programmes.
- a mechanism for coordination and integration horizontally between sectors and vertically between governments.
- institutional and legal arrangements in support of ICZM
- capacity building for planning and management of ICZM of coastal and marine resources and building awareness among the private sectors, politicians and stakeholders of the benefits of ICZM;
- the wide range of technical and management skills, practical experience and information available within the international community are great assets. However, to make full use of these assets great emphasis needs to be placed on interdisciplinary approaches to the formulation and implementation of ICZM programmes and projects. This will help promote more rapid progress in the development of improved methodologies for evaluating the functions and flows of renewable resources generated by coastal ecosystems, and planning for and managing the wise, sustainable and optimal use of the flow of renewable resources from those systems to meet local, national and regional social and economic needs and aspirations; and
- investment will be required to fulfil the broad objectives of UNCED Agenda 21 Section 17 relating to the development of more sustainable forms of marine and coastal development. Setting priorities for such investment is not easy as the needs for improved concepts, methodologies, practical techniques and well-trained human resources are very real. We hope that the materials presented in this training manual will help you to improve the planning for and management of coastal development and resources management and help us all fulfil the objectives of Agenda 21.

SESSION ACTIVITIES 1.3

- Ask participants to list developments, growth of economic activity and population growth in their regions over the past 5, 10 and 25 years.
- Consider opportunities for development. How are coastal resources used? Are some uses better than others? If so, why do you think this is the case?
- Consider the benefits and costs of developments to local, regional and national economies.
- Are there benefits in applying ICZM principles to you region, and if so, what are they?

MODULE	**1** **Why Manage the Coastal Zone?**
TRAINING SESSION	**1.4** **ICZM, a tool for the future**
OBJECTIVE	To summarise the previous Training Sessions and emphasise the importance of ICZM for the future sustainability of the coastal zone.
SIGNIFICANCE	It is important for mangers to understand the role of ICZM in a broad context, to recognise its importance for the long-term future of the world's coastal zones and know that ICZM is a long term process requiring persistence and perseverance.
PRESENTATION	Lecture and group discussion.
TIME	1 hour
EQUIPMENT	Slide projector, blackboard or whiteboard and markers.

TRAINING SESSION 1.4

ICZM, A TOOL FOR THE FUTURE

Author: Dr Peter Burbridge

INTRODUCTION

Introduce participants to the session and explain that you will be summarising the information from the previous sessions in this module. Participants will also be expected to discuss the future application of ICZM to their regions.

SESSION CONTENT

- Summarise the outcomes of this module using the following points as well as issues that have resulted from group activities.

- The coastal zones of the world contain some of the most biologically productive, diverse, complex, yet fragile ecosystems on the face of the earth. This productivity and diversity is matched in many regions by a concentration of human populations and diversity of economic activities. Coastal regions are also vulnerable to the mismanagement of resources within the adjacent landward and seaward area. Many forms of mismanagement of land and water uses can adversely influence the health and productivity of coastal ecosystems. This reduces the flow of resources these systems generate and reduces the environmental services they perform, such as providing breeding, spawning, feeding and nursery areas for a wide range of fish species. At the same time mismanagement of resources outside and within the coastal zone can increase the incidence and severity of natural events such as flooding and coastal erosion making people and activities more prone to natural hazards. Together, these factors add up to make the management of coastal zones and their resource development opportunities one of our most complex challenges.

- The corresponding complexity of ICZM projects requires careful integration of detailed knowledge of coastal ecosystems, local social, cultural and economic factors, and national, regional and local planning and administrative arrangements.

- Greater attention needs to be given in coastal management and natural resource development projects to the conservation of natural systems that generate the renewable natural resources that sustain economic activities.

- The conservation of these natural systems can be influenced by a wide range of human activities that take place within water catchments upstream and within the marine environment. The adoption of a "Coastal Zone" to delineate a broad area within which special management arrangements may be required to protect the health and productivity of coastal ecosystems can be a useful management tool. However, it is far more important to identify critical management considerations and the action that may be required to resolve resource use conflicts within a coastal zone than to expend a great deal of effort and time in defining a perfect boundary for that zone.

- Experience to date in the design and implementation of Integrated Coastal Zone Management programmes and projects has taught us that it is a very complex form of activity. To be successful, such programmes and projects must be well funded to cope with the time required to fully understand the diverse social, cultural, bio-physical and economic elements involved, develop a design which is both comprehensive and robust, and to gain the support and active participation of people at the community level and at all levels of government who will be responsible for implementing any lessons learned in the conduct of the programme or project. Three to five years is a minimum period of time that should be devoted to the formulation, implementation and evaluation of any ICZM or integrated fisheries project.

- Many methodologies are available for addressing individual resource evaluation and management issues. However, there is considerable work to be done in developing robust and effective techniques for integrating social, cultural, bio-physical and economic considerations in planning for and managing the wise and sustainable use of renewable coastal resources.

- The wide range of technical and management skills, practical experience and information available within the international community are great assets. However, to make full use of these assets, great emphasis needs to be placed on interdisciplinary approaches to the formulation and implementation of ICZM programmes and projects. This will help promote more rapid progress in the development of improved methodologies for evaluating the functions and flows of renewable resources generated by coastal ecosystems, and planning for and managing the wise, sustainable and optimal use of the flow of renewable resources from those systems to meet local, national and regional social and economic needs and aspirations.

- Investment will be required to fulfil the broad objectives of UNCED Agenda 21 Section 17 relating to the development of more sustainable forms of marine and coastal development. Setting priorities for such investment is not easy as the needs for improved concepts, methodologies, practical techniques and well-trained human resources are very real. We hope that the materials presented in this training manual will help you to improve the planning for, and management of, coastal development and resources management and help us all fulfil the objectives of Agenda 21.

SESSION ACTIVITIES 1.4

- List the actions needed to establish improved ICZM in your community.
- Identify priorities, interactions and the time scale needed to achieve the necessary action.

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MODULE 2

WHAT IS THE COASTAL ZONE?

OBJECTIVE

To describe the main ecosystems within the coastal zone, their interconnectedness and their interdependence.

TRAINING SESSIONS

2.1 Marine and Coastal Resources and Associated Ecosystems

2.2 Processes of Significance

2.3 State of The System

MODULE	**2.** **What is the Coastal Zone?**
TRAINING SESSION	**2.1** **Marine and Coastal Resources and Associated Ecosystems**
OBJECTIVE	For participants to gain a broad understanding of the various ecosystems found in the coastal zone.
SIGNIFICANCE	Coastal zone managers need to be aware of the complex nature of individual coastal ecosystems.
PRESENTATION	Lecture, presentations by participants, field trips
TIME	One day minimum
EQUIPMENT	Overhead projector, blackboard or whiteboard, slide projector, field equipment as outlined in the exercises below. *Advise people before they arrive that they will be expected to make a presentation about their region and can bring slides, maps, posters, props etc.*

TRAINING SESSION 2.1

MARINE AND COASTAL RESOURCES AND ASSOCIATED ECOSYSTEMS

Authors: Deborah Cavanagh and Dr Chou Loke Ming

INTRODUCTION

Welcome participants to the training session.

Through discussion, presentations and field trips the group will study the differences between the various coastal ecosystems, their interconnectedness and their interdependence.

Preview the contents of the lecture covering water movements, coral reefs, mangroves, seagrasses.

Prepare participants for the fact that they will be giving presentations about their own areas as part of this training session.

The examples in this session are in the marine areas. The coastal zone also includes coastal forests and swamps. Use information about these ecosystems to broaden your presentation.

SESSION CONTENT

THE COASTAL ZONE

- Using slides from your own collection describe the "coastal zone".

The Coastal Zone is the dynamic margin where land and sea meet and mix. It is a vital region made up of coastal lands, bays, estuaries, mangroves, seagrass meadows, algal beds, fresh and salt water and coral reefs. The coastal zone is intimately linked to lakes, rivers and the open ocean. It includes water, the sea bed, estuarine and coastal land and the fauna and flora which live in them.

Coastal ecosystems are among the world's most productive. Energy producing sunlight saturates the shallow, nutrient rich coastal waters. Here, algal beds, sea grass meadows, reefs, estuaries and mangroves provide food and shelter for vast quantities of fish, shellfish and other marine organisms.

In the Asian and Pacific region the coastal zone is vital for many human activities. The coastal zone provides a large part of the human food and energy

needs in this region. Living and non-living resources include fish, minerals, oil and gas. Urban development is rapidly growing in coastal areas along with tourism and other economic activities (see Module 1.2 for discussion about urban development in the coastal zone). The regional seas are transportation routes for vessels used in international trade.

THE EAST ASIAN SEAS

- Using a map from your own collection, orient participants to the East Asian Seas setting.

The East Asian Seas region includes the ASEAN countries of Brunei Darussalam, Vietnam, Indonesia, Malaysia, the Philippines, Singapore and Thailand. Other countries bordering the East Asian seas are: Korea, Cambodia, the Union of Myanmar and the People's Republic of China.

  - The South East Asian seas cover 9 million square kilometres or 2.5% of the earth's ocean surface.
  - This region links the Indian and Pacific oceans and separates the continents of Asia and Australia.
  - Indonesia and the Philippines are the two largest island archipelagos in the world with more than 20,000 islands combined.
  - The total length of the coastline is 92,451 kilometres.

- Explain why the East Asian seas are so rich and diverse.

The seas of East Asia form one biogeographical unit between Asia and Australia and between the Pacific and the Indian Ocean. They are a complex of topographical features comprising deep sea basins, troughs, trenches, continental slopes, volcanic and coral islands, shallow continental shelves with deeply penetrating coves and numerous islands dividing the waters into seas connected by channels, passages and straits (Fortes, 1988).

The region is characterised by high diversity habitats found in tropical climates and heavy precipitation that transports nutrients from land to sea. Almost all the East Asian countries have extensive coastlines and numerous coral or volcanic offshore islands (Chou, 1994).

The tropical waters experience little change in surface temperature and moderate tidal variation. Currents can be strong and in many areas they reverse their direction under the influence of the seasonal monsoons (Chou, 1994). The north monsoon in South East Asia lasts from December to February and the south monsoon from June to August (UNEP, 1990).

Stratification of the water column occurs in some of the deeper seas but over most of the Sunda and Sahul shelves the temperature remains uniform throughout the water column. Salinity is variable and lowered in nearshore areas, particularly after heavy rainfall. Bays and channels with restricted circulation also tend to have lowered salinity.

Nutrient load in coastal and nearshore waters is high because of river outflows. Nutrient levels increase during monsoons. In offshore waters the surface layers have low nutrient levels while the deeper layers have greater nutrient content. In the tropics, nutrients remain trapped in the deeper layers unlike the temperate seas where annual turnover, due to seasonal climate variation, brings up bottom nutrients. In tropical open seas, nutrients are brought to the surface by upwelling or divergent water movements at the surface, which are usually localised or seasonal.

- Explain that the East Asian Seas are influenced by a larger oceanic system that meets and mixes in the coastal zone. From your own slide collection illustrate the meeting and mixing of water from rivers into the sea, and nutrient rich areas where ocean currents meet.

The water mass of the East Asian region originates from the Pacific Ocean. The North Equatorial Current flows westwards and upon reaching the Philippine islands, splits into 2 main branches. The northward branch becomes the Kuroshio and the southward branch the Mindanao Current. The Kuroshio begins east of northern Luzon and flows to the east coast of Taiwan, the East China Sea and the Japan Sea. During the north monsoon, the Kuroshio is deflected into the China Sea and the Japan Sea. The Mindanao current flows South East with a speed of 1 or 2 knots along the coast of Mindanao Island with its main part entering the Celebes Sea through the straits between Mindanao, Sangir and Talaut Islands (Gomez, 1990).

The tides of East Asian waters are affected by both the Pacific and the Indian Oceans. Diurnal tides predominate in the South China and Java Seas, whereas mixed tides prevail in the eastern Indonesian archipelago, Philippine waters, the Adnaman Sea, Straits of Malacca and the shelf areas north-east of Australia.

- **OH 2.1.1 Major ocean currents in the East Asia Seas.**

Circulation and mixing change abruptly in the coastal zone. Where offshore winds prevail the nutrient-rich water moving towards the coast is dragged up to the surface. In the shallow coastal waters microscopic marine plants (phytoplankton) feed on the sun's energy and on the nutrients washed off the land. These in turn are food for small schooling fish as well as enormous animals such as baleen whales and basking sharks. Manta rays are also among the many species of plankton feeders.

Sometimes the areas where the open ocean and coastal waters meet are well marked. The silt laden water from the land may be brown and distinctly different from the ocean water which is clear and blue because of its low nutrient levels. As the two bodies of water meet the surface water sinks, creating an upwelling of deeper water. Here the mixing creates a rich soup of nutrients and sunshine where the phytoplankton can flourish and provide abundant food for the larger marine animals. These feeding marine fishes, jelly fish, shrimp,

marine mammals and sea birds are the basis of many human economic activities.

CORAL REEFS

- Provide an overview of coral reefs using your own collection of slides and props including examples of corals, varieties of coral sand, reef animals and plants etc.

- **OH 2.1.2 Coral Reefs of the East Asia Seas**

The East Asian seas contain 25 to 30% of the estimated 600,000 square kilometres of coral reefs worldwide. The most extensive reefs occur in Indonesia and the Philippines (Chou, 1994).

Tropical coral reefs are the most diverse of all ecosystems. They contain more plant and animal species than any other ecosystem and they support one-third of all fish species. Plants form the basic building blocks of coral reefs. They grow best in sun-drenched, shallow areas and they need clear, clean water to thrive. Coral reefs are found in warm waters, usually between latitudes of 30 degrees north and south. Because they need clean, clear waters, coral growth is usually sparse immediately adjacent to the shore, but often increases dramatically as you swim seaward (McManus, 1988).

A typical East Asian fringing reef consists of a shelf of limestone bordering the coast, an intertidal or slightly subtidal reef flat, a wave-breaking reef crest and an outer reef slope broken into series of ridges and rifts. The reef flat is generally dominated by sea grass. Most of the coral growth occurs on the reef slope and may extend a few hundred metres beyond the breaking waves (McManus, 1988).

Corals grow on a variety of hard surfaces and it is not surprising to find them along the rocky shores, independent of any substantial limestone reef. Such coral communities can be found in parts of Ambon Bay, Indonesia, the Sichang Islands in Thailand, various rocky shores in Malaysia and Singapore and the Sombrero Island, Philippines (McManus, 1988).

There are thousands of offshore, subsurface reefs throughout East Asia. Dense aggregations of subsurface atolls and shoal reefs make up the Palawan and Camarines reef banks in the Philippines, comprising approximately 30,000 square kilometres of potential fishing ground (McManus, 1988).

MANGROVES

- Describe the mangrove ecosystem using slides and props, including leaves, trunks, examples of animals, a jar of mangrove mud etc.

East Asian mangroves represent more than 30% of the world's mangroves and are the most diverse in species composition. The total number of mangrove

species in the world is estimated at about 90, of which 60 are found in Asia and the Pacific.

- **OH 2.1.3 Map of Mangroves in the East Asia Seas**

Mangrove areas cover nearly 24 million hectares in the world. Indonesia has the largest area of mangroves (3 million hectares), followed by Australia (1.2 million hectares) (SOMER, 1990). The most extensive mangrove regions are found in Malaysia, Sumatra, Borneo, Thailand and in areas associated with the deltas of rivers entering the Straits of Malacca (Fortes, 1988).

Mangroves forests are diverse communities growing in the area between the average sea level and the high tide mark (the intertidal zone). They are found in the rivers, estuaries, bays and on the coasts adjacent to fringing reefs.

- **OH 2.1.4 A Mangrove Ecosystem**

Mangrove forests are a crucial part of the tropical coastal ecosystem. The leaves of the mangrove plants use sunlight to convert carbon dioxide gas to organic compounds in a process called photosynthesis. This, and the nutrients taken up from the soil, provide the raw materials for tree growth. After they have died, the decaying leaves release carbon and nutrients that can be used by other mangrove organisms.

The decaying mangrove leaves (detritus) are broken down by fungi and bacteria or are eaten by small crabs. The detritus contributes to nearshore and offshore productivity. Snails (molluscs), crabs, shrimps, prawns (crustaceans) and fish feed on the decaying organic material and are, in turn, food for larger animals. Nutrients released into the water also feed the mangrove plants, plankton and algae (Lovelock, 1993).

Mangroves are home to a great variety of land and sea creatures. Saltwater crocodiles and sea snakes come into the mangroves to feed. Mudskippers live in the mangroves exclusively while most of the other fish only live in the mangroves during a certain part of their life cycle. Crustaceans (sea lice, barnacles, shrimps, prawns, and crabs) are abundant in mangrove forests. Molluscs such as the mangrove oyster and common mud whelk often live around the base of mangrove trees (Lovelock, 1993).

Many species of birds visit the mangroves seasonally for food and shelter and flying foxes form large colonies that roost in mangroves (Lovelock, 1993).

Many commercial fish and prawn species live in the mangroves during their juvenile stages then move offshore when they mature. Many of the food fish for the commercial species also spend their early days in the mangroves before migrating to the open ocean. Some animals, such as mud crabs, spend most of their lives in the mangroves and move to the open sea to spawn.

Nutrients from the mangroves also wash over the sea grass beds and on to the coral reefs. They enrich these offshore environments and provide nutrients for the turtles, dugongs and fish.

The tangled roots and trunks of the mangroves reduce current speed and trap sediment. This reduces siltation in nearby marine habitats, such as fringing reefs. Mangroves also act as a buffer during heavy winds and seas, protecting the low lying coastal areas from erosion.

SEAGRASS MEADOWS

- Provide slides and examples of seagrasses and explain their importance for the coastal zone.

Seagrasses are the only group of submerged flowering plants in tropical and temperate marine environments. They thrive mostly in shallow water, coastal habitats and are adapted to live submerged in a saline environment. Their anchoring system withstands wave action and they are capable of pollination by water (Hydrophilous). The greatest number of seagrass species are usually found in areas characterised by sandy-muddy substrate and moderately protected from wind and waves.

Seagrasses are concentrated in the Indo-West Pacific and the Caribbean and the Pacific Coast of Central America. East Asia has the most highly diverse seagrass flora in the world (Fortes, 1988).

- **OH 2.1.5 Map of seagrass distribution in South East Asia**

Dense meadows of seagrass cover large areas of coastal waters and perform a wide spectrum of biological and physical functions in the marine environment. Seagrass meadows provide a sheltered, nutrient rich habitat for a great variety of animals. They are nursery grounds for commercial prawn species. They are also sheltered habitat for a number of juvenile open ocean and reef fishes. Many molluscs and crustaceans feed on the decaying matter in the sea grass meadows, while grazing animals, such as dugong and turtle, feed on sea grasses directly (Lanyon, 1986).

Seagrass meadows allow animals to migrate between the near shore, mangrove systems to the nearby reefs and offshore. The meadows trap nutrients and waste washed in from the land and they contain erosion in shallow waters. The seagrasses also clarify the surrounding water, reducing its turbidity and making life easier for filter feeders and coral reefs (SOMER, 1990). Because of their strategic position between coral reefs and mangroves tropical seagrass meadows are effective buffers, reducing wave energy and exporting nutrients to nearby ecosystems.

The fundamental role of seagrasses was revealed dramatically in the 1930s when the "wasting disease" threatened to eliminate eelgrass, (*Zostera marina*). This disease killed over 90% of the North Atlantic eelgrass population. Scallops,

clams, crabs and many fish species suffered from the loss of protective habitat and from sedimentation and erosion resulting from the loss of the eelgrass root systems which anchored the bottom sediments. In North Carolina, the commercial scallop fishery crashed and many species of ducks and geese were severely affected. The American brant nearly vanished from the North American flyway. Currently, there is some concern about a similar phenomenon occurring in the South Eastern coasts of the United States of America (Fortes, 1995).

Seagrass meadows are extremely important for coral reef ecosystems. In the topics most coral reefs are associated with seagrass meadows. The reefs and seagrass meadows combined could (currently) supply more than one-fifth of the fish catch in the associated countries. Five times as many fish live over seagrass beds as over sea floors made up of mud, shells and sand. In Cape Bolinao, 5 of the 104 species of fish resided in the seagrass beds all year round while 23 lived in the seagrass only seasonally or for a particular stage in their life history, 59 species were only found in seagrasses occasionally (Fortes, 1995).

Some species of reptiles and mammals are known to occur in seagrass beds of East Asia. Among the sea turtles are the green sea turtle (*Chelonia mydas*), the olive ridley (*Lepidochelys olivacea*), the loggerhead (*Caretta caretta*) and the flatback (*Chelonia depressa*) which are found especially in the seagrass meadows of Thailand, Malaysia, Indonesia and the Philippines. Dugong (*Dugong dugon*) are also found among seagrass meadows of South East Asia.

The high diversity of the seagrass ecosystem is probably due to its extremely high organic production rate. Seagrass can be more productive than the phytoplankton production off Peru, one of the most productive areas in the world's oceans. Seagrasses can produce two to four leaf crops annually and this level of production (which is comparable to cultivated crops) is achieved without the use of fertilisers and modern cultivation techniques.

TRAINING SESSION 2.1

CASE STUDY 1

Australia's Great Barrier Reef: A Coral Reef Case Study

The Great Barrier Reef (GBR) is the world's largest system of corals and associated life forms. It covers an area of about 350,000 square kilometres on the Australian continental shelf. The GBR stretches for almost 2,000 kilometres along the north-eastern coast of Queensland in a complex maze of around 2,900 individual reefs. These reefs range in area from less than a hectare to more than 10 square kilometres. In the north the GBR is narrow and its eastern edge is marked by a series of narrow "ribbon" reefs. In the southern areas it broadens out and presents a vast wilderness of "patch" reefs (Kelleher, 1993).

The reef is home to a great diversity of living organisms. Six species of turtle are found in the region, approximately 1,500 species of fish, 500 species of coral, 4,000 mollusc species as well as sponges, anemones, whales and dolphins. The GBR may be the last place on earth where dugong, an endangered species, are still common. The GBR is also a breeding ground for a variety of migratory tuna and the islands are inhabited or visited by over 242 species of birds. This great diversity of life forms reflects the mature development of the ecosystem over millions of years, giving the reef considerable scientific importance.

The value of reef-dependent activities (on the reef and on the adjacent mainland) approximates AUS $1,400 million per annum. These activities include commercial fishing and tourism, recreational fishing, diving, camping, traditional fishing, scientific research and shipping. Oil drilling is prohibited throughout the region while mining is prohibited in the GBR Marine Park which covers 98.4% of the region.

Resort tourism is the largest commercial activity in economic terms. In 1986/87 there was an estimated 162,000 visitor trips resulting in 1,018,000 visitor nights spent on the 24 island resorts. The visitors spent around AUD$175.6 million at the resorts.

The popularity of the reef and adjacent coast region as a tourist destination increased forty-fold over the period from the 1940s to 1980 and continues to increase. Accommodation establishments have been built directly on reefs and wave-piercer catamarans provide day trips to islands and outer reefs for up to 400 people per boat-load.

Conflict exists between reef users. Some wish to use reef resources to the disadvantage of others, while some believe the reef should be maintained in its

pristine state. Bottom trawling for prawns, for example, has reached levels which may be fully exploiting the productive capacity of the system. Run-off from islands and the mainland contains suspended solids, herbicides, pesticides, nutrients and other materials. The effect of these possible contaminants is being studied.

In 1975 the Australian Federal Parliament enacted the Great Barrier Reef Marine Park Act. The Great Barrier Reef Marine Park Authority (GBRMPA) was established under this act. GBRMPA's goal is to "provide for the protection, wise use, understanding and enjoyment of the Great Barrier Reef in perpetuity through the care and development of the Great Barrier Reef Marine Park." To achieve this goal a series of zoning plans is used to manage the competing uses in the marine park (see Module 1.2).

The overall annual cost per unit area for the Authority to fulfil its functions has decreased from $AUD268 in 1981-82 to $AUD51 per square kilometre in 1986-87. These costs include expenditure on education, research and monitoring, planning and implementation, management and supervision and routine administration. On the basis of day to day management costs alone, since 1981 it has cost Australia on average $AUD26 per square kilometre to protect this unique resource (UN, 1990).

TRAINING SESSION 2.1

CASE STUDY 2

The Management of Matang Mangrove Forest Reserves in Peninsular Malaysia

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In DARUS, M.b.Hj.M. and HARON, b.Hj.A.H. 1989. *The management of Matang mangrove forest reserves in Peninsular Malaysia.* p. 77-84. In T.-E. Chua and D. Pauly (eds.) *Coastal area management in East East Asia: policies, management strategies and case studies.* ICLARM Conference Proceedings 19, 254 p. Ministry of Science, Technology and the Environment, Kuala Lumpur; Johore State Economic Planning Unit, Johore Bahru, Malaysia; and International Center for Living Aquatic Resources Management, Manila, Philippines.

Abstract

Since 1950, the Matang mangrove forests in Peninsular Malaysia have been managed, partly or wholly, under a sustained-yield basis particularly for the production of fuelwood and poles. Initially, the forests were under systematic management in the form of a 10 year working plan with a 30-year rotation. Lately, emphasis has been given to managing the forests for the sustained production of edible marine life resources as well. Mangroves have been regarded as a significant contributor to the fisheries industry and to the socioeconomic development of the coastal communities. Priorities in the management of mangrove forests should be considered wisely as there are many socioeconomic benefits that can be provided by them. The impact of the activities of all mangrove users on one another must be critically and objectively evaluated and the results applied to improve the multipurpose management of these forests.

Introduction

Mangrove formations are a major feature of many tropical and subtropical coasts. Although they cover a relatively small surface area, mangroves form a prominent forest type and display a distinct structure.

In Peninsular Malaysia, 95% of the mangrove forests, which henceforth will be referred to as "mangroves," occur along the sheltered west coast and the southern tip of the peninsula, in the states of Kedah, Perak, Selangor and Johore. Along the exposed East Coast states, only small patches of mangroves occur at small tidal estuaries in the states of Pahang and Terengganu. Out of the total

area, more than 82% is considered productive in terms of timber production and most of these are in forest reserves.

Mangroves are considered valuable, both economically and ecologically (Noakes 1952, Haron 1981). Apart from producing timber for fuelwood, particularly charcoal and poles, mangroves are important in the sustained production of a number of commercially important fish, prawns, crabs, cockles and other aquatic resources.

This paper outlines the basic management system for the Matang mangroves and shows that, with proper management, these forests can remain economically viable and ecologically sound.

The Matang Mangrove Forest Reserves

The distribution and extent of mangrove forest reserves in Peninsular Malaysia are shown in Table 1.

Table 1. Productive and unproductive mangrove forest reserves in Peninsular Malaysia. (Anon. 1986).

	Productive	Unproductive	Total
Johore	16,754	6,929	23,683
Kedah	7,577	1,248	8,825
Malacca	227	111	338
Kelantan	-	-	-
N. Sembilan	808	327	1,135
Pahang	2,360	123	2,483
Penang	345	-	345
Perak	33,738	7,131	40,689
Perlis	-	-	-
Selangor	17,210	464	17,674
Terengganu	2,237	745	2,982
Total	81,256	17,078	98,334

The Matang mangroves are located on the Northwestern coast of Peninsular Malaysia, lying at latitude of 4°45'N and longitude of 100°35'E. This forest is the most extensive mangrove area in Peninsular Malaysia, representing more than two-fifths of the total mangrove forest area. It comprises 17 reserves, divided into 108 compartments. The total area, however, changes constantly through the continuing processes of erosion and accretion. The present estimated area of

Matang mangrove is about 41,000 ha. Of this, 93% is productive forest. The unproductive area of about 7,000 ha comprises mainly new accretion forest of *Avicennia* species (5,000 ha) and dryland forest (2,200 ha).

The species can be identified by their natural zones consisting, from the seaward side of the *Avicennia/Sonneratia* zone, followed by a *Bruguiera caryphylides/parviflora* zone, a *Rhizophora* zone and a *Bruguiera gymnorrhiza* zone (Watson 1928). The last zone is a relatively dry area usually covered with *Xylocarpus* and *Pandanus* spp.

However, since the beginning of the planned management period, the composition and structure of the Matang mangroves have changed to meet current demands and management objectives. More than 80% of the production forest now has at least 60% *Rhizophora* out of which more than 65% has pure *Rhizophora* stands. The remaining species include *B. parviflora, B. gymnorrhiza* and *B. cylindrica.*

Management

Objectives and plans

The general objective of the management of the Matang mangrove forests is the production of charcoal and poles on a sustained-yield basis. However, the specific management objectives are as follows:

1. to produce a sustained yield of greenwood for fuelwood, particularly charcoal, to meet local and export demands;
2. to produce quality poles for industrial use;
3. to protect and preserve the mangrove as habitat for marine resources and land-based wildlife;
4. to provide livelihood, employment and cheap building materials to the local communities;
5. to preserve sufficient areas for research and training in mangrove ecology and management; and
6. to conserve and protect the foreshores and riverbanks from strong winds, waves and tidal currents.

Management plans exist for the mangroves of Johore, Perak and Selangor although the Matang mangroves of Perak are the best managed. Indeed, these mangroves have been managed by the State Forestry Department of Perak since they were instituted as a forest reserve in 1908. Since then, the rotation age has changed four times, varying from 20 to 40 years. The silvicultural systems have also been changed: a minimum girth system of 30 cm diameter at breast height (dbh) was first tried and later superseded by the "mother trees system" to ensure that adequate seed trees were evenly distributed throughout the logged areas. Initially, the recommended number of standards was 25 trees/ha regardless of the presence or absence of natural regeneration. In 1925, this number was increased to 50 trees/ha in areas without natural regeneration.

The standards system remained in operation till 1940. From 1950 onwards, the rotation age was changed to 30 years, and a working plan was prepared for each

10-year period. For the first 10-year period (1950-1959), the working plan, the first complete working plan ever published - was prepared by Noakes (1952). The second 10-year plan was revised by Dixon and the third 10-year plan by Darus (1969). The first rotation ended in 1979 when the working plan for the second 30 year rotation was revised. The revision was undertaken by Haron (1981) for the current first 10-year period beginning 1980 to 1989. The current silvicultural system is a clear-felling system with the retention of 7 standard trees/ha.

Operations

Stand Age. In the Matang mangrove forest, the productive area is divided into three periodic blocks. Each block consists of about 11,600 ha of productive forest. The age of the stand is used as a basis for this division, each period having crops with age classes 21-30 years (Period l), 11-20 years (Period 2) and 1-10 years (Period 3).

A stand analysis showed that about 87% of the forest was 27 years old at the time of final felling (Haron 1981). The younger felling age is unavoidable and is mainly due to the controlled opening of the forest in the first half of this century, before the first working plan was formulated. Rehabilitation operations were also delayed in the early 1950s and this resulted in younger stands which were generally less than 30 years old at the beginning of the second rotation in 1980. A similar situation will occur in the second and third period of the current rotation is by virtue of the "carry-forward" phenomenon.

However, steps have been taken to achieve uniformity in the age of the stand, at least within each compartment. A uniform stand will facilitate and accelerate operation in the implementation of silvicultural treatments and record-keeping on the history of each compartment.

Rotation Age. The rotation is the time required for the trees to reach the size or volume that corresponds to financial maturity for the end-user. The rotation depends on the growth rate of the trees. For *bakau (Rhizophora spp.),* for example, which is used for charcoal manufacture at age 25 or less, a 30-year rotation is now considered sufficient to provide time for maturity, considering constraints in rehabilitation-operations. However, the rotation age for *bakau* has changed four times from 1914-1924, starting with 20 years, then 25 years, 30 years and again 40 years in 1924. In 1950, the rotation time was reduced to 30 years. This final figure was based on the mean annual volume increment of the trees in sample plots which indicated that growth of *bakau* species culminate at about 23 years, thus a shorter rotation age is preferred.

Allocation of felling areas

The Matang mangrove is divided into three periodic blocks, each to be worked within 10 years. The periodic blocks are located in three ranges, namely, Kuala Sepetang range, Kuala Trong range and Sungai Kerang range. Yield regulation in Matang is on an area basis and, due to a decline in the expected yield of 177 t/ha, the number of charcoal kilns has to be reduced. At present, the forest can support only 316 charcoal kilns with an allocation of 2.8 ha/kiln/year.

The productive forest available for allocation in Period I is 10,521 ha comprising 9,522 ha and 999 ha of charcoal and firewood coupes, respectively. The annual coupe is 896 ha for charcoal and 97 ha for firewood and a balance of about 590 ha as reserves for "topping-up" purposes when annual coupe areas have eroded or are considered naturally degraded.

Areas to be worked for firewood consist of the poorer quality forest with lower stand volume. In Matang, however, the so-called "poor" and "rich" forests of the pre-1950 period are gradually becoming indistinguishable as all areas were given similar postfelling treatments and tended to respond similarly when located in the same tidal zone. Each firewood contractor is allocated 4.8 ha of mangrove forest per year for supplying domestic firewood, particularly to the state of Penang.

Administration

Administratively, a District Forest Officer manages the Matang mangroves, with the help of an Assistant District Forest Officer. The three ranges are each headed by a Forest Ranger who has a supporting staff which include foresters, labourers and boatmen.

Silvicultural operations

Silvicultural operations in Matang mangroves aim to bring about a highly productive forest at minimum cost for the production of quality poles and greenwood for charcoal manufacture with due consideration of environmental protection and preservation habitats for marine and other organisms. The silvicultural system in practice is a clear-felling system with the retention of standards. The sequence of operations in the Matang mangroves is as follows:

Year	Operation
-1	i. Enumeration operations (4% intensity of all trees 8cm diameter and above) to obtain information on growing stock, species composition and assessment of premium to be charged for the licence area
	ii. Determination of the extent of inundation, dryland and disturbed forests
0	Final felling Trees of 8 cm diameter and above are clear-felled for charcoal and firewood using chainsaws. All species are utilised, namely: *Bakau kurap (R. mucronata)* *Bakau minyak (R. apiculata)* *Tumu (B. gymnorrhiza)* *Berus (B. cylindrica)* *Tengar (Ceriops tagal)* *Lenggadai (B. parviflora)* (for firewood only)

Seven good trees are marked for retention as standards for every hectare of a normal coupe. For coupes which border the rivers and seaface, a 3-m buffer for all trees above 8 cm diameter is left untouched to prevent or reduce erosion as well as for seed propagation.
Before the licence area is closed, the charcoal firewood contractor is required to girdle all non-utilised species such as *perepat (S. griffithii), berembang (S. caseolaris)* and *gedabu (S. ovata).*

1	Estimation of areas that need planting. A chemical spraying of Hexazinone (Velpar 90) is used to eradicate ferns *(Acrostichum speciosum* and A. *aureum).*
2	Enrichment planting with R. *apiculata* with 1.2 m by 1.2 m spacing and *R. mucronata* with 1.8 m by 1.8 m spacing. Planting is carried out, usually between August and December, if stocking of natural regeneration is less than 75%.
3	Inspection of all planting areas to determine survival rate; planting in areas where initial seedlings failed.
15-19	Thinning I, with a 1.2 m stick. This procedure consists of selecting one good tree, usually near the corner of the compartment or beside a riverbank, to be retained and all trees within a radius of 1.2 m from this tree are felled. Trees with a good structure are extracted as poles while malformed ones are left to rot on the forest floor.
20-24	Thinning II: The same procedure as in Thinning I, but 1.8-m stick is used.
30	Final felling.

Problems
Problems encountered usually involve administration and management. They are being tackled by the Forestry Department from time to time.

Determination of Rotation Age. A 30-year rotation period is practised in Matang mangrove forest, with two thinnings at years 15-19 and 20-24. About 57% of the available forest in Period I will be less than 29 years old. At the time of final felling, the crop age is 27 years (Haron 1981), and this results in smaller trees and lower yield. There have been suggestions to reduce the rotation age although this may also lead to smaller trees and lower yield. On the other hand, if the rotation is lengthened, the annual coupe will be reduced and this will affect the charcoal industry.
Regeneration of Residual Stands. More than 75% of the annual coupe require planting. The causes of failure of natural regeneration are not known even though there are enough seedlings on the ground prior to final felling. More studies are needed to monitor the progress of natural regeneration under different situations.
Weed Problem. It has been observed that when the forest canopy is removed following clear-felling, the seedling density of B. *parviflora (lenggadai)* , an inferior species, occurring in potentially good *Rhizophora* areas invariably increases.

Invasion by the *piai* fern (*Acrostichum* spp.), particularly in the drier areas, is also a serious problem. These ferns respond rapidly to full light, forming dense and almost impenetrable thickets up to 3 m in height. These ferns appear to effectively sieve out waterborne seedlings from creeks and rivers, rendering natural regeneration impossible. Thus, if no natural regeneration occurs within the thickets before final felling, regeneration will be inadequate, except for that from seed trees.

The Forestry Department has taken measures in the logged-over forest areas to eradicate the *Acrostichum* fern either manually or with chemicals. Spraying Hexazinone onto the fern thickets is an extremely effective chemical method of eradication. However, Hexazinone is now being restrained since it can also damage natural regeneration among the ferns and may adversely affect mangrove aquatic fauna. Eradicating unwanted weeds, therefore, still remains a problem.

Erosion. Most of the year, the Matang mangroves are exposed to windstorms especially during the *sumatras* which reach velocities of over 80 km/hour. Though short-lived, these storms, together with strong waves, have caused serious damage to the mangrove forests particularly in areas fronting the coastline, resulting in coastal erosion. The net losses are small, as newly accreted areas of more than 3,000 ha have been formed, largely replacing the good forest stands which have eroded. Attempts to accelerate natural succession by introducing *bakau* species are being carried out.
Pest. Mangrove reforestation must also include the resolution of this resource's pest problems. In some areas in Matang, crabs are such a menace that normal planting of naked seedlings is impossible. Potted seedlings are being planted to offset crab attack.

Conclusion
Mangrove forest management has found a niche in Malaysian forestry. Mangroves contribute significantly to the socioeconomic well-being of the local communities who depend on them for fuelwood, poles and the like, and for income. Mangroves also play an integral and vital role in maintaining catches of fish, shrimp and other seafoods.

As a renewable resource, mangroves can be managed on a sustained-yield basis. The management system that has been developed and practised has been successful. Mangroves have vital functions and should not be regarded as wastelands or dumping grounds or converted to other uses for quick monetary gain. Such conversions upset the ecosystem and the stability of the remaining area.

It is hoped that with existing expertise in mangrove forest management coupled with research, the management of Matang and other mangrove forests will be further improved so that maximum benefit can be derived from them.

SESSION ACTIVITIES 2.1

- Ask participants to make a comprehensive presentation about their region with a detailed description of the area(s) where they regularly work. It is important to advise participants before they arrive at the course that they will be expected to make this presentation so participants can bring the appropriate materials, slides, maps, posters, props etc.

- Ask participants to make a map of the region they are proposing to study. Place it in its national and international context. Describe the influences of major current and weather systems on the region.

- Locate the main ecosystems of the area ie. major watersheds, mangroves, seagrasses, coral reefs.

SESSION MATERIALS 2.1

- **OH 2.1.1** Major ocean currents in South East Asia
- **OH 2.1.2** Coral Reefs of South East Asia
- **OH 2.1.3** Mangroves in South East Asia
- **OH 2.1.4** Mangrove Food Chain
- **OH 2.1.5** Seagrasses in South East Asia

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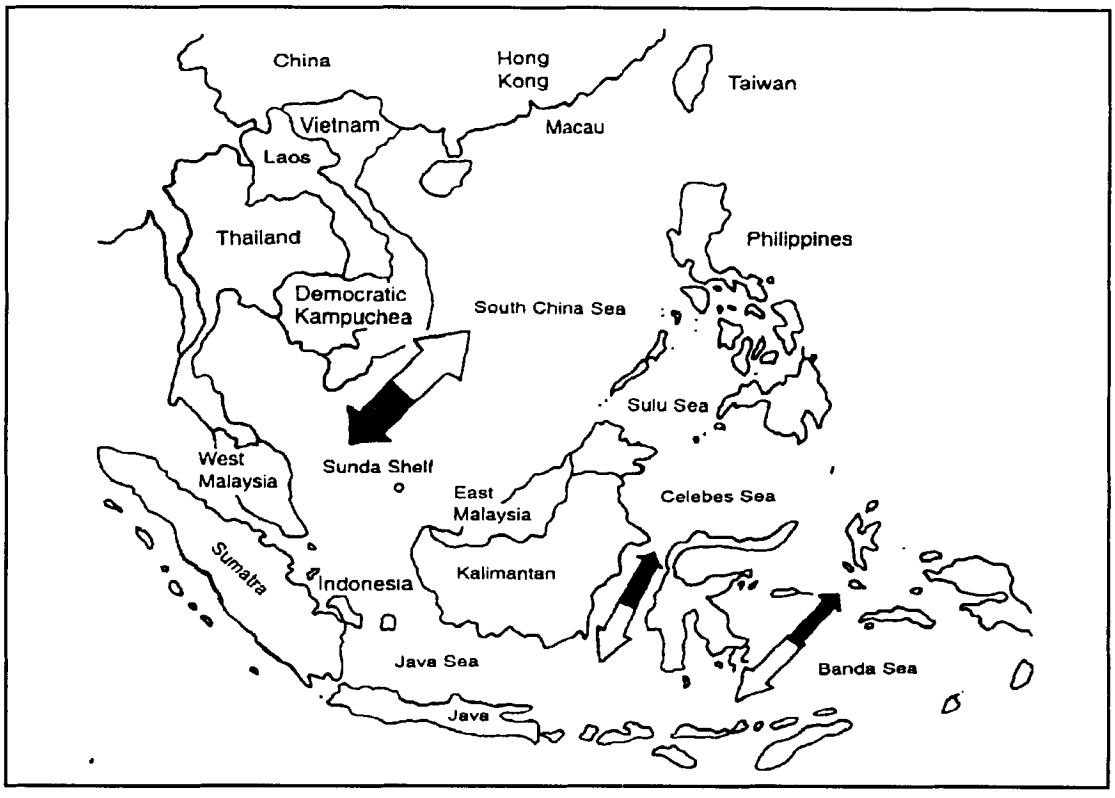
Major current patterns in Southeast Asia during Southeast (dry) and Northeast (wet) monsoons

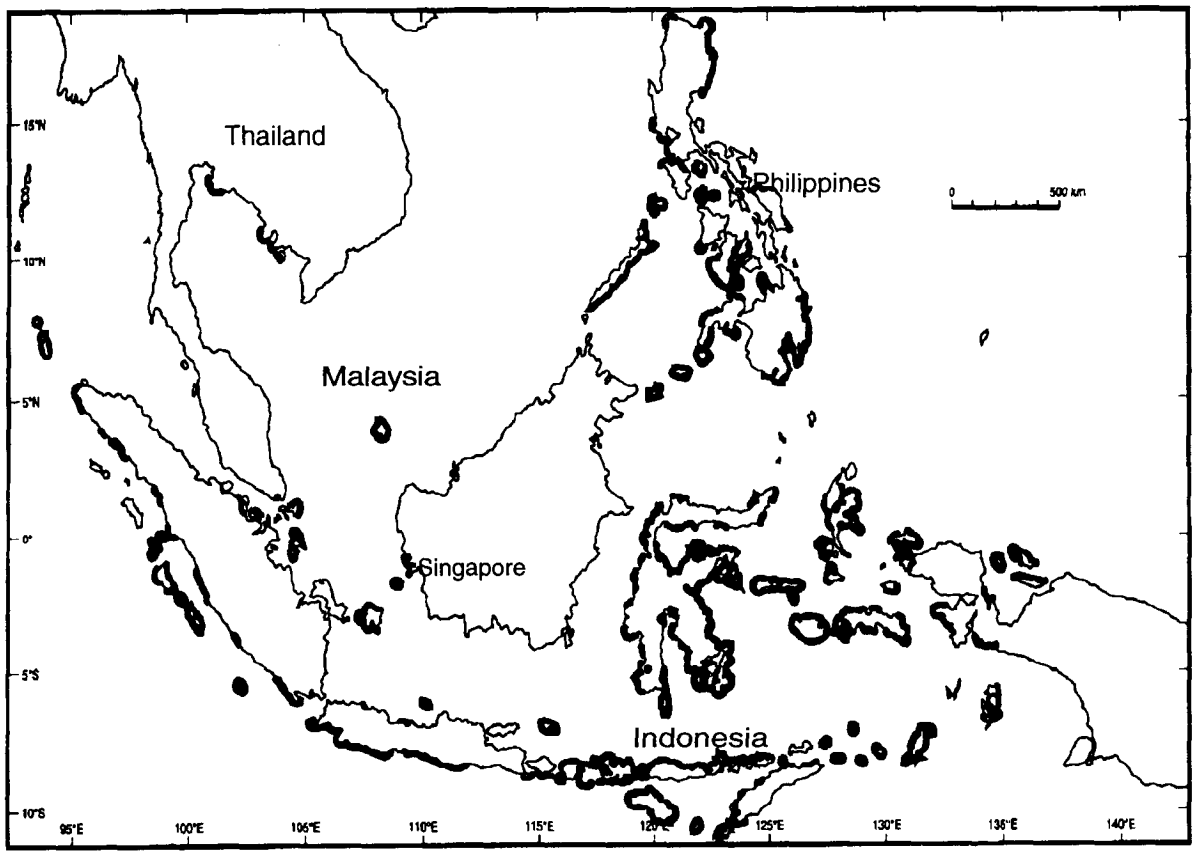


SW monsoon currents

NE monsoon currents

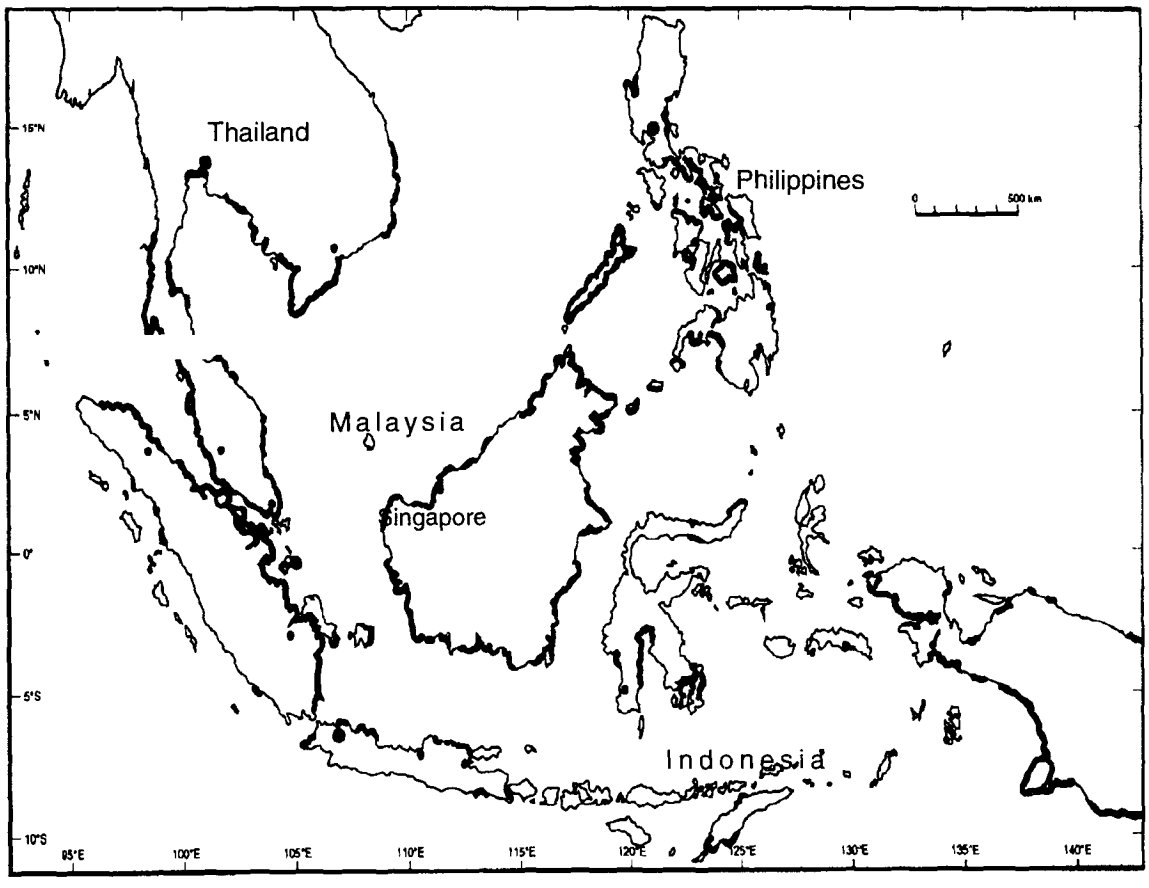
Source: Wilkinson, C.R. May 1994. *Living Coastal Resources of South East Asia: Status and Management*, Chulalongkorn University, Thailand

Coral Reefs in South East Asia



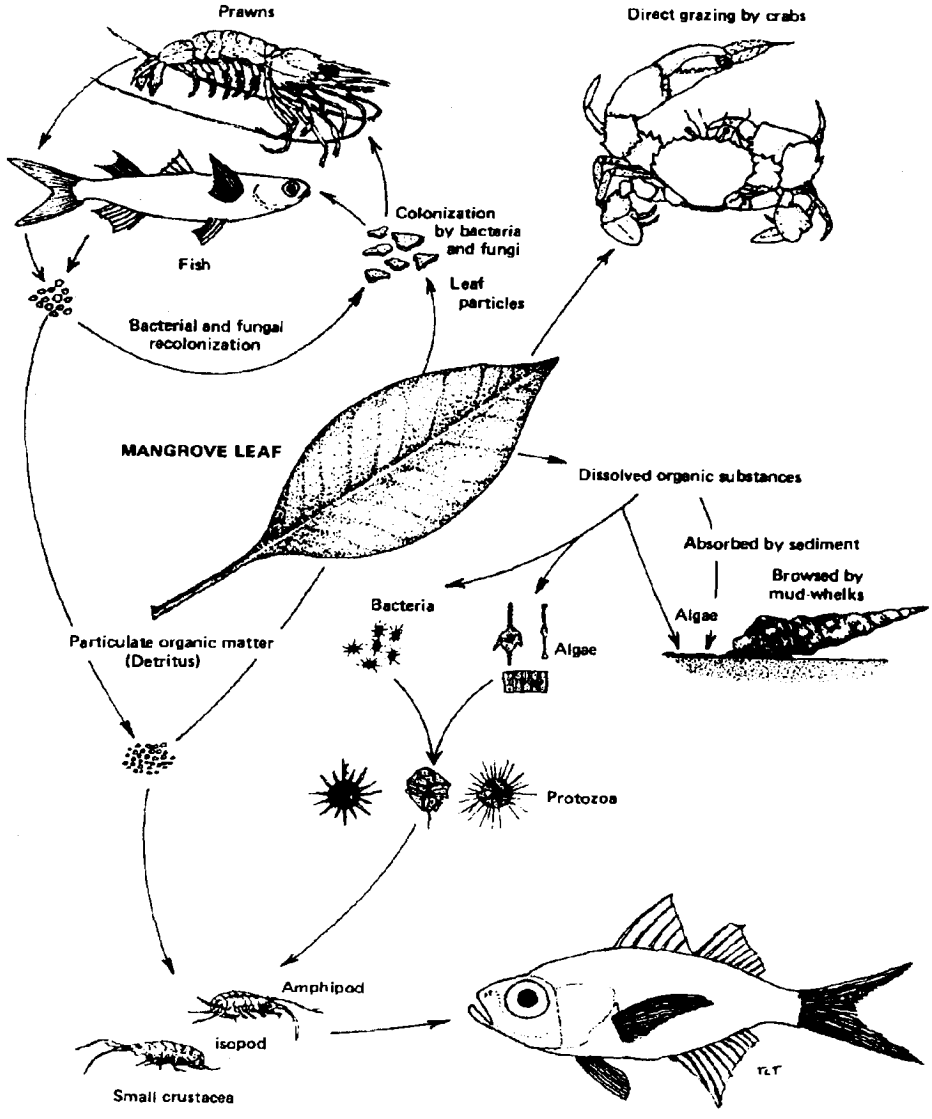
Source: Wilkinson, C.R. May 1994. *Living Coastal Resources of South East Asia: Status and Management*, Chulalongkorn University, Thailand

Mangroves in South East Asia

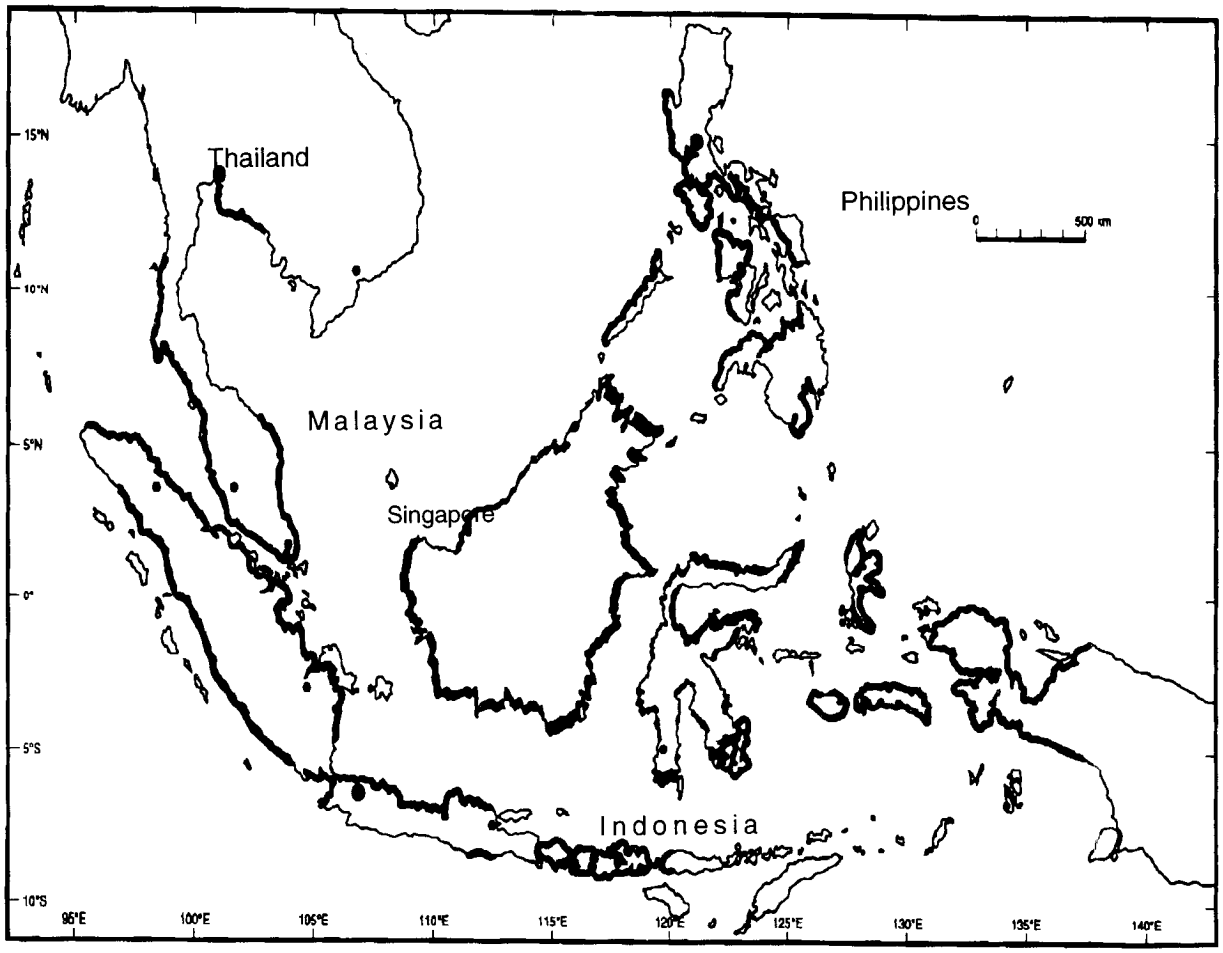


Distribution of Mangroves in the South East Asian Seas Region
Source: Wilkinson, C.R. May 1994. *Living Coastal Resources of South East Asia: Status and Management, Chulalongkorn University,* Thailand.

Mangrove Food Chain



Seagrasses in South East Asia



Source: Wilkinson, C.R. May 1994. *Living Coastal Resources of South East Asia: Status and Management*, Chulalongkorn University, Thailand

MODULE	**2.** **What is the Coastal Zone?**
TRAINING SESSION	**2.2** **Processes of Significance**
OBJECTIVE	To examine the differences between ecological processes between marine and terrestrial environments.
SIGNIFICANCE	Environmental management practices are based on terrestrial systems. To manage marine environments the managers must be aware of the significant differences between the two systems and the need for equally different management strategies.
PRESENTATION	Lecture, presentations by participants, field trips
TIME	One day minimum
EQUIPMENT	Overhead projector, blackboard or whiteboard, slide projector, field equipment as outlined in the exercises below. *Advise people before they arrive that they will be expected to make a presentation about their region and can bring slides, maps, posters, props etc.*

TRAINING SESSION 2.2

PROCESSES OF SIGNIFICANCE

Author: Richard Kenchington

INTRODUCTION

Welcome participants to the session and explain that they will be discussing the interconnectedness of the coastal zone systems and its relevance to management.

SESSION CONTENT

- Discuss the concept of managing for a terrestrial environment versus a marine environment. Use slides and overheads to illustrate your points about the differences between boundaries and biological communities in the sea and on land.

The management of human activities has developed over millennia of experience on the land and coastal fringes of the sea. These terrestrially derived concepts of space, separate entities, natural boundaries and the dynamics of natural systems can be inappropriate or irrelevant when applied to the sea.

On land, we are used to the concept of biological communities associated with sites bounded by identifiable and often distinctive geological features such as rivers, mountains, the sea, the extent of a catchment, or the occurrence of a particular soil type. Generally, such biological communities can be considered as two dimensional and mostly site-attached; a layer of soil with interacting animals and plants on or within a few metres of the land surface. In the third dimension, the air column above such sites is a neutral transport medium enabling passive distribution or transport of pollen, spores, seeds, and drifting or flying animals but providing no nourishment or sustenance. Plants and animals cannot grow, feed and reproduce without using resources formed on the surface or generally, without direct contact with the surface.

In the marine environment precise, permanent geographic boundaries that contain or separate biological communities and processes are rare. The third dimension, the water column above the seabed, is active. It nourishes and sustains communities of plants and animals. Some drift or swim perpetually; others are the planktonic spores, eggs and young of most of the species whose adult forms settle on the substrate. Above the essentially two-dimensional community of the seabed is a three-dimensional water column containing its

own communities and the elements of many seabed communities. The water mass above an area of sheltered, sandy seabed is likely to carry the genetic material, spores, and larvae for a range of communities whether rocky, sandy or mud substrate, exposed or sheltered, shallow or deep.

The water mass is rarely static. It moves with the wind, with the tides and with residual currents. As it moves, its biological communities change with the biological processes of photosynthesis and respiration, the feeding, excretion, and death of grazers and predators, the birth and development of larvae from newly discharged eggs and sperm, and the settlement of mature larvae. The chemical nature of the water mass alters continually. It may gain nutrients from ocean/atmosphere interactions, runoff from land masses, deep ocean upwellings, and bacterial breakdown of detritus. It may lose them as they are absorbed by plants and animals or as they are absorbed onto the surface of particles that settle onto benthic sediments.

The effects of the movement and variation of major currents can be spectacular. If a warm current intrudes into an area usually occupied by a cool water mass, it will bring subtropical and even tropical forms. Larvae may settle and mature to adulthood, displacing cooler water forms. Fish fauna may change dramatically, as is the case with the sardine/anchovy shift in Peruvian waters. These water current changes and reversals may be catastrophic to the established fauna and flora, but they represent opportunities for intruding species.

The biological communities expressed in the water column on and above a point in the seabed may be regarded as dynamic and four dimensional. At any point of time they represent the horizontal and vertical integration of upstream events in the water mass over a variety of scales of space and time, most of them vastly different from any comparable situation on land.

- Discuss and illustrate with slides the connectivity of marine versus terrestrial communities.

The linkages of the active water column lead to fundamental differences between terrestrial and marine environments. We are used to the daily and seasonal processes of nutrition and growth being largely site-related on land. The energy of sunlight is fixed by plants, which are directly or indirectly attached to the substrate. Most animals move in search of food.

Most plant nutrients are obtained from the soil locally or from materials borne from a limited upstream catchment. Energy and nutrients, thus fixed, may be moved considerable distances by displacement of seeds, insects, and birds blown by the wind. They may also be borne away and dispersed by a flood, or released to the atmosphere as smoke from a fire. There are major migrations of birds and large mammals that transfer energy stored in a rich feeding season in high latitudes or seasonal grazing lands. Nevertheless a major part of the biological products resulting from photosynthesis remain at or fairly close to the point of production.

To a considerable extent, the biological processes occurring within a geographic unit on land are self-contained. Unless adjacent sites are related in a drainage catchment, or on a significant migration route, they are not likely to be closely interlinked. The transfer of materials between sites in different catchments was rarely a substantial issue in terrestrial environment management until the phenomenon of acid rain became apparent.

In the sea, most photosynthetic fixing of the energy of sunlight is carried out by the drifting plant cells of the phytoplankton. These plants and many of the animals are effectively part of the water mass. They move with it and within it. The communities that are attached to the substrate depend upon the moving water mass to bring nutrients and food to them. Massive transfer of materials between sites is a basic process of marine community dynamics. Isolated sites are the exception rather than the rule. Over a large area affected by a particular water mass, the same or very similar benthic communities are likely to occur wherever appropriate conditions of geological substrate, water depth, and shelter coincide. Such locations may be many miles apart, but the communities they support are likely to be genetically very closely linked.

- Discuss the unique nature of the intertidal environment.

The most familiar marine environments are those of the margins of land that are atypical in that they face many of the problems of terrestrial existence. In many parts of the world there are rich intertidal communities of attached plants and animals and of dependent free-living animals. Familiar as they may be to coastal humans, intertidal communities contain exceptional marine species that are able to cope with problems that do not arise for fully marine species. Their environment changes as the tide rises and falls. When the tide is in, they benefit from a rich environment with high levels of nutrients and light in which plants flourish. Food chains of animals are supported by the attached plants and by detritus and organic matter from land. When the tide is out, these communities share with terrestrial plants and animals the need to solve the problems of desiccation, temperature shock, disposal of metabolic wastes, exposure to solar radiation, and occasional inundation by freshwater, often with accompanying loads of silt, from rain storms or coastal runoff.

Shallow subtidal communities can also be superficially and deceptively similar to the terrestrial environment. High light levels and stable areas of the seabed support attached photosynthetic communities; forests of algae, meadows of seagrass or coral reefs. These in turn support grazing animals. They function in a manner similar to the terrestrial norm of moving animals supported directly or through predation by fixed plant communities. They also contain species that function according to the norm of the fixed or free-living forms of the deep seabed and water column which take their food from the plankton and suspended detritus of the water column. Despite similarities to those of terrestrial environments, most species in the biological communities of intertidal and shallow subtidal generally have reproductive strategies similar to those of other marine environments.

- Discuss reproductive strategies in the sea.

For most species in the relatively benign environment of seawater, parental investment in an individual larva extends no further than a small amount of metabolic energy for the larva to develop to a point at which it can feed itself within the planktonic community. Many species appear to have behavioural or physiological adaptations to coordinate spawning to increase the change of eggs being fertilised. Beyond this, the reproductive strategy is to maximise the numbers of eggs and sperm discharged into the plankton. Many, often millions, of eggs are produced by females of species that have planktonic larvae. The resulting larvae drift in the water column taking their chance of being fertilised by a coincident sperm and drawing their metabolic and developmental needs from materials dissolved in or supported by the surrounding water. As they drift and develop, the young are transported by the water mass. A minute proportion survives to be carried to an area suitable for adult life.

- Compare with reproductive strategies on land.

In contrast, most terrestrial plants and animals devote substantial energy to producing relatively few large seeds or yolky eggs which can function as energy reserves and survival capsules until the young reach a stage at which they have a reasonable chance of surviving. Many species have elaborate physiological and behavioural mechanisms, such as dormancy, viviparity or parental brooding and caring behaviour to protect their young and to ensure that the next generation has a reasonable chance of finding a habitat or environment suitable for adult life.

- Highlight the management implications of these different reproductive strategies.

The problems of larval survival are compounded for terrestrial species where adult habitats are geographically limited and functionally separated from similar areas. The geographic isolation of such parent terrestrial communities can pose problems for genetic mixing with other communities of the same species. The harsh, isolated and fragmented environments of such species thus tend to favour adaptation, specialisation and reproductive isolation. Specialised terrestrial species are relatively common but they are vulnerable to extinction if their specialised habitat is destroyed or significantly modified by human activity. The endangered species endemic to a specialised habitat is a fact that is fundamental to much of terrestrial conservation philosophy. Conservation of rare and endangered terrestrial species is an obvious priority that can often be immediately addressed in relative isolation from the mainstream of human activity management by excluding incompatible human use from relatively small but clearly definable areas.

A few marine species, particularly some molluscs and fish, reproduce by caring for relatively small numbers of eggs or young rather than by planktonic larvae. Some of these may be endemic to specialised habitats. Marine-dependent species such as sea birds and secondarily marine air-breathing species, the marine

mammals and marine reptiles, care for their young and are particularly vulnerable when breeding on land or in known areas of sheltered and generally shallow sea. Such species present the same management issues and challenges as endangered species on land.

In contrast, marine species with planktonic or free swimming larvae are rarely site-dependent. The demonstrably endangered endemic species and its threatened habitat are rarely issues in marine conservation. Admittedly, the logistic difficulties of most marine studies have the effect that less effort has been put into species inventory in marine environments than on land, but it is remarkable that there are no records of apparent 20th century global extinction of a marine fish or invertebrate.

- Examine the issues facing managers of marine ecosystems.

The richness, relative permanence or regular seasonal recurrence of intertidal and subtidal communities at specific locations means that, where accessible, they are often prime sites for fishing and recreation. Their use by humans can be controlled in the same way as for terrestrial sites, on the basis of regulations applying to areas that may be precisely defined in relation to landmarks or specific points on the surface of the earth.

The combination of long linkages and the problem of large-scale studies in the marine environment means that it will rarely be possible to demonstrate that management control of a specific limited intertidal or subtidal area makes, or is likely to make, a specific contribution to the survival of any fish or invertebrate species. Such control can protect the human amenity values, such as recreational opportunities; reduce conflict between forms of use; set aside areas for contemplation and research, free from the influences of fishing or collecting and protect sensitive sites, such as known nursery areas for juvenile fish and invertebrates.

- Discuss the problems of scale as they relate to marine versus terrestrial management.

The movement of water masses and their associated chemical and planktonic characteristics may extend over vast distances. A planktonic larva carried for 28 days at a net speed of 1 knot will travel almost 600 nautical miles. A spawning or pollution event may thus have significant effects many miles from its point of occurrence.

In terrestrial environments, most ecological communities can be addressed by survey and management scales of 10^1 to 10^4 metres. These scales are generally appropriate for fixed or territorial components of intertidal and benthic communities but for planktonic species scales, of 10^4 to 10^6 metres are appropriate while for nektonic and migratory species scales of 10^4 to 10^7 metres apply. The range of life cycle strategies can dictate a range of scales. For many marine animals and plants a fixed phase produces gametes or propagules that

produce a larva that develops while it is transported in the plankton by ocean currents. Some, such as jellyfish, operate in the reverse with the planktonic sexual stage budded or discharged from a fixed asexual stage. A few animals and plants do not have a planktonic or pelagic phase and some pelagic or migratory species have specific breeding sites. Many species have no fixed or site-dependent stage in their life cycle. A benthic species that broods its young may be addressed by a small area. At the other extreme, a whale that makes annual migrations between Arctic and Antarctic must be addressed at a global scale.

- **OH 2.2.1** illustrates the geographic scales of plant and animal distribution in the sea in relation to the attached or territorial and the distribution phases of life strategies. It can thus illustrate the apparent scope of site-specific management strategies.

- **OH 2.2.1 Marine Life Cycle Relationships**

Type A. A fixed or territorial adult phase with a strategy, such as brooding, viviparity, or attached yolky eggs which does not involve planktonic larvae. Such species may have a limited adult and larval range. Site-specific area protection may be critical for species management in a strategy similar to the terrestrial national park.

Type B. A fixed or site-dependent phase with planktonic larvae or a large migratory range. The site may be a distinctive benthic structure or community, such as a coral reef, or it may be the nesting site for turtles and birds, the calving area for whales or spawning area for pelagic fish. In such a situation, site-specific protection contributes to species management and may address a critical life-cycle stage but it will generally need to be supported by more general measures over the range of the species concerned.

Type C. A limited adult territory and a planktonic larval phase - e.g. shore crabs, lobsters and territorial reef fish - or a nursery area (generally inshore) for planktonic or benthic larvae of species with a large adult range. Site-specific management is an effective approach where suitable areas for adult territory or larval nursery are limited, as may be the case for species that use estuaries, mangroves, coral reefs or salt marshes. Otherwise, species management is largely a matter of conserving processes and environmental quality throughout a significant proportion of the distributional range.

Type D. Pelagic or planktonic adult with planktonic larvae. Site specific management is unlikely to make a substantial contribution. Conservation and management are process related.

- Discuss the problems of information collection in the marine versus terrestrial environment.

The problem of the large scale of marine systems is compounded by the fact that field investigation in marine environments is seriously restricted by the aquatic medium. On land, a single researcher can spend days living in the study

environment achieving hours of direct on-site study by day or night. Through continued presence in relative safety and comfort, such a researcher has the opportunity to observe and record rare events and to appreciate the context of the interactions of the components of the studied environment. On the surface and unaccompanied, the observer can travel and observe on foot or by vehicle and can, unless obscured by dense vegetation or cloud, see objects hundreds of feet away and study them through binoculars or long-range camera lens.

Above the surface of the land, the observer can identify major vegetation types or count large animals from an aircraft. A wide spectrum of light wave lengths can be reflected from the land surface and recorded by aerial or satellite remote sensing. Remotely sensed data can be analysed to deduce a considerable amount of information on the extent and dynamics of catchment areas, surface slope, texture, soil type, biological communities and human impacts.

SCUBA diving has enabled humans to enter shallow marine environments and to observe a small part of them directly. But such are the limitations of the technology and human physiology that the diver is a transient and very temporary observer. A diver may be able to conduct *in situ* experiments with planktonic forms, but generally the planktonic plants and animals are of microscopic size not amenable to direct observation in the field. The diver is effectively restricted to limited observations of the essentially two-dimensional community of the shallow seabed. In a day, it is unreasonable to expect an observer using SCUBA equipment to make detailed studies for more than two periods of an hour or so. Observations can be made at night, but they often require more surface support than daytime operations. In any case, depending on the depth, prudent diving practice would still restrict the diver to a maximum of about 4 hours in a 24-hour period.

The aquatic medium greatly limits the capacity to make long-range or remote observations. In the clearest of water the maximum range of vision for a diver or a camera is about 60 metres. In many inshore waters the range of vision is usually less than 7 metres and rarely reaches 15 metres. Swimming energetically, or towed by some form of vessel, a diver, using SCUBA or snorkel equipment, can in an hour carry out a reconnaissance or superficial survey over a track of 2 to 5 kilometres by 5 to 10 metres.

The potential of aerial photography and satellite remote sensing are severely limited in comparison to terrestrial environments because the water column absorbs light, particularly in the shorter infrared to green wavelengths. In clear waters, there can be useful reflectance from the seabed beneath shallow water but this declines rapidly, with little reflected signal in depths greater than 15 metres. If the water column is turbid, as is frequently the case in coastal waters, the effective depth of vision is further reduced.

Considerable progress has been made in interpreting the limited data available within the capability of satellite remote sensing. It has been possible to prepare maps and to interpret physical conditions and probable associated biological communities of shallow seabed areas of the Great Barrier Reef Region and other

northern Australian waters. Despite this, the marine researcher and manager is generally faced with very large natural systems but is armed with a very limited capacity for reconnaissance and interpretation with which to target very limited capacities for detailed field investigation.

- Discuss different management scales in the marine versus terrestrial environments.

Any human lifestyle on land, with the possible exception of low level hunting and gathering, involves deliberate alienation and fundamental alteration of areas of originally pristine environment. This is done for purposes ranging from pioneer agriculture to urban and industrial development. The relative isolation or lack of interaction between sites has made it possible to deal with issues individually. Typically, human activities are regulated on the basis that a range of uses can be accommodated by subdividing an area or a resource and allocating sub-units for different purposes with, generally, little interaction between the subdivided sites. Problems or disputes generally occur on the scale of kilometres or tens of kilometres, so mechanisms to manage these can generally operate at the level of the local community or local government. They may become national government issues if there is a profound local disagreement or if a plan or actions at the local level appear to have significant broader political, economic, or ecological implications.

In the sea, the majority of uses are still at the level of hunting and gathering. Alienation and fundamental alteration of the environment of areas of the seabed or volumes of the water column have not been substantial issues until very recently. Now, mariculture, seabed mining, reclamation, tourism and some forms or trawl or dredge fishing can all alienate or alter areas of seabed. Pollution can modify the water column. Some aspects of activities may be regulated by subdividing areas and resources and allocating sub-units for different purposes. Nevertheless, such are the linkages in marine systems that there may be substantial interactions over long distances. Problems or disputes are likely to occur on the scale of tens to hundreds of kilometres and to require resolution at the national or international level.

- Discuss alienation and perceptual hurdles faced by managers of marine systems.

A major difference arises from the fact that when humans pass through the air-water interface they are in an alien and mysterious environment. On land, it is easy to demonstrate the life cycle of many of the animals and plants. However, in the sea, the larvae of most species are microscopic and planktonic. The settled young are usually very well hidden and often have a form and habitat very different from their adult forms. The dynamics of populations of marine animals are complex for the marine ecologist. To the non-specialist, marine animals such as lobsters, barnacles, sea urchins and fish seem to materialise from nowhere and their numbers seem to fluctuate for no apparent reason.

The strangeness of marine animals is increased by centuries of anthropomorphic appreciation of the form and life histories of land animals. Folklore, song, and particularly stories and books for children, lead people to observe and admire land animals and plants for their beauty of form, their adaptations and their behaviour. Mammals and birds, in particular, inspire devotion, empathy, and strong popular support in the face of actions that might threaten them. In the sea, only whales, other marine mammals, turtles and seabirds inspire similar popular sentiment. They breathe air and care for their young. They operate on a basis that can be related to that of familiar land animals, although none of them is typical of the bulk of marine life.

Fish, worms, seastars, jellyfish, or scallops do not so easily evoke public empathy. They are cold-blooded; they can breathe in water which drowns mammals; most do not care for their young. In fact, to all intents and purposes, they do not appear to have young. In the English language, terms which describe many marine creatures have acquired pejorative meaning when applied to humans: cold-blooded, poor fish, spineless, wet, jellyfish, slimy, and slippery are a few examples.

- Discuss the implications of the differences between marine and terrestrial environments for managers.

The nature of many processes and problems in the marine environment may appear similar to those encountered in the more familiar terrestrial environment. Nevertheless, the scale, the interconnected nature, and the unfamiliarity of marine systems, make many of the management issues very different from those of most terrestrial areas. Known management problems are widespread. Most are caused by the impacts of badly managed human activities, particularly pollution, alienation, and over-exploitation in coastal and nearshore waters. These problems are amplified by increased human populations, new applications of technology in the use of marine resources and consequent increased demands.

- Summarise and discuss the management problems and issues covered in this training session.

    - Acquisition of information for planning and management is considerably more difficult, more expensive and more time-consuming than in terrestrial environments.
    - Management problems tend to become evident by gradual reduction of environmental quality or loss of opportunity for humans to use and enjoy aspects of marine environments in areas that are accessible.
    - Dramatic issues of global species endangerdness or extinction are rarely substantial factors in marine environment management and are unlikely to be so for species with planktonic larvae.
    - Because of the scale and linkages of marine environments, their conservation is more clearly a matter of broad-based management of human uses and impacts than is the case on land.

- The major aspect of any natural environment that can be managed is the impact of human activity. By intention or ignorance, human action can rapidly degrade or destroy the natural environment and its capacity to sustain the long-term economic, cultural and scientific needs of human society.
- The management of plants and animals, and their environments, involves the management of people.

Clearly, the basic requirement for marine environment and resource protection is the management of human use and impacts in very large areas. This generates two requirements. The first is for understanding of uses:

- the historic and current extent and impact of each use;
- the extent and likely impact of future use on the basis of user expectations;
- the interactions of the range of present and likely future uses;
- the apparent capacity of the system to sustain use;
- the options for management of each use.

The second is to persuade users that their long-term interests will be served by management of the marine environment. If the people closest to the marine environment do not or cannot economically afford to accept the need for management, it will either fail or be extremely costly to enforce.

SESSION ACTIVITIES 2.2

- Ask participants to discuss their experiences in marine versus terrestrial management issues, emphasising the differences and similarities between managing in the different environments.

- Ask participants to discuss the management of river catchment areas in their region, the information known about the catchments and how that may affect the coastal zone.

SESSION MATERIALS

- **OH 2.2.1 Four marine life cycle relationships relevant to marine area management.**

REFERENCES 2.2

Kenchington, R. A. 1990, 'Nature of Marine Systems Relevant to Management' in*Managing Marine Environments*, Taylor & Francis, New York, pp 28-39.

Marine Life Cycle Relationships

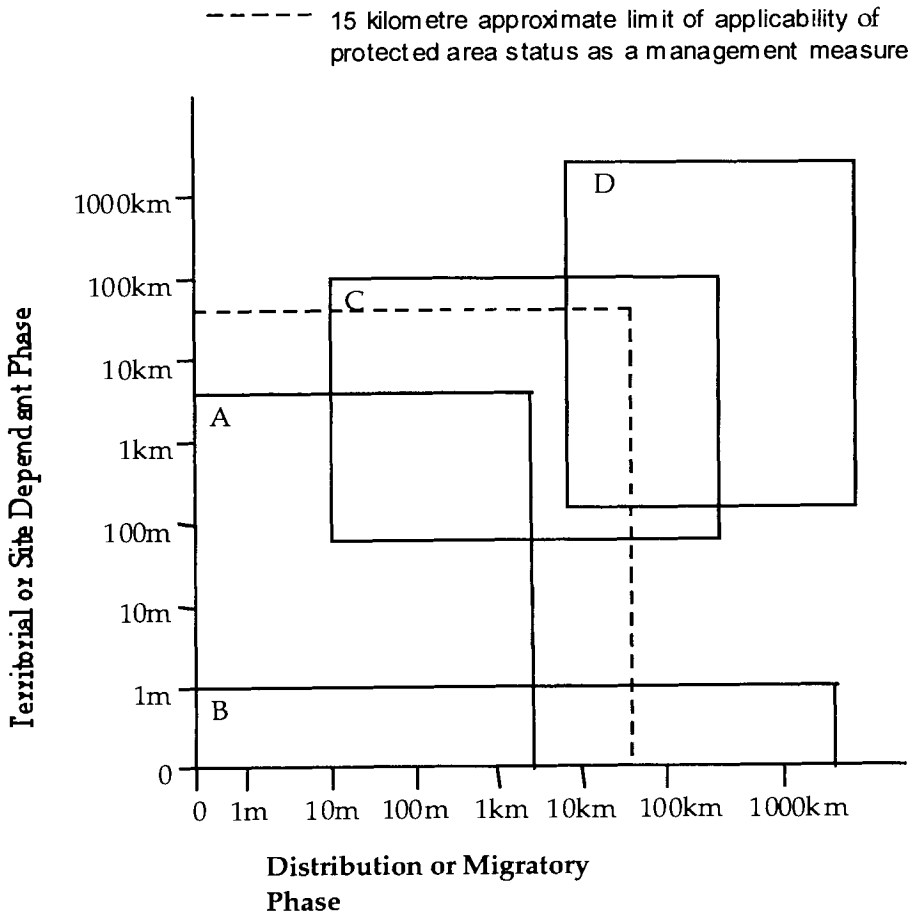


Diagram illustrating four marine life cycle relationships relevant to marine area management. A: Fixed or very restricted movement in the adult phase with no planktonic or pelagic larval or juvenile phase. B: One phase fixed, the other planktonic or pelagic. C: Limited territorial range of adult, extensive planktonic larval range. D: All phases pelagic or demersal.

Source: Kenchington, R. A. 1990, *Managing Marine Environments*, Taylor & Francis, New York.

MODULE	**2.** **What is the Coastal Zone?**
TRAINING SESSION	**2.3** **State of the System**
OBJECTIVE	To overview the state of the coastal zone in a number of ASEAN countries.
SIGNIFICANCE	Information about the state of the system is a useful management tool and participants need to know the kind of information available as well as future research requirements.
PRESENTATION	Lecture, presentations by participants, field trips
TIME	One day minimum
EQUIPMENT	Overhead projector, blackboard or whiteboard, slide projector, field equipment as outlined in the exercises below. *Advise people before they arrive that they will be expected to make a presentation about their region and can bring slides, maps, posters, props etc.*

TRAINING SESSION 2.3

STATE OF THE SYSTEM

INTRODUCTION

Welcome participants to the session and explain that they will be looking at the "state of the system" based on information from the Living Coastal Resources of South East Asia, Report of the Consultative Forum, May 1994.

As well as discussing the state of the system, participants are asked to look at the type of data collected and the recommendations for further research.

Participants will be asked to make presentations outlining the extent of information available about the state of the system in their regions.

SESSION CONTENT

- Explain that the following information is provided with permission from: Wilkinson, Clive. (ed) *ASEAN-Australian Symposium on Living Coastal Resources* (3rd:1994 Bangkok, Thailand). Consultative Forum. *Living coastal resources of South-East Asia: status and management report.* Published by: The Australian Institute of Marine Science.

The Living Coastal Resources Project is funded by AusAID under the ASEAN-Australia Economic Cooperation Programme. It is a collaborative regional effort to develop the scientific understanding and expertise for better management of our coastal resources.

The following summarises the state of coral reefs, mangroves and seagrass beds in Indonesia, Malaysia, the Philippines, Singapore and Thailand.

INDONESIA

Coral Reefs: The Indonesian island chain has about 17,500 islands with 81,000 km of coastline. These have probably the largest concentration and diversity of coral reefs in the world. The reefs contain at least 359 species of hard corals and many more species of coral reef fish.

Scientists from the Oceanology Centre of the Indonesian Institute of Sciences (LIPI) have concentrated on assessing the string of platform coral reefs and cays, Pulau Pulau Seribu, which stretch northwards from Jakarta Bay. The percentage of coral cover is declining and fishing activity is intense, including dynamite

fishing. Most (73.2%) of these reefs, which do not experience strong natural disturbances, have coral cover of less than 50%. Only 5.1% of the reefs on the zone of highest coral cover (at 3 to 10m depth) can be described as having excellent cover (>75%).

Surveys have also been conducted on reefs in Eastern Indonesia with 69% of the reefs surveyed having only fair cover (>50%) and 7% being in excellent condition. Most of these reefs are not impacted by pollution, with fishing pressures and natural disturbances causing most damage.

Fish on Indonesian coral reefs are being heavily exploited, with subsistence fisher catches on Pulau Seribu decreasing from 1350 tonnes in 1973 to about 100 tonnes in 1990. There is a distinct correlation between a decrease in percent coral cover and fisheries stocks, with both declining under human pressures.

The Government of Indonesia has instituted measures to protect some coral reef resources by declaring marine protected areas throughout the archipelago. Although 17 areas have been declared for protection, enforcement and management in most areas is insufficient or lacking such that more effort is required to conserve Indonesia's coral reef resources.

Mangroves: The Indonesian island chain has the world's largest remaining reserves of tropical mangrove forests with approximately 3.73 to 3.24 million hectares (depending on the methodology used to measure area). This is approximately 30 to 40% of the world's total. However, this is approximately 66% of the original mangrove area.

The Indonesian mangroves are predominantly concentrated in Irian Jaya and Maluku Islands (71%), Sumatra (16%), Kalimantan (9%) and Sulawesi (2.5%). The once large areas of mangrove forests fringing the main island of Java have been largely destroyed during development and for timber collection.

The Indonesian government is aware of the economic importance of mangroves for fisheries and coastal protection and the current rate of mangrove degradation. It has implemented a conservation strategy by declaring 17.5% of the remaining area as conservation forests and 25% as sustainable forestry areas. Much of the remainder, however, will be impacted during increasing development. Large areas of the forests on Java and Sulawesi have been removed to construct prawn and fish culture ponds (tambaks). More recently, large areas of mangrove trees have been removed for the export wood-chip industry, particularly to Japan.

Coastal fisheries are important in the Indonesian economy, contributing 2.27 million tonnes for local and export consumption, with much of this mangrove based. This amount is predicted to almost treble as the industry develops. Maintenance of the mangrove forests is seen as a vital component of this potential expansion.

The mangrove forests also contain some species threatened with extinction e.g. long tailed macauqe, proboscis monkey, estuarine crocodile, and many bird species that use mangroves as either permanent or migratory habitats.

Sea Grasses: The large continental shelf around the western Indonesian archipelago, creates ideal conditions for the growth of luxurious seagrass beds. There are also extensive beds on the narrower shelves around the eastern islands. It is probable that Indonesia has the world's largest resources of seagrasses, estimated at around 30,000 km^2, but this cannot be confirmed as few studies have been conducted to measure seagrass area. Certainly, this region shares some of the richest biodiversity with at least 12 seagrass species and over 300 species of fishes in the seagrass beds.

The main study area for scientists from the Indonesian Institute of Sciences is Banten Bay in far western Java, where recent industrial activities have resulted in losses of almost 80% of the seagrass beds. Disturbance by fishing boats has caused similar damage to the seagrasses on the coral reef flats of Pulau Seribu, to the north of Jakarta. Other study areas around Bali and Lombok show losses of seagrass cover.

Research has emphasised the rate of productivity of seagrasses and the transfer of this productivity into food chains and particularly into commercial species of fishes and prawns. Many of these species use seagrass beds as nursery grounds, which is a factor often ignored in management studies because the adults are caught in adjacent areas.

A major concern in Indonesia is the possible localised extinctions of dugongs and marine turtles, which feed extensively on seagrass beds. These are being threatened by hunting and destruction of the habitat, particularly in heavily populated parts of Indonesia. One of the largest constraints on seagrass conservation is a lack of recognition by decision makers of the ecological importance of seagrasses. Few senior managers realise that extensive losses in seagrass cover will result in major losses to commercial fisheries.

MALAYSIA

In the early eighties, an extensive survey was made of the islands off the coast of Peninsular Malaysia with the objective of establishing protective measures for coral reef habitats. This survey was undertaken on the directive of the Prime Minister of Malaysia. The survey resulted in the Government of Malaysia establishing the waters surrounding 21 offshore island up to 5 km offshore as fisheries protected areas in the interim period until appropriate management measures were instituted. With the assistance of the Great Barrier Reef Marine Park Authority and the UNEP East Asian Seas Programme, action was taken by the Fisheries Department to establish and implement management plans, including the drafting of appropriate legislation for the establishment of these waters as marine parks under the newly promulgated (then) Fisheries Act 1985. Management facilities and training of staff had been instituted for 5 Marine Park

headquarters established to manage these waters and their associated coastal and marine resources.

Since action was taken to establish these marine protected areas, mainly for the protection of coral reefs and the associated ecosystems, many management problems have emerged, namely:

- Although the legislation and regulations have been established, no action has been taken by the authority concerned to gazette them into laws. As a result, enforcement measures under these laws cannot be acted upon. Enforcement under the provisions of the Fisheries Act, mainly on fishing activities in the park waters, assisted to a certain extent to curtail illegal fishing activities.
- The islands and the terrestrial resources, including the foreshore and the superadjacent waters up to three miles from the coast, fall under the jurisdiction of the State Governments concerned, whilst the Federal Government which instituted the protection of these waters has jurisdiction over all marine living resources and the foreshore from 3 miles from the coast to the edge of the continental shelf and the superadjacent waters. Establishment of ICZM plans for the management of the coastal zone of these islands were therefore not possible without the consent and cooperation of the State Governments concerned. The inability of the State Government concerned to look at long-term gains in the protection of the marine and coastal resources as opposed to short-term gains from intensive tourism development with accompanying extensive development of hotels and golf courses, have degraded the coastal and marine environment in these waters and the destruction of the associated marine resources. The building of a golf course with the accompanying removal of the mangrove system on the island of Pulau Redang, east coast of Peninsular Malaysia, has caused extensive turbidity of the waters around the island and the destruction of a nearby, unique mono species stand of coral reef community.
- The inability of the authority concerned (lack of political, managerial and administrative will) to adhere to the management policies and guidelines established for the proper management of the waters of the marine parks has allowed the establishment of inappropriate tourist facilities in the marine park vicinity, adding to the adverse impacts on the coral reefs concerned. Priority is now given to promotion of tourism at the expense of appropriate management for the conservation and sustained use of the coastal and marine resources and the associated environment.
- The level of marine park rangers and their inability to comprehend the issues involved contribute to a certain extent to the poor management practices prevalent in these marine parks.
- The inability of the scientists and resource managers of the authority concerned to translate the training they had received for the proper management and monitoring of the marine parks into action in their real life situation has in some ways contributed to the poor management of the marine parks established (Kim-Looi Ch'ng, pers. comm).

Coral reefs: Coral reefs of Malaysia differ remarkably from those on the heavily sedimented west coast of the peninsular to the oceanic reefs off Sabah. The majority (64%) of reefs have fair coral cover dominated by the offshore reefs which have good coral cover. A total of 346 species have been recorded. The fringing reefs on the west coast have fair to poor coral cover because of the high levels of sediment in the water. Reefs on the east coast of Peninsular Malaysia have fair to good cover, except for the reefs of Pulau Tioman where intense tourism activity and the crown-of-thorns starfish have resulted in a decrease in cover. The reefs off Sabah have fair coral cover and those in the Spratly group have lower cover due to strong wave action and localised dredging activities.

More than 320 species of fish have been recorded on Malaysian reefs, with most species being on the eastern reefs. Coral reef fisheries provide from 7 to 35% of the fish landings in the west and more in Sabah (28%), but these probably underestimate the true proportion, as much of the catch does not reach the market. Fishing activity is generally not as intensive as other parts of Asia, however, there are instances of the use of dynamite and poisons.

The major increasing use of coral reefs is in the developing tourism industry, particularly featuring snorkelling and scuba diving. This is resulting in some damage through untreated wastes flowing onto the reefs and anchor damage from tourist boats. The major stress to coastal reefs, however, is through the massive increases in sediment loading in the waters as a result of extensive land clearing for agriculture and forestry. Some reefs in Sabah were mined for sand and rubble and this is apparently still happening although, the practice has been banned.

Mangroves: Mangrove studies have been a major component of studies within the LCR project in Malaysia. This research has been focussed within two universities: University Sains Malaysia (USM) in Penang; and University of Malaysia (UM) in Kuala Lumpur.

The mangrove forests are globally significant with the third largest area coverage of 647 thousand hectares, most of this in East Malaysia: 57% in Sabah; 27% in Sarawak.

Probably the world's best example of sustainable mangrove use in found on the west coast of Peninsular Malaysia at Larut-Matang. An area or 40,000 hectares has been managed as forestry concessions for about 80 years with no decrease in productivity and an active fishing industry based in and around the forests. Mangrove saplings are used as scaffolding and fishing stakes with the mature trees harvested after 30 years for charcoal production; this forestry industry is worth US$9 million per annum.

Although the scientists and resource managers of the National Mangrove Committee (NATMANCOM) have established guidelines for the management and exploitation of the mangroves these have not been translated into acceptable national or state government policies. Mangroves are therefore considered as

waste land and often expropriated at no cost for use by private/public sectors as land for urbanisation, shrimp aquaculture farms and agriculture purposes.

Matang Mangrove Forest is an example of how long-term economic benefits can be derived from the well-managed mangrove forest. In other areas, the conversion of mangrove forests has resulted in short-term economic gains, but acid sulphate soil conditions have led to a reduction in the productivity of the shrimp and aquaculture farms.

Sea Grasses: Studies into seagrasses have recently been re-commenced by scientists from the University Pertanian Malaysia. These studies have concentrated on documenting the 13 species of seagrasses present and their distribution in Malaysian waters. There are small areas of seagrass beds around Peninsular Malaysia, growing both in the muddy sediments of the west coast and the sands of the east coast. Many of these beds have been damaged through trawling activities, dredging for port access and land reclamation.

There are larger areas of intact seagrass beds in the eastern Malaysian states of Sabah and Sarawak, apparently associated with trawl fishery resources.

Several plans have been submitted to government for improved management of seagrass resources, however, little action has eventuated as these plans are based on inadequate baseline studies and a low research base.

THE PHILIPPINES

Coral Reefs: Coral reefs have played a strong traditional role in Philippine culture. Reefs fringe most of the islands and their fisheries provided up to 36 tons per square kilometre, whereas the degraded reefs now only provide 10 to 15% of this. In addition, reefs have provided much material for the curio trade and now live animals for aquariums. Unfortunately, many of these benefits are being devalued as the reefs are being damaged by human activities.

Scientists from the Marine Science Institute of the University of the Philippines and from Silliman University have conducted extensive surveys throughout the country and report that only 5.3% of their reefs have excellent coral cover, whereas 39% have fair and 30% have poor coral cover. These results are summarised from more than 740 different sites. While some of the damage to the reefs is due to the numerous typhoons that sweep across the northern islands, the persistent and long-term damage is a result of direct human stresses: over-collecting of corals and clams, destructive fishing practices like dynamite, muro ami and poison fishing. In addition, there are massive indirect human impacts, particularly sediment runoff from large scale deforestation and mining, sewage, agricultural and industrial pollution.

Coral reef research is particularly strong in the Philippines with the emphasis evolving from resource surveys and determination of the effects of damaging practices, like dynamite fishing, towards dynamic aspects of how reefs function and rehabilitation techniques. There has been a large scale project to culture

giant clams that have become virtually extinct throughout the country. These are now being re-established in the wild, as well as being farmed for commercial exploitation.

There are now extensive efforts from all levels of government to conserve and manage the coral reef resources. The Department of Environment and Natural Resources is pushing for the establishment of more protected and managed areas containing coral reefs. At the other end of the scale, there are excellent examples of direct management of reef resources by local communities in southern Negros. These schemes set aside approximately 25% of the reef resources as replenishment zones with the remainder available for controlled fishing, i.e. limited entry and user-controlled restrictions on damaging practices. These are now world models for marine resource management. Many of these activities are a result of research and training conducted under the LCR project.

Mangroves: The area of mangrove forest in the Philippines has been reduced by almost 80% in the past 70 years with most of the losses being caused by clearing for fish and prawn ponds, collection of firewood, and clearing for human settlements. The current losses of mangrove trees are about 760 hectares per year with direct losses to the economy of approximately US$1.7 million. These losses do not include reductions in fisheries productivity, which is based on the nursery ground function of mangroves. The Philippine mangrove forests are particularly rich in tree species (50) and fish (over 100 species).

The major efforts at assessing the importance of mangroves has been undertaken by the Silliman University Marine Laboratory in the south and the Marine Science Institute of the University of the Philippines in the north. They have detailed the significant nursery ground function of the forests by assessing the migration of fishes into and out of mangrove creeks and the export of mangrove materials into nearby feeding grounds. For example, the remaining forests in Bais Bay, Negros Oriental, export at least 17 tonnes per day, which is down from the estimated 66 tonnes that were exported from the original forests.

The Philippine Government has attempted reforestation of some degraded areas by issuing Certificates of Stewardship to local people and NGOs. This has shown limited success. The recipients have access to the firewood and increased fisheries of the areas, but the reforestation has shown only limited success.

Sea Grasses: The Philippines has large areas of seagrass beds and, in parallel, there has been considerable research on many aspects of seagrasses. Most of this has been conducted by the Marine Science Institute of the University of the Philippines and also at Silliman University.

Their research has documented many aspects of the 16 species and determined that the areas can be divided into pristine, disturbed, altered and emergent beds, depending on their state of health and the degree of disturbance. Human impacts include sewage and sediment pollution which causes a reduction in available light and smothering of the grasses. Dredging for port activities and trawlers also cause considerable damage and can reduce the number of species

dependent on seagrass beds. Disturbed beds have reduced productivity because of structural and pollution damage to the seagrasses.

Seagrass beds are also disturbed by storms and it is possible to detect signatures of past storm and other weather events (like El Nino Southern Oscillation - ENSO) in banding patterns in rhizomes or underground stems. Seagrass transplantation and the use of artificial (plastic) seagrass has improved considerably the biodiversity in a bay disturbed by the dumping of copper mine wastes.

Seagrass beds are particularly productive e.g. the beds in Calauag Bay contribute cycles of 1.8 million kg of dry leaves, possibly up to 14 times per year. These beds support large populations of fishes, particularly juveniles of 126 species. The most prominent of these are the rabbitfish (Siganids), which make up a major fishery from seagrass areas.

Management of seagrass resources is now extensive but fragmented (partly due to a lack of recognition of the economic value of seagrasses). This can be improved through better mapping of seagrass areas using satellite imagery and stock assessment in the field, determination of impacts that damage seagrass beds, accompanied by education programmes to minimise damage and measurement of the true contribution of seagrasses to prawn and fish catches.

SINGAPORE

Coral Reefs: The small coral reefs in Singapore are amongst the most stressed in Asia. Singapore is a major port and the island has undergone massive land reclamation. This has caused considerable deterioration in water quality. Corals that once grew to a depth of 10m are now only found in the upper 5m. Recent government activities have significantly reduced pollution from shipping and all sewage is now treated.

The Department of Zoology, National University of Singapore, has undertaken much research into the reefs and this information has been used to formulate proposals in 1991 to the Government for the designation of 4 areas as marine protected areas. These data are now incorporated into the Singapore Green Plan.

There are 197 species of corals and 107 species of fish on Singapore reefs, with the outer reefs having very high coral cover (approximately 70% cover). These reefs can constitute the basis for local tourism and education activities, if they are managed effectively.

Mangroves: There has been widespread destruction of the once flourishing mangrove forests during the development of modern Singapore with only 600 hectares present; 0.5% of the original forest area. Most of the forests have been cleared for industrial and domestic development as the area of the island state has been increased by 10%. Researchers at the National University of Singapore have little confidence that much of this remaining area will be conserved, except for a few hundred hectares in Sungei Buloh Nature Park. Its success has led to

the planning of another mangrove nature park in Khatib Bongsu. Mangroves on the southern islands are being cleared for industrial and tourist development and for use as a garbage dump and few will remain after the turn of the century.

Seagrasses: Singapore originally had relatively large areas of seagrass beds around the island. These have been drastically reduced following the large scale development of the island: land reclamation and dredging for port construction. The depth distribution of the seagrasses has also decreased due to large increases in the amount of suspended sediment in the water. The existing shallow water beds are disturbed by boat traffic and oil pollution from ships and industry.

The remaining patches of seagrass beds fringing the southern coral islands grow in shallow muddy to sandy sediments. A recent study by scientists from the National University of Singapore have identified 7 species of seagrasses, 13 species of fish and 23 species of molluscs that live within seagrass beds.

THAILAND

Coral Reefs: Coral reefs grow in 4 distinct regions of Thailand, but their formations and current health are quite different in each region. The reefs in the inner part of the Gulf of Thailand are heavily influenced by 4 rivers and proximity to the city of Bangkok. Therefore, reefs only occur on offshore islands in the eastern side because mangrove forests dominate the west. Most reefs, except those patrolled by the Thai Navy, show severe human pressures, particularly from fishing and tourism activities.

Further to the east, reefs occur on many offshore islands which have become the target for considerable tourism development. These reefs were once heavily damaged by dynamite fishing but now the most damaging impacts are due to uncontrolled tourism and the capture of live fish for aquarium export. Recent damage has been so severe on some reefs, which a few years ago had good coral cover, that they are now almost devoid of live corals.

To the west of Bangkok, there are many reefs on islands which are occasionally impacted by typhoons. All reefs close to land have been damaged by sediment and pollution runoff from the land. This area includes some rapidly developing tourism centres, such as Ko Samui, Pha-Ngan and Tao, with tourism numbers having increased from almost zero 15 years ago, to approximately 1 million per year. This increased activity resulted in considerable damage to the coral reefs with losses of cover of more than 20%. However, the tourist operators have formed an organisation to manage the reefs by installing permanent moorings, running education programmes and protecting some areas.

The Andaman Sea reefs are the richest in Thailand, with the spectacular reefs of the Surin and Similan Island National Parks and many reefs around Phuket. Reefs close to shore, particularly those around Phuket, are showing damage from sewage and sediment runoff from tourism developments. There is some conflict between tourism operators who have a conservation ethic and are attempting to implement sustainable management, and those after the 'quick buck'.

All Thai coral reefs are in need of effective management with a balance of areas for development, zones for common use and preservation areas. Fishing is still a prominent activity on most reefs, with the use of dynamite and poison still evident in some areas.

Around tourism centres, fishers are now converting their boats to carry tourists and this is increasing a local conservation ethic. This change is necessary as only 36% of Thai reefs are in good to excellent condition, with evidence in most areas of continuing degradation. The LCR project has provided much useful data to the Office of the National Environment Board, which has resulted in enhanced conservation measures being put to government in 1990, with the Navy and Harbours Department being responsible for enforcing the Fisheries Act.

Mangroves: The dramatic loss of more than 60% of Thailand's mangrove forests so alarmed the Royal Thai Government that they allocated US$30 million in 1991 for a 5 year plan to rehabilitate damaged areas. Recent losses have amounted to approximately 6,500 hectares per year over the last 30 years, particularly along the Gulf of Thailand coastlines, where massive areas have been cleared for prawn pond development. Unfortunately, many of the ponds in cleared mangrove areas have only a 5 year productive period because rising acidity from the peat rich mangrove soils destroys water quality. This declining productivity often means that new mangrove areas have been cleared to replace lost ponds. For example, around Samut Sakhon and Samut Songkhram to the west of Bangkok, more than 95% of the mangroves have been lost to prawn pond development, which have now virtually ceased production with great economic losses to both the prawn farmers and fishermen. Such areas are a major target of reforestation efforts by scientists at Chulalongkorn University.

Another recent development has been the declaration of the Phang Nga Bay National Park, east of Phuket Island. This area contains large areas of both intact and previously logged forests, which are the basis of a rich fishery further south in the bay, as well as a significant tourist attraction.

The losses of mangroves have also exposed coastlines to storm damage and this was particularly evident along the central coast of the western Gulf of Thailand, when Typhoon Gay caused massive erosion and damage to prawn pond developments in 1989, after the mangroves had been removed.

Major mangrove research efforts have been conducted in three Universities (Kasetsart, Chulalongkorn and Prince of Songkla), the Phuket Marine Biological Centre, and the Royal Thai Forestry Department. Themes have included tree productivity, nutrient recycling, export of mangrove organic matter, fisheries and methods of reforestation and regeneration of unproductive ponds.

Another major theme of research has been into aquaculture methods to improve productivity without further destruction of mangrove forests.

Seagrasses: The seagrass resources in Thailand occur in two ocean provinces: the Gulf of Thailand to the east and the Andaman Sea in the west. These beds are rich in biodiversity with 12 seagrass species and 67 species of fishes, including many of economic importance. These seagrass beds, particularly those in the Andaman Sea, support one of the last remaining populations of the threatened dugong and sea turtles.

Research undertaken by the Phuket Marine Biological Center has emphasised distribution and contribution to fisheries of seagrass beds in Phang-Nga Bay near Phuket. These beds are productive with a dry biomass of 1.2 kg m^{-2}, but degraded areas have much less. Damage has been caused by vessels operating in the beds, although they are prohibited from operating within 3 km of the coast. Pollution and sediment from the developing tourism industries of Phuket is also degrading the beds.

The Gulf of Thailand beds have been examined by researchers from Chulalongkorn University. Around Ko Samui, seagrass dry biomass is low on the west coast (max 16 g m^{-2}), but higher on the east (max 1.1 kg m^{-2}). The beds on the west are being damaged by tourism developments and pollution from the many prawn ponds on the coast in Ban Don Bay.

Amongst the sites studied, 40% were in pristine condition; 30% in good condition; with the remaining 30% in poor or degraded condition. Apart from restricting trawlers, the important measure to protect the seagrass beds is to control the nature of coast development to reduce the input of sediment and pollution. The economic and biodiversity value of seagrasses needs to be conveyed to decision makers and local fishers, probably through the activities of NGOs. Such activities have resulted in areas on the Andaman coastline being protected to conserve the last remaining populations of dugongs. Moreover, if fishers appreciate the value of seagrasses to their catches, they will restrict damaging practices, in favour of safer and environmentally friendly methods.

Summary

Coral Reefs: While South East Asian coral reefs are the richest in the world, their continued existence in this state is threatened by human activities. The LCR project has assisted in increasing the pool of trained and experienced marine scientists over the past 10 years. This expertise and the data they have collected are available to assist governments and the communities in implementing effective management of the coral reef resources. This is essential as the pressures on the reefs are increasing, with expanding economies, industries, populations and tourism developments.

Mangroves: While there has been massive losses of mangrove forests in the ASEAN region, most governments have attempted to reverse current rates of loss by outlawing many destructive practices and declaring large areas as both national parks and sustainable forestry reserves. The example of Larut-Matang in Malaysia should be used as a successful project for both extracting economic products, whilst retaining the ecosystem function of the mangrove forests.

Seagrasses: Seagrasses are one of the least appreciated living coastal resources of ASEAN, because little is known about them and they are less spectacular than either coral reefs and mangroves. Seagrass beds, however, are particularly productive and support major prawn and fish industries, as well as protecting large areas of coastlines from erosion.

TRAINING SESSION 2.3

CASE STUDY 1

Social Economic Impacts of Development Projects Pulau Redang, Malaysia

Author: A Rahim Gor Yaman

Introduction

This paper highlights the implementation of development projects by the state and federal governments, and how the implementation of these development projects has changed the social and economic environments of residents on the island of Pulau Redang in the state of Terengganu, Peninsular Malaysia. Development projects related to tourism, village settlement, road construction, agriculture and the establishment of a marine park are discussed.

Background

Pulau Redang archipelago, located within 5°44' to 5°50N latitude and 102°59' to 103°5'E longitude, is a group of 9 continental tropical islands. The largest island is Pulau Redang, with an area of 25 km^2, and located 22.4 km off the coast from Terengganu. Within 3 nautical miles to the north-east of Pulau Redang there are 7 other smaller islands. All of these are inhabited, except for Pulau Pinang, an island located to the south of Pulau Redang. The Department of Fisheries Marine Park Centre is located on the north-west tip of Pulau Pinang (Map 1).

Climate

Pulau Redang receives high annual rainfall, from December to February, during the North East Monsoon. The seasonal drought occurs from July to September.

Accessibility

Pulau Redang is accessible by boat only. The residents of the island still use fishing boats as the main mode of transportation. Visitors to the island, however, use passenger boats that operate from most coastal towns on the mainland. A plan to build an air strip has been mooted by the state government but to date, there has been no further action.

Natural Resources

Pulau Redang is blessed with rich natural resources: the tropical rainforest and the fringing reefs. In 1990, about 94.3% (20,250 ha) of the land on the island was a state forest reserve. The forest reserve consists of low hill forests (81%), beach forests (12%), and mangrove forests at 1.4%. The built up area covered 3% (75 ha) and was primarily the Kampong Redang site.

The island is known for its extensive fringing reefs which are comparatively better than other islands off the coast of Terengganu. Pulau Redang archipelago is home to more than 55 genera of corals. Approximately 100 fish species have been identified in the coral reefs.

Pulau Redang is a major green turtle *(Chelonia mydas)* nesting site. It was estimated that the green turtle makes up 90% of the nesting population on Pulau Redang, while 10% are hawksbill turtles *(Eretmochelys imbricata)* and olive ridleys (*Lepidochelys olivacea*). There are four nesting sites in the Pulau Redang archipelago, all of which are protected under state law.

Swiftlets (*Aerodramus maximus* and *A. fuciphagus*) nest in the caves dotted along the north-east coast of the island. The state government tenders the right to collect the swiftlets' nests through the village cooperative.

Jurisdiction of the island
The state government has jurisdiction over the terrestrial component of the island, while the federal government has jurisdiction over the waters around the island. Sea turtles are under state government jurisdiction, although these resources are managed collaboratively by state and federal governments. Marine park management is an example of federal initiatives conducted by the Department of Fisheries.

The Forestry Department, a state government agency, has jurisdiction over tropical forests and mangrove resources on the island. About 70% of the island is under state forest reserve.

Social Aspects

Population
Over 1,500 people were living on the island in 1987. The population is from the Malay ethnic group and practises Islam. A survey conducted in 1990 revealed that the majority of residents supported the move by the state and federal governments to provide a new settlement site, public amenities and to develop tourism projects on the island.

Public amenities on the island
Pulau Redang has a primary school, a mosque, a clinic, police station, public telephone and a post office. The school can accommodate 150 students and doubles as a community meeting place. The island has a limited water supply. The catchment is small, the bed rock is porous and does not retain much ground water. Even though there is a piped water supply to the village, water shortages are common during the drier months from July to September. Electricity was introduced in 1975, but was available only during daylight hours. In 1994, the supply was increased to a full 24 hours. There are 16 shops/family residences in the village. The residents received free education, medical care and water supply, and pay for their electricity.

Education
The education level of residents on the island is fairly low. A census conducted in 1987 found that 72% of the residents had primary education, an equivalent of 6 years of education. About 16% were without formal education. The school dropout rate was high during the transition between primary to secondary education. Secondary education is available at boarding school on the mainland. This probably explains why less than 12% of the population had secondary schooling.

Economic Aspects
The total estimated Gross Regional Product (GRP) of Pulau Redang in 1990 was RM$1693,000. The distribution of GRP according to sectors was: fishing and related industries 53.7%, tourism 12.9%, government services 9.5%, retailing 9.3%, agriculture 4.4%, transportation 3.5%, construction 2.9% and other services 3.8%.

Fishing
In 1987 more than 81% of island residents received their income from fishing. The average household income per capita was RM$380.00 per month (an average family comprised 4.97 members). About 34.2% (54) of the residents owned fishing nets and 43% (69) owned boats with inboard engines. The majority of the boats were small with inboard engines ranging from 16 to 22 horse power. Fishing gear included purse seines, gill nets, hooks and lines.

Collection of Turtle Eggs
Turtle egg collecting is a traditional activity on Pulau. Income from the sale of turtle eggs was estimated to be about RM$100,000 annually. This represents a substantial contribution to the economy of a small fishing community.

The state government tendered the right to collect turtle eggs on Pulau Redang annually. Every year, the villagers collectively pooled their financial resources to bid for the tender. This bidding process increased tender prices to a staggering amount which was beyond the financial capacity of the villagers. In 1985 the state government awarded the tender at a negotiated price to the local residents through the village cooperative. Since 1985, the state government has been providing proceeds from the tender to the Department of Fisheries to buy the turtle eggs at market price from the cooperative.

Tourism
The involvement of residents on the island in tourism-related activities was limited to the operation of one camping ground with less than 20 campsites. The residents were trained by state and federal government agencies about various aspects of the tourism industry but their involvement in tourism remains limited.

Government Services
Public servants are stationed on the island and work at the police station, clinic, marine park centre and school. The state and federal governments have given local residents priority when appointing people to positions based on the island.

Agriculture
In the 1970's, attempts were made to developed 200 ha for clove cultivation on the islands. After clearing 60 to 80 ha the project was due to unfavourable soil and climatic conditions. The title of the land under cultivation was not transferred to the local residents participating in the project. Failure of the project may, in part, have been due to the collective approach adopted by the programme as well as the fact that the fishermen on the island are not keen farmers and lack farming skills. Island residents own small, agricultural land holdings where they grow fruit such as mangos, durians, coconuts and rubber trees.

Retailing
The residential shops at Kampong Redang are food outlets for local people and visitors. This business is seasonal, with a low turnover during the monsoon season. Due to small visitor numbers and the difficulty of bringing supplies from the mainland.

Sea transportation
Few local residents are involved in marine transport. Unlike fishing boats, the passenger boats can only be operated by people with navigation and sea safety certification. Because the island residents do not generally have higher education they are unlikely to obtain the qualifications necessary to operate the boats and therefore are not included in the marine transportation business. Residents involved in this sector usually work as boat crews.

Development Projects

Settlement
First resettlement
The dates of first human settlement on the island are unknown. Before 1975, the were three centers of settlement along the coast. In 1975, due to the cramped living condition of these villages, the state government resettled all the inhabitants (220 families) to a new village of Kampong Redang. Built by the state government, this consisted of 236 wooden houses built on stilts. It was located on reef flat. The resettled fishermen were compensated by the state government, and lost their entitlement to the previous settlement sites.

The residents were given the choice of being relocated to the mainland or moving to Kampong Redang. Only 15 families (6.8%) chose to move to the mainland while the others chose to remain on the island and continue to fish. The relocation scheme did not reduce the number of people staying on the island.

Second resettlement
The state government has allocated an area at Kampong Ulu Redang to be a new resettlement site. Work on the village began in 1990. A 2 km road will be built to connect Kampong Ulu Redang with Kampong Redang. Part of the new settlement site was once a padi field and low-lying areas. Massive reclamation is necessary to prepare the new site.

Resort Development
In a push to develop the tourism infrastructure, the Terengganu state government alienated 265 ha to a private company in 1990. This was part of a privatisation programme to develop tourist resorts on the island. In return, the company will develop the resort in 4 phases. The construction period, which begun in 1990, is expected to be completed in 20 years' time. Once completed, the resort will consist of a 600-room hotel, 57 holiday villas, 80 holiday bungalows, 100 condominium units, staff quarters, an 18-hole golf course and club house, a horse ranch, a sporting complex, a tourist centre and a jetty. On an additional 38.8 ha, the resort owners propose to develop a vegetable farm, orchid farm, butterfly farm, aviary, crocodile farm and fruit orchard. This will be the biggest island resort in the state of Terengganu. In 1989, visitor numbers to the island was approximately 16,800. This is anticipated to increase to 147,150 on completion of the resort in 2009.

Eight other resorts are located on the island's north east coast. They were built after 1990. They are small scale, with a maximum of 20 rooms. These resorts are situated on one of settlement sites used by the villagers before they were relocated in 1975.

Road construction
Two roads are being built on the island. One is a 2 km road being built by the state as part of the resettlement plan of the new village. The second is 12.3 km road linking the various components of the resort. Construction of this road began in 1990.

Establishment of Marine Park
In 1985 marine areas up to two nautical miles from the shore of any island in the Pulau Redang archipelago were declared part of the marine park. In 1987, the management plan for the marine park was formulated. Implementation of the management plan was only possible in 1989, when a marine park visitor centre was established on Pulau Pinang, an island south of Pulau Redang.

Fishing activity was confined to the relatively sheltered waters in between the islands and within the fringing coral reefs before the marine park was established. Under the marine park regulation, fishing during the non-monsoon season is restricted to the area outside the park boundary. During the monsoon season the resident fishermen on the island are permitted to fish anywhere.

Social Impacts

Change the demographic make up of the island

The influx of workers to build and operate the resorts has changed the demographic make-up of the island. Despite government programmes aimed at reducing the number of people staying on the island, migration into the area has increased. It will not be long before the number of new residents outstrips the number of traditional inhabitants. The resort developer has estimated that the number of visitors to the island will be 8 to 9 times higher by the year 2009.

Increase exposure to other culture and religion

Visitors and workers at have introduced new cultures and religions to the island.

Increase demand for housing

Housing demands will increase. New housing development projects may result in over-crowding in the developed areas.

Increase demand for public amenities

The increased number of workers and visitors will create a demand for improved support services, including an upgraded water supply, electricity supply, schools and medical facilities.

Economics Impacts

Displacement of residents

Island residents have traditionally lived on the coast. In an effort to improve the living conditions, villagers have been resettled and displaced. Shifting houses can be costly, especially when old houses have to be dismantled and rebuilt. Furthermore, all new building materials must be transported from the mainland. Even though the settlement site for the new village at Kampong Ulu Redang has been ready since 1994, the villagers have yet to be resettled to the new village. Their unwillingness to move is mainly due to economic reasons.

Limits to future economic options

Because Pulau Redang is small there is very little suitable land available for development. Tropical rainforest and agricultural lands have to be converted to make room for projects such as resorts, roads, settlement sites, etc.

At present, the option of giving tourism top priority has short term benefits for island residents and the government, but the long term advantages are unclear. The alienation of public land to private land limits the options left open to the state government.

Increased land prices

Before 1990, land prices on Pulau Redang were low. The land on the island is classified as Malay reserve land under the state constitution. This prevents other ethic groups from owning the land and reduces its value. Before 1990, public amenities such as sea transport, communications, schools, medical

facilities and power supply were rudimentary, making the island unappealing for potential migrants to the island.

With changes in land ownership, the price of land tripled within a few years after 1990. This coincides with the "Visit Malaysia Year" campaign by the Malaysian Government. This campaign was part of a government programme to promote the tourism industry.

Generate employment opportunities
Development projects in construction, tourism and transportation will increase the employment opportunities for island residents. Although there are many opportunities for employment, the residents are only eligible for the lower paid jobs because they lack the appropriate work experience and language skills. To ensure that the local residents would not be left out of the development processes, the state government set a quota on the number of local residents employed by developers. Developers must meet this quota if their project is to receive government approval. Developers now use the number of locals they are hiring as a bargaining point to encourage the government to approve their project.

Boost the island economy
Island residents stand to benefit if they can be involved in the island development activities. The big resorts are self sufficient in all aspects of their operations and trickling effect from such operations to the local economy is limited.

Loss of traditional fishing ground
The establishment of the marine park has affected the resident fishermen. The immediate impact is the loss of income from extractive use of fisheries resources in the park. The resident fishermen also have to travel greater distances to the fishing grounds, thus increasing the cost of their fishing operations.

Other Impacts

Resource Degradation
The hydrological systems and resources on the island and in the sea may be affected by the piping of fresh water from an external source, and the operation of a golf course. Golf courses are well known for their extensive watering regimes and heavy use of fertilisers.

The effect of siltation and elevated nutrient levels on the island resources, particularly the fish and coral reefs have yet to be assessed. There is very little awareness of the long term implications of resource degradation among island residents.

SESSION ACTIVITIES 2.3

- Divide the group into working teams and ask the participants to discuss the state of the system for their regions. Participants should draw up a list of the coastal ecosystems they wish to assess (eg. coral reefs, mangroves, river estuaries, forests etc.). Beside each category list the information needs i.e. what is already available and what needs to be collected to provide a picture of the state of the system in their region.

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MODULE 3

COASTAL ZONE USES AND IMPACTS

OBJECTIVE

To emphasise the multi dimensional use and significance of the coastal zone for human societies, to examine the impacts of resource use systems on the coastal zone, to examine the meaning of the concept of sustainable development of the coastal zone.

TRAINING SESSIONS

3.1 Uses Of The Coastal Zone

3.2 Impacts of Resource Use In The Coastal Zone

3.3 Sustainable Development Of The Coastal Zone

MODULE	**3** **Coastal Zone Uses and Impacts**
TRAINING SESSION	**3.1** **Uses of the Coastal Zone**
OBJECTIVE	To emphasise the multi dimensional use and significance of the coastal zone for human societies.
SIGNIFICANCE	The coastal zone is a preferred habitat for human settlement and the importance of this area for human societies is multi-faceted. To be effective, coastal zone managers must understand the broad scope of uses of the coastal zone as well as its social and economic significance for human societies.
PRESENTATION	Lecture, presentations by participants, field trips Workshop: mapping exercise using the regional map developed in Training Session 1.2, overlay the various uses of the coastal zone in that region.
TIME	One day minimum
EQUIPMENT	Overhead projector, blackboard or whiteboard, slide projector, field equipment as outlined in the exercises below. *Advise people before they arrive that they will be expected to make a presentation about their region and can bring slides, maps, posters, props etc. and will be conducting mapping exercise about their area.*

TRAINING SESSION 3.1

USES OF THE COASTAL ZONE

Authors: Deborah Cavanagh and Dr Chou Loke Ming

INTRODUCTION

Welcome participants to the session.

Through discussion, presentations and field trips the group will examine the broad scope of uses of the coastal zone and its social and economic significance for human societies.

Prepare participants for the fact that they will be giving presentations about the human use of their own areas as well as its cultural and economic significance.

Presenters can organise field trips which illustrate the interconnections of the coastal ecosystems and the harmful or beneficial effects of resource use on the environment and each other.

This training session is aimed at listing uses of the coastal zone, the impacts of these uses are discussed in Training Session 3.2. You may find it expedient to combine the two training sessions during your field trips.

SESSION CONTENT

- List and describe the various social, cultural and economic uses of the coastal zone. Ask participants to tell you about the various uses in their regions and add these to your list. Use the information below as a basis for discussion, adding your own experiences and those of the participants.

The ASEAN region has a total coastline estimated at 85,504km and the coastal zone has some of the world's richest habitats/ecosystems in terms of biodiversity and productivity. Roughly 30% of the world's coral reefs are found in the ASEAN region. As well as one-quarter (26%) of the world's total mangroves.

The main resources include fisheries (finfishes, crustaceans, molluscs and seaweeds), coral reefs and seagrasses, lesser resources include birds, reptiles and mammals.

Human use of coral reefs

Traditional uses: Traditionally, coral reefs have provided a large amount of quality protein food in the form of fish captured by lines, nets, traps or enclosures and other animals and plants taken from the reef flats. Community members often had specialised roles: men caught fish and women collected algae, molluscs, beche de mer and crabs in shallow water. Coral rock was used as building material, particularly when there were few rocks nearby. Communities also collected sponges and jewellery from the reef.

Many cultures developed around coral reefs and became largely dependent on them. The Bugis of Indonesia, for example, depended on the sea for their livelihood and lived in boats or houses built over the water on stilts. The Bugis were famous seafarers and travelled throughout ASEAN as far as Australia. Many Asian coastal settlements were pioneered by Bugis families, like, for example, the Peninsular Malaysian people.

Fishing: Fishing is the most common use of reefs throughout ASEAN. Approximately 60% of the animal protein intake for people consists of fisheries products, 10 to 15% of this comes from coral reefs. almost all the ASEAN members depend on fish as a main source of protein with a per capita annual consumption that ranges from 15kg to 35kg which is among the world's highest. (Wilkinson, 1995)

Commercial Fishing: Of the world marine fish production of 84.6 million mt, ASEAN members produced around 6.8 million mt in 1988 (FAO Fish. Stat., 1988). Fishing is economically important for many ASEAN nations, the Philippine fisheries production, for example, comprises about 5% of the GNP and employs over 1 million people or 5% of the national labour force (ACI, 1989). The major target species caught on coral reefs are grouper (serranids), snapper (lutjanids and lethrinids), rabbit fish (siganids), large pelagic fishes such as mackerel, tuna and carangids and small schooling fishes like the fusiliers (caesionids). Squid and cuttlefish are also major commercial species. (Wilkinson, 1995)

- **OH 3.1.1 Fisheries and populations throughout ASEAN (p.26 Wilkinson)**

Collecting: A number of species are collected on the reef including clams, pearl oysters, trochus and other ornamental shells. Fish and corals are also collected for the international aquarium market.

Tourism: The major coral reef activity, tourism, is increasing throughout ASEAN. Promotion of coral reefs is used to attract tourists but the subsequent development often destroys the industry which brought in the tourists in the first place.

- **OH 3.1.2 Growth in tourism in ASEAN (p.29 Wilkinson)**

Coral and sand mining: due to its destructive nature, this is banned in most countries, if it does occur it is strictly regulated to extract only the excess sand produced by coral reefs.

Mariculture: these activities include cage, shellfish and algal culture and fish ranching providing large quantities of product in a cost effective manner.

Cage culture: is relatively easy to operate and has been adopted for commercial finfish production or to augment the livelihood of inshore fishermen. In Seabass *Lates calcarifer* and grouper *Ephinephelus salmoides* are two main commercial species farmed in most of the six ASEAN nations. Production in Thailand, Malaysia and Singapore has increased with floating netcages. Unlike seabass farming, grouper farming depends largely on seed supply from nature as seed production from hatcheries has yet to be developed at a commercial scale.

Seaweed Cultivation: entails growing seaweeds in bamboo rafts and stakes in the shallow continental shelf in the Philippines and Saah, Malaysia. The Philippines is a major producer of red seaweed *Eucheuma* spp. and the brown algae *Gracillaria* spp. The latter, together with *Caulerpa* spp are usually cultivated in ponds.

Mollusc culture: is another important form of mariculture. Oysters and mussels are cultured in eutrophic coastal waters. Common culture methods used are bamboo stakes in shallow waters and floating rafts in deep waters. In Thailand, most oyster farms are located in Ban Don Bay. Oysters are raised on cemented blocks installed close to the seabed. Cockles *Anadara granosa* are raised in extensive mudflats along the west coast of Peninsular Malaysia and southern Thailand.

The depletion of fish stocks in coastal waters, the growing demand for fish protein and the potential for foreign exchange earnings have encouraged many developing nations to place high priority on aquaculture development. Financial incentives for big and small scale shrimp growers are common.

Shipping and oil: ASEAN is the crossroads of the world's busiest shipping routes. Virtually all the oil consumed in Southeast and east Asia passes through the narrow straits of Malacca, as well as many other toxic and damaging cargoes.

Coastline stability: reefs also contribute to coastline stability by acting as an efficient physical barrier to tidal waves.

Pharmaceutical supply: the contribution of coral reefs to the pharmaceutical industry could be even greater when knowledge and advanced technology are available to exploit their potential fully.

Human use of mangroves

- List and discuss the uses of mangroves using your own information as well as that provided below.

- **OH 3.1.3 Major uses of the mangrove ecosystem**

Mangrove forests provide natural protection against coastal erosion, contribute organic matter and nutrients to the primary and secondary productivity of the coastal ecosystems, supply forest products and serve as nursery ground for fish and sanctuary for wildlife. The estimated area of mangroves in the ASEAN region is 5335 million ha or 26% of the world's mangroves. Considered as a wasteland in many developing countries in Southeast Asia prior to the 1950s, mangroves are now valued at US$160-530 ha $^{-1}$ y $^{-1}$ (Chua, 1989).

Traditional use: traditionally mangroves in Southeast Asia have been occupied by coastal fishing communities living within or at the fringes of mangrove forests for generations. Fishing in the mangrove coastal waters, estuaries and creeks is the major occupation. The forest itself provides a wide variety of economic goods and services including timber for domestic fuel wood, poles for fish-drying platforms, fishing stakes and building materials, and nipa for roof and wall thatching. This traditional type of forestry and fishery has had minimal impact on the mangrove ecosystem (Chua, 1989).

Forestry: mangroves are clear felled for timber, charcoal and woodchip production.

Pond Aquaculture: has been practiced in Asia for more than 4,000 years. Stimulated by the increasing export value of aquaculture products, aquaculture has developed rapidly over the past few decades (particularly shrimp farming). In South East Asia the relatively warm water temperatures and availability of cheap land resources contribute to a shrimp industry now worth nearly US$2 billion annually (Chua, 1989).

Modern shrimp farming evolved from the traditional trapping method practiced in Malaysia and Singapore some 20 years ago. Portions of mangrove forest were enclosed, shrimp entered the pond through one or several sluice gates during high tides. The accumulated larvae stay in the bottom of the pond during the day and cannot escape. The shrimp grow inside the pond yielding from 250 to 400kg/ha/year. The harvest usually consists of shrimp as well as various species of finfish and crustaceans. Pond size varies between 5 and 200 ha, but is commonly 20 to 50 ha. This method does not require complete removal of mangrove plants or large scale clearing of mangroves (Chua, 1989).

In Thailand the trapping method was improved by pumping water into the ponds to concentrate the larvae instead of relying on tidal energy. Shrimp production in the 1950s and '60s was based on the quantity of fry that could be concentrated by pumping and the low value of artificial feeds given. Pond yields were usually around 200-400 kg/ha with little pond management required (Chua, 1989).

By the end of 1970 an improved hatchery technology was developed in Taiwan and then in Thailand - especially for tiger shrimp *Penaeus monodon.* Closing the life cycle of the tiger shrimp increased pond yields over the years from an

initial 1-2 t/ha/year to as high as 15-30 t/ha/year. Similarly high yields have also been achieved in Thailand, the Philippines and Malaysia through proper water quality management using aeration, feeds and strict disease control measures (Chua, 1989).

Fishing: the South East Asian seas support one of the world's most productive marine fisheries. In recent years the annual catch from the region has been approximately 7 million t. Historically these abundant fisheries resources have been harvested in inshore and coastal waters with a variety of traditional fishing gears and have been an important source of food, animal protein and employment for the region's coastal people. While market and barter systems, with networks extending to the interior, are based on these fisheries, mechanised fishing for export provides a significant source of foreign exchange. The infrastructure supporting these fisheries is a further source of income and employment, for example, freezing, cold storage, boat-building, net making and mending, etc (Chua, 1989).

Turtle egg fishery: occurs on the east coast of the Malay peninsula.

Petroleum production: including Indonesia the region produces about 3.5% of the world's crude oil and 2.5% of its natural gas. Asia's first offshore well was drilled on the north-west continental shelf of Borneo in 1957. By 1980, about 50% of crude oil production was from offshore wells. The predominant offshore discoveries and production are in basins in the central and southern Sunda Shelf and the North-west Palawan and North Sumatra Basins (Valencia, 1989).

The predominant offshore discoveries and production are in basins in the central and southern Sunda Shelf and the North-west Palawan and North Sumatra Basins. Brunei Darassulam, Indonesia, Malaysia, Thailand and the Philippines have established offshore hydrocarbon potential and account for most of the exploratory wells drilled in the region (Valencia, 1989).

Offshore exploratory drilling capabilities worldwide increased from a water depth of 412 metres in 1973 to about 2,400 metres in 1983, although no discovery in waters deeper than about 1,500 metres has yet been developed. One of the world's deepest wells in terms of water depth (Exxon-Discoverer 534, 1,055m) was drilled in 1976 in the Andaman Sea off Thailand. Areas with petroleum rights under waters deeper than 200 metres include part of the North-west and South-east Palawan and Reed Bank Basins (Valencia, 1989).

HUMAN USE OF SEAGRASS BEDS

The most important benefits of seagrasses are indirect as they shelter juvenile prawns, crabs and fishes until such time as the animals are mature enough to migrate into deeper waters. Seagrass beds also help stabilise the shoreline.

WORKSHOP 3.1

In their working teams, participants can list then discuss the variety of human uses of their region. Participants are then asked to map the uses on an overlay of their regional map.

SESSION MATERIALS 3.1

- **OH 3.1.1** Fisheries and Populations Throughout ASEAN
- **OH 3.1.2** Growth in Tourism in ASEAN
- **OH 3.1.3** Major Uses of a Mangrove Ecosystem

REFERENCES 3.1

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Fisheries & Populations Throughout ASEAN

	Population million	Fisheries Consumption million tonnes	Marine Fisheries Catch million tonnes
Brunei Darussalam	0.27	0.007	0.003
Indonesia	194.95	2.729	1.971
Malaysia	19.31	0.590	0.599
Philippines	67.07	2.267	1.478
Singapore	2.82	0.112	0.014
Thailand	58.26	1.212	2.629
Total	**242.68**	**6.917**	**7.694**

Basic statistics on fisheries and populations throughout the ASEAN region. Source: Wilkinson C. R. ed. May 1994. *Proceedings Third ASEAN-Australia Symposium on Living Coastal Resource,* Vol. 1, Status Reviews. Chulalongkorn University Bangkok, Thailand.

Growth in Tourism in ASEAN

Country	1985 million US$	1992 million US$	Annual Growth %
Indonesia	548	2723	56.7%
Malaysia	622	1595	22.3%
Philippines	944	1350	5.1%
Singapore	1600	5782	35.5%
Thailand	1171	4057	35.2%

Source: Wilkinson C. R. ed. May 1994, *Proceedings Third ASEAN-Australia Symposium on Living Coastal Resource*, Vol. 1, Status Reviews. Chulalongkorn University Bangkok, Thailand.

Major Uses of a Mangrove Ecosystem

COUNTRY/TERRITORY	Firewood	Charcoal	Construction Purposes	Paper	Wood Chip	Tannins	Food and Drinks	Medicine	Stockgranzing	Honey	Fish	Crustaceans	Shellfish	Utilisation of Other Animal Species	Recreation	Education	Preservation	Flood Assimilation+	Shoreline Protection++	Shoreline Protective Planting*	Riverbank Protection**	Riverbank Protection Planting*
Australia	L1		L1				L1		L1	L3	W3	W3	L1		W3	W1	L2				L1	L1
Bangladesh	W3		W3	L3		X	X			W3	W3	X					W3		X	W3		
Brunei Darussalam	X																					
China						X														W3		
Cambodia	X	X																				
Fiji	W2		X			X	X	X			W3	W3	X			X			X			
Hong Kong																						
India	W3		X			L2	X	X		W3	W2	W3	W3	W3				X		X	X	
Indonesia	W3	X	W2	L3	L3	X	X				X	X					X	X	X	X		
Japan	L1		L1			L1			X						X		X					
Malaysia	L1	W3	W3		L3	L1	L1	L1			W3	W3	L3	L1	L1	L2	L2		L1		L2	
Myanmar	W3	W3	W3			X				X	X	X		X								
New Zealand									X		X				W3	W3	L1		W3	W3	L3	L3
Pakistan	W3		X				X	X	X			X										
Papua New Guinea	W2L3		W2L3			X	W2L3				W3	W2	W2	W1	L1	L2			L1	L2		
Philippines	W3	W3	W2			X	X				X	X							X	X	X	
Singapore	X		X								X									L1		
Solomon Islands	L1		L1			W1	L1	W1			W1	X	X	X								
Sri Lanka	X		X			X	X				X	X								X		
Thailand	W3	W3	W3				X	X			X	X	X									
Viet Nam	X	X	X			X																
Other Pacific Islands	X	X	X			X	X	X			X	X	X				X					

The following letters and numbers describe the distribution and importance of a particular use in country/area:

L = use is localised (ie. only used in some areas)

W = use is widespread in a country's mangroves

1 = minor use; 2 = moderate use; 3 = major use

X = inadequate information to define distribution and importance of use

The following provides clarification of some of the 'use' categories:

+ Flood assimilation - mangroves protected in order to retain natural floodplains.

++Shoreline protection - existing mangrove fringes protected in order to safeguard shorelines from erosion and storm damage.

* Shoreline protective planting - new mangroves planted in order to protect shorelines from erosion and storm damage.

** Riverbank protection - existing mangrove fringes protected in order to safeguard riverbanks from erosion and property damage.

Source: IUCN Global Status of Mangrove Ecosystem, Vol. 3 (1983) Supplement No. 3, P. 21.

MODULE	**3.** **Coastal Zone Uses and Impacts**
TRAINING SESSION	**3.2** **Impacts of Resource Use in the Coastal Zone**
OBJECTIVE	To examine the impacts of resource use systems on the coastal zone.
SIGNIFICANCE	Successful management of the coastal zone depends on the manager's ability to recognise the short and long term implications of resource utilisation.
PRESENTATION	Lecture, discussion, field trip Workshop: mapping exercise, using the map developed in Training Session 3.1, show how resource use in one area affects resource use of an ecosystem in that and other areas.
TIME	1 day
EQUIPMENT	Overhead projector, blackboard, whiteboard, slide projector, field equipment.

TRAINING SESSION 3.2

IMPACTS OF RESOURCE USE IN THE COASTAL ZONE

Authors: Deborah Cavanagh and Dr Chou Loke Ming

INTRODUCTION

Welcome participants to the training session and explain that during this session we will be taking a closer look at the impacts of the resource use we described in Training Session 1.2

Using the maps they developed in Training Session 1.1 and 1.2, students will make connections between the different activities in their study area. Students will then discuss the interconnectedness of the resource use systems and their individual and combined impact on the region.

Using your own collection of slides, present information about the impact of various types of resource use on the natural ecology of the coastal zone in the ASEAN region.

Use the case studies and a field trip (if this is practical) to illustrate your points.

After the lecture, encourage group discussion and comparison of the impact of resource use in different regions.

SESSION CONTENT

Environmental impacts of human activities on the coastal zone

The coastal zone is affected by people almost everywhere and encroachment continues world wide. The global report on the state of the marine environment by the Joint Group of Experts on the Scientific aspects of Marine Pollution stated that:

"The growing exploitation of the coasts is a reflection of population increase, accelerating urbanisation, greater affluence and faster transport - trends that will continue throughout the world. The major causes of immediate concern in the marine environment on a global basis are coastal development and the attendant destruction of habitats, eutrophication, microbial contamination of seafood and

beaches, fouling the seas by plastic litter, progressive build-up of chlorinated hydrocarbons, especially in the tropics and the subtropics and accumulation of tar on beaches."(UN 1990).

The population of the six ASEAN countries is a little under one third of a billion people. The region is considered to be developing with agriculture as the predominant activity. Industries are concentrated around a limited number of cities which characteristically have high population densities (2 to 8 million people) (Gomez, 1990).

The marine environment has been increasingly influenced by human activities with the degree of contamination being most pronounced near coastal population centres (Gomez, 1990).

Human impact on coral reefs

- Using the information below and your own experience, list and describe the human impacts on various ecosystems within the coastal zone.

The following information is taken, with permission, from:
Wilkinson, C. (ed) 1994, *ASEAN - Australia Symposium on Living Coastal Resources: Living Coastal Resources of South East Asia: Status and Management Report of the Consultative Forum, Bangkok,* Australian Institute of Marine Science, Townsville.

Urbanisation: more than 60% of about 340 million people in ASEAN countries live on or near the coast. The cities of Bangkok, Manila and Jakarta as well as thousands of small towns and fishing villages are on the coast. Most industry is located on the coast near port access.

Human Waste: almost all wastes from these large populations enter the rivers as raw, untreated sewage, with large loads of organic and inorganic nutrients. This results in immediate eutrophication around the outfalls and increases the stress and damage to coral reefs. Mangroves benefit from moderate sewage loads, but the reefs around the densely populated areas are severely degraded.

The cost of installing sewage treatment in these cities is astronomical and will require international assistance. All new domestic and tourism developments as well as towns and villages near coral reefs in ASEAN should be built with a minimum of primary sewage treatment.

Agricultural Pollution: the combined activities of logging and slash and burn agriculture have depleted at least 60% of the forests of Southern Asia. The thin topsoil is washed away, making replanting difficult. Erosion continues to act on the slopes and the runoff substantially increases the sediment load of coastal waters. Corals grow in such a way that they tend to accumulate silt. They lack large polyps to remove the silt or there is a lack of appropriate currents to wash away the mucus, which the corals emit to remove the silt. Other corals may suffer scouring by sediment laden currents, or from a depletion of available light, which is necessary to support their zooxanthellae. The silt may inhibit the

settling of new polyps, lowering the resilience of the reefs to other disruptive forces such as outbreaks of crown of thorns starfish (McManus, 1988).

Intensive crop and animal rearing industries result in large outflows of fertiliser, animal wastes and sediment into waterways. Cost effective solutions include: regulation of fertiliser use, runoff from fields should be prevented by bund walls, green tillage is preferable to ploughing and animal wastes should be treated and the water recycled.

Development on Land: A major impact of development and construction, land clearing and deforestation is the release of sediments into the rivers and out onto seagrass beds and reefs. Much of this can be avoided by preventing sediment washing off sites and doing most of the clearing during dry seasons.

Tourism Development: It is ironic that tourists are often attracted to coastal areas because of the coral reefs but the tourist presence often results in degradation of the reef. Damage resulting from tourism development includes:

- Construction damage: Silt laden runoff from the hotel construction flows onto the coral reefs and smothers them. The fine clay sediments settle over the reef flat and are resuspended each time there is a strong wind. Hotels are usually built directly on the shoreline, causing erosion problems. Sea walls are then constructed to control the erosion and the materials are often dredged from the nearby reefs. The walls also alter sand movements and frequently result in scouring reef flats and beaches. Sand is then pumped from the reefs to build up the beaches so the tourists have enough beach to lie on. This problem would be avoided if the hotels were built further back from the beach.

- Operation damage: Few developments are equipped with adequate sewage treatment facilities and garbage disposal is inadequate. Consequently, tourists are often advised not to swim near their hotels, garbage is piled up around the hotels and beaches, waste plastic damages the reef and is an aesthetic problem for scuba divers.

- Golf courses are built on unsuitable land and overfertilised. The rate of golf course construction in Asia will eventually flood the market and prove detrimental to local economies.

- Destructive tourist activities: Reef walking, uncontrolled fishing and uncontrolled boat anchoring are some of the activities affecting coral reefs.

Fishing: most of the coralline areas within 15 km of the shores of South East Asia are believed to be overfished. Exceptions to this would be the southern islands of Singapore and other areas where the coastal fishing populations are low. As the fish stocks are depleted the fishermen, in some countries, resort to more destructive fishing techniques to catch dwindling numbers of fish. The mesh sizes in nets and traps decreases, fishermen use dynamite and fish poisons

(cyanide or bleach) and destructive techniques such as muro-ami are practiced (coral reefs are smashed to drive the fish into large nets).

The seine line is another commercial fishing method involving 200-400 people at a time operating from large ships. The 25 vessels involved in this fishery, based in the Philippines, operate throughout the South China Sea and Sulu Sea. In addition to the environmental effects of this fishery, there are major safety and social problems concerning the use of young divers operating from crowded ships and manipulating nets at depths of 30 metres or more by free diving. In the Philippines, recent attempts to ban this type of fishery have been hampered by the problem of finding alternative livelihoods to support the estimated 15,000 people dependent upon the fishery (McManus, 1988).

By overfishing and using destructive fishing techniques on the more distant reefs, fishermen may be destroying the source reefs for many of the larvae that populate the reefs around the large cities and urban centres. This could potentially create large collapses in fish populations throughout ASEAN.

Mining and oil exploration: increased sedimentation is also caused by the dumping of mine tailings. East Asian Seas countries are major suppliers of tin dredged from shallow offshore waters. Offshore oil drilling is common on coralline areas of Indonesia and the Philippines. Drilling mud is used to lubricate the drilling bit and to prevent fluids in the sedimentary layers from forcing its way up the shaft. When the densities of mud used is not appropriately balanced against those in the sediments plumes of mud escape around the shaft (McManus,1988).

Mangroves and seagrasses

Domestic uses: in most of the remaining East Asian mangroves over-exploitation is the general rule. It is largely due to population pressure and the low-income status of the coastal population. A significant consequence of the loss of mangrove habitat is the destruction of nursery grounds for shrimp and fish. In Ecuador, more than half of the original mangrove areas have been converted into shrimp farms. Thus by 1986, the remaining mangrove ecosystem was not able to produce shrimp seeds needed for stocking, resulting in 60% of the ponds lying idle. The mangrove forests is also one source of nutrients for the maintenance of the marine food chains (Tai Eng and Paw, 1989).

Sewage and Waste Disposal: pollution from land based sources is a serious problem. High levels of coliform bacteria occur in shellfish beds in the Strait of Malacca, oysters and mussels are contaminated by sewage in the Gulf of Thailand and in 1988 an epidemic of hepatitis associated with the consumption of shellfish occurred in Hong Kong with nearly 1,400 cases reported (UNEP, 1990).

While mangroves may be resistant to pollution, they can also mobilise these pollutants rendering them more available, and therefore, more destructive. This also seems to be the case for seagrasses.

Agricultural Pollution: conversion of coastal land for agriculture is not extensive in the region. Only in Thailand and Indonesia have some mangrove areas been converted and replaced by coconut plantations. One of the programme objectives of the International Rice Research Institute is to include tidal flats, beach ridges and reclaimed lands in global efforts to increase agricultural production. There has been significant improvements in cultigen hybridisation and conversion of saline acidic soils, which is parallel to the increasing demands for arable land. Mangrove areas and other low land coastal areas are now viewed as a major source of agricultural lands.

Forestry: large areas of mangroves in remote areas of Indonesia and Malaysia have been lost to the woodchip industry. This is usually a very destructive activity as the industry traditionally sees the mangroves as a one-off resource. Hundreds of thousands of hectares have been lost to production of woodchips for the Japanese rayon industry.

Aquaculture: reports from various ASEAN countries (the data is of questionable accuracy) suggest that the overall destruction rate of mangroves is in the order of 1% per annum. It is estimated that some 50% of mangroves has been lost in ASEAN over the past 50 years. In the Philippines over 80% of the mangroves were degraded by converting them to fish ponds. In the past 10 years 50% of Thailand's mangroves have been lost to prawn ponds.

A significant consequence resulting from the loss of mangrove habitat is the loss of nursery grounds for shrimp and fish. In Ecuador, more than half of the original mangrove areas have been converted into shrimp farms. Thus by 1986, the remaining mangrove ecosystem was not able to produce shrimp seeds needed for stocking, resulting in 60% of the ponds lying idle. The mangrove forests are also a source of nutrients for the maintenance of the marine food chains (Chau and Paw, 1989).

Cage structures and stakes or rafts used for mussel and oyster farming, when indiscriminately installed in rivers, lagoons or bays, often obstruct navigational routes. More importantly, these structures reduce water current and encourage sedimentation which affects the cultured organisms. In Sweden, mussel farming introduced 10.5 t of dry sediments from a farm size of about 1,500 square metres in 1.5 to 2 years. Excessive sedimentation in Sapian Bay (Philippines) was attributed to extensive mussel and oyster culture (Chau and Paw, 1989).

In the pond preparation phase, pesticides are widely used to eradicate undesirable species, but their improper application and untimely discharge can also kill desirable species. These pesticides include: tobacco dust (nicotine), teaseed cake (saponin) Derris root extract (rotenone), as well as organic pesticides such as Gusathion (an organo-phosphate), Brestan and Aquatin (organo-tin)(Chau and Paw, 1989).

Heavy feeding using low value fish or artificial feed is widely practiced in intensive and semi-intensive shrimp ponds. The common daily water exchange rate of 30% adds tremendous biological oxygen demand load into the already stressed coastal waters. While precise estimates of the organic load from shrimp

farms have yet to be computed, information from a trout farm in Denmark shows that 10 kg of phosphate are released from earthen ponds per year per ton of fish produced (Chau and Paw, 1989).

Development in shrimp aquaculture, cage culture and raft and stake oyster/mussel farming is increasingly seen to:

- contribute to coastal water quality deterioration;
- reduce mangrove habitat; and,
- contribute to resource use conflicts (Chau and Paw, 1989).

Offshore mineral mining: tin exploitation in Indonesian waters is concentrated in several localities around "tin islands", Banka and Belitung. Silica sand prospects and/or exploitation are known at a few localities along the coast in Rayong Province and South-west Chumphon Province, Thailand, and some ten sites scattered throughout the Philippines. Iron sands have been mined in Indonesia. Dredging of live and dead coral heads for construction has severely damaged the reefs of west Sabah, particularly in the Palau Gaya National Park, and is also practiced in Indonesia and the Philippines (Valencia, 1989).

Bottom mining for tin or sand and gravel involves dredging and disposal of tailings. Offshore mineral exploration and dredging can thus interfere with marine transportation and fisheries operations through increased turbidity and siltation as well as through alteration of the bottom and/or shore sediment regime. Mining can also directly or indirectly affect mariculture and the harvest of pelagic and benthic fish by direct removal and smothering of benthic organisms and alteration of bottom character. Increased turbidity may decrease primary productivity or force pelagic fish to migrate or cease schooling (Valencia, 1989).

Current and wave patterns as well as dispersal of sediments is affected by bottom mining, this may alter the coastline and impact tourism/recreation, and human settlements. High sediment content may also render water unsuitable for agricultural, commercial/industrial and domestic use, power plant cooling or desalination. With bottom dredges operating in the vicinity, port facilities may become silted, sewage sludge or other benthic waste may be resuspended, harvesting of mangrove may be inhibited and aquaculture ponds silted up (Valencia, 1989).

Oil Exploration: worldwide, the petroleum industry has recorded 140 rig accidents, causing damages valued at about US$1 billion in 26 years. Most accidents were caused by blowouts, followed by on-location damage by hurricanes and rough seas. Blowouts have caused 20-40% of accidents over the years, indicating that, despite technological developments and precautions, the tendency to drill deeper and faster is keeping the accident rate up (Valencia, 1989).

Despite intensive offshore drilling and exploitation activities in the South China Sea region during the past decade, the area has had a generally good safety and environment record. However, much of the continental shelf in the region

appears to contain shallow, high-pressure gas pockets. Where these have been encountered, there have been few spectacular gas blowouts, but none has yet resulted in serious environmental consequences. For example, off Burma in 1972, a jack-up rig capsized after a gas blowout. There have also been several minor gas blowouts in Indonesia and off the east coast of Peninsular Malaysia from only 300 to 400 metres. In 1971, however, a drill barge sank off Brunei after a blowout and fire, and reportedly, oil drifted into Malaysian waters continuously for several months (Valencia, 1989).

Typhoons are significant natural hazards for oil rigs. They are the most potentially destructive and frequent. Over a 45 year period an average of 9 typhoons per year struck exposed oil drilling sites in the South China Sea (Valencia, 1989).

The South China Sea region has the most active volcanoes in any region of comparable size on earth today. Earthquakes with underwater epicentres may be accompanied by tsunamis. The Philippines is one of the most seismically active areas in the world. From 1900 to 1965, 20 tsunamis were reported in the region, a frequency of about one about every 3 years (Valencia, 1989).

Shipping: the transhipment of ores, fuels and other raw materials from remote areas and the increased tonnage of the transporting vessels has led to an increase in the construction of channels and harbours. This has changed the hydrology of mean water levels, bringing about chronic salinity stresses and leading to changes in species composition. In Sydney, Australia, these activities changed the reflection patterns of the shore waves, leading to the serious erosion of mangrove areas and destruction of seagrass beds (Fortes, 1988).

The Port of Singapore is the world's third busiest port. Its strategic location makes it a centre for repairs and service for the oil tankers that operate in the region. In the Straits of Malacca, 5 accidents have occurred, due to heavy tanker traffic, have been recorded for the period 1976-1979, spilling at least 5610 tons of crude and bunker oil. In the South China Sea, two spills were recorded due to tanker collisions, spilling 10,000 tons of crude oil. At least ten accidents occurred in Malaysian waters from 1975-1980, 24 in Singapore and at least 12 in Philippine waters in 1978. Apart from oil spills caused by accidents, operational shipping and refinery activities (ie. de-ballasting, tank cleaning, dry docking, cargo loading and unloading) discharge oil into the marine environment (Fortes, 1988).

The transhipment of the greater bulk of crude oil, principally en-route to Japan, passes the Andaman Sea, through the Straits of Malacca, to the South China Sea, following the entire coast of western and northern Borneo and the Philippines. Similarly, the Gulf of Thailand, Straits of Macassar, Celebes Sea and the Sulu Sea all receive subsidiary (0.2 million barrels per day or less) oil shipments. The most luxuriant mangroves as well as the highest diversity of seagrass in the East Asian region are situated along the coastal fringes of the major shipping corridors (Fortes, 1988).

Mangroves and seagrasses are excellent traps for drifting oil slicks. The tidal water circulation in these habitats favours deposition and accumulation in the

sediment. The grounding of the tanker Showa Maru in the Malacca Straits in 1975 spilling 7,000 tons of crude oil caused dieback of hundreds of hectares of mangroves on the east coast of Sumatra. At Cilacap (Indonesia) a mangrove-mortality of 98 % has been associated with oil-refinery effluent. In Australia, oil spills, slicks and tarballs have killed invertebrates and caused extensive mangrove defoliation and seedling death (Fortes, 1988).

Oil pollution from ships and offshore oil rigs is a concern, as is the shipping industry. The highest hydrocarbon concentrations are in the South China Sea off southern Vietnam and in the Macassar Strait. Many tarballs are also found in these localities. Tarballs have also been reported beached; along the coasts of the Gulf of Thailand, the Thai Andaman Sea coast, both coasts of the Malay Peninsula and in Pulau Seribu, north of Jakarta (Fortes, 1988).

The effects of oil on coastal vegetation may lead to chronic stress and reduced productivity as a result of lowered rates of litter production. Temporary damage to seagrass blades may occur if the oil comes in contact with the blades in the air. There is no apparent damage if the leaves remain submerged. Rhizomes and roots are not damaged by the oil (Fortes, 1988).

The most well-documented case study dealing with the effect of oil on seagrasses was the oil spill from the tanker Amoco Cadiz that stranded on the coast of Brittany, France, discharging 216,000 tons of crude oil and 4,000 tons of bunker fuel. The *Zostera* plants remained almost unaffected, but the animal groups were selectively affected. Gastropods were not affected, but the amphipods, isopods and polychaetes were seriously damaged and did not recover during the year following the spill (Fortes, 1988).

In Puerto Rico, an oil spill caused the wash out of 3,000 cubic metres of sand containing *Thalassia* . The wash out occurred because the oil mixed with the sediments caused them to become buoyant (Fortes, 1988).

Oil can have direct and indirect lethal and sublethal effects on eggs, juveniles and adults of many fish species. Fish may be tainted, and fishing gear may be fouled by oil, resulting in socioeconomic depression of the fishing industry and thus indirectly affecting all those who depend upon it for food and a livelihood (Fortes, 1988).

The vulnerability of coastal ecosystems to oil spills is a current concern. The prime ecosystems of consideration are: (1) estuaries within the mouths of larger river systems; (2) mangroves associated with low coastlines and estuaries; and (3) coral reefs associated with most smaller islands and those coasts on larger islands lacking large inputs of fresh water or sediments from river systems (Fortes, 1988).

Mangroves (and coastal marshes) have been ranked as the most sensitive or vulnerable, due to the persistence of oil in that environment and the ecosystem's slow recovery, estimated at 20 years or more. The vulnerability of coral reefs to oil depends on the level of toxicity in the water column, presence and degree of mixing and degree of direct exposure of corals and other organisms to the oil. Beach systems, although not productive alone, provide habitat for certain

organisms vulnerable to oil. The impact of oil on species normally involves a degradation of habitat (Fortes, 1988).

Threatened species

According to the International Union for Conservation of Nature and Natural Resources (IUCN), a number of marine species in the ASEAN region are threatened and/or endangered. This is due to a variety of pressures including commercial exploitation, habitat destruction and pollution. Threatened species include:

- Marine mammals (whales, dolphins and dugongs)
  The Japanese sealion has possibly become extinct due to the activities of fishermen and the effects of coastal development. The single remaining species of dugong (*Dugong dugon*) is found only in scattered populations along tropical and subtropical coasts in the Indo-Pacific area. The Indus dolphin (*Platanista indi*) which was once common in the Indus river and its tributaries, has been listed as endangered and is on the verge of extinction with a population not exceeding a few hundred.

  There is a growing concern about the conservation of marine mammals, notably whales. In 1979, at the International Whaling Commission, the entire Indian Ocean north of 55°S was declared as a cetacean sanctuary. A moratorium has also been imposed, prohibiting the killing of whales except for scientific purposes.

  Baleen whales (fin, blue, minke, sei and humpback) and toothed whales (pigmy, dwarf, sperm and killer whales) are among the marine mammal species that inhabit the ASEAN marine waters. Although the status of many marine species is not known, it is certain that the dugong and freshwater Indus Susu are depleted.

- Sea turtles are threatened by the collection of their eggs and the hunting of adults for human consumption. In addition to hunting, a large number are also killed in incidental capture in trawl nets. The sandy beaches on the eastern coast of Peninsula Malaysia are major nesting sites for endangered sea turtles. Tourists travel to the area to see the turtles and stay in small resorts. The offshore islands of Pulau Tioman, Pulau Tenggol, Pulau Redang and Pulau Perhentian Besar are fringed by coral reefs and turtles nest on the beaches. Each island is proposed for reserve or park status and each holds a potential for increased tourism. Estuarine areas on the coast include several shorebird sanctuaries.

- precious corals; and

- some invertebrates.

To prevent indiscriminate exploitation and to provide the necessary protection to marine life and resources through conservation measures, several countries

in the region have taken policy decisions and enforced regulations with varying degrees of success. A number of countries have established marine parks, reserves and sanctuaries. The Great Barrier Reef and Torres Strait Dugong Sanctuary in Australia, the Marine National Parks in Gujarat and the Andaman and Nicobar islands in India, the Iriomote National Park in the Ryuku Islands in Japan, and the Sombrero Island Marine Park in the Philippines are some examples of these initiatives.

Impact of fisheries

Despite the overall steady growth in the marine catch, the time of spectacular and sustained increases in fishery catches is over. This is because almost all important stocks of demersal species are either fully exploited or overfished and many of the stocks of the more highly valued species are depleted. Furthermore, reef stocks and those of estuaries and littoral zones are under threat from illegal fishing and environmental pollution. It is likely that in the years to come, the effects of overfishing will be felt regionally in areas where overfishing and pollution combine to reduce the catch.

Fisheries resources of the Gulf of Thailand and the Straits of Malacca have been overexploited for years. In Malaysia, the depleted inshore resources are not able to meet the increasing demand for fish. Similarly, in India the scope for further increases in production from a 0-50 metre depth area has become limited. In fact, according to the FAO (1989), it appears to have reached or exceeded the estimated potential in all areas of the country except in the north-east. In the Pacific, the overlap between subsistence and commercial fishing is increasing as local fishermen go further and deeper to ensure an adequate catch. As the subsistence fishery sector is of vital importance to the island nations, this situation is of growing concern.

In certain cases, depletion has affected many species in the region. For example, the production of both penaeid and non-penaeid shrimp/prawn invertebrates in South East Asia declined during the 1977-1985 period. This was due to full harvesting and partial overexploitation in the area. The exploitation of small and medium size pelagic fish such as sardines, round scads and mackerel in the Gulf of Thailand and Andaman Sea have also exceeded maximum sustainable levels. Thus Thailand's production of scad dropped from 131,000 metric tonnes in 1977 to 70,000 metric tonnes in 1985.

The marked increase in regional fishing effort in the past 20 years, encouraged by the rapidly increasing local and international demand for fisheries products, has subjected many of the region's inshore and coastal fisheries to intense fishing pressures and has resulted in the over exploitation of several important fisheries. Concurrent with these has been the loss of important spawning and nursery grounds of many valued species due to increased coastal pollution and the widespread development of coastal lands. Thus, many of the region's fisheries are under stress. Much of the preceeding information was taken from the *State of the Environment in Asia and the Pacific, 1990* , United Nations Economic and Social Commission for Asia and the Pacific, Bangkok, Thailand, Chapter 3.

SESSION ACTIVITIES 3.2

Mapping exercise

- Using the mapping information from Module 3.1, show how resource use in one area affects use or ecosystems in other areas of the coastal zone.
- Discuss the patterns of use of each activity separately, then examine the combined impact of resource use on the natural ecology of the area.
- This exercise may be conducted as a field trip or a desk-top activity.

TRAINING SESSION 3.2

CASE STUDY 1

Sirikul Bunpapong 1992, *Coastal Tourism Impacts: Lessons Learned from Pattaya in Coastal Resources and Systems of the Pacific Basin: Investigation and steps toward protective management*, UNEP Regional Seas Reports and Studies No. 147.

COASTAL TOURISM IMPACTS: LESSONS LEARNED FROM PATTAYA

Abstract: Tourism is of great importance to Thailand's economy. The boom in the tourism industry has led to an increasing number of people visiting the country's attractions, which in turn has led to serious environmental problems. Pattaya which is the best known seaside destination in Thailand, serves as a case example of the national phenomenon of over-development and poor planning. Even though Pattaya attracts tourists because of the natural beauty of its coastline, its environmental assets have been allowed to deteriorate to meet the demands of the fast-growing tourism industry.

The success of tourism is usually measured in terms of how many tourists visit and how much foreign exchange is earned. No matter how successful Thailand's tourism industry may appear, there is a dark side to its development.

Introduction

Tourism is the largest generator of foreign currency in Thailand, having surpassed the earnings from major exports such as rice, tapioca, rubber and tin in 1982. The country's tourism income rose from US$511.04 million in 1980 to US$4,880 million in 1990.

As Pattaya is the largest tourism destination in the country after Bangkok, its good reputation as an international resort has played a vital role in national economic growth. Pattaya is endowed with several advantages that supported its rapid growth. Its closeness to Bangkok, its good access and the variety of its activities serve to maintain it as the top beach resort area.

Pattaya developed from a small fishing port to a major tourism resort in the brief space of 30 years. During this time the number of tourists increased sharply along with associated large investment to meet infrastructure requirements. These led to disorderly land development and serious urban problems, which now threaten Pattaya's reputation.

Pattaya in the past

In the early 1960s Pattaya was a small fishing village with a sandy, 3 kilometre long beach, calm sea and tropical vegetation backing the beach. The spot was used as a recreation area by Thais for some years. In the mid-1960s the USA military was based in Thailand, and during the Vietnam War used Pattaya for rest and recreation. The first international class hotel was established in 1964, and significant international tourism began in the late 1960s and early 1970's.

The number of tourists visiting Pattaya has increased rapidly. In 1973 an estimated 280,000 tourists spent at least one night in Pattaya, in 1974 some 360,000 and in 1975 the numbers rose to 400,000. Almost half of these visitors were international tourists. In 1975 Pattaya had only 12 hotels with 1,903 rooms and bungalows with 359 rooms. The sea and beach front was acceptable for recreation in 1975 although building was congesting the seaside and sewage was contaminating the sea.

By the 1970s the beaches and nearshore waters were degraded due to unplanned and largely unrestrained construction of hotels and affiliated structures. Building laws were largely ignored as hotels, bars and entertainment complexes were built to serve the increasing numbers of foreign tourists. By the early 1980s the number of foreign tourists visiting Thailand reached two million and continued to increase steadily at an average of 10% per year. Arrivals at Pattaya stabilised at 20% of the total arrivals in Thailand. To meet the increasing demand the number of hotel rooms increased in Pattaya at an annual rate of 8.1% from 7,642 rooms in 1982 to 11,262 rooms in 1987. In 1987 the estimated revenue generated by foreign tourists in Pattaya was equivalent to 31% of the total revenue from the tourist sector in Thailand or 5.1% of the value of Thailand's total exports. Clearly, tourism has been the mainstay of Pattaya's economy, providing many job opportunities and bringing income to the area.

Pattaya today

By 1990, Pattaya had over 20,500 hotel rooms, more than 60% of them first class. Aside from the stimulus and effects of tourism, Pattaya's environment has changed because the city has been the focus of the Eastern Seaboard project. This is the Thai government's first major intervention for planning and managing the development of an emerging urban/industrial region. The Eastern Seaboard project intended to decentralise development from Bangkok and vicinity. The city has grown and there has been rapid industrial development in the Eastern Seaboard region along the coast of Thailand's upper Gulf. This has caused pollution problems resulting in a decline in the tourism industry, with the number of visitors to Pattaya decreasing from 1.72 million in 1988 to 1.69 million in 1989.

Coastline and beach: Pattaya's bay and beach are extensively used for recreation, including sunbathing, swimming, sight-seeing, boating, water skiing, skin diving, sport fishing and coral viewing. The boats in the bay are mostly excursion vessels, speed boats, water scooters and pedal boats. Over-utilisation of

the waters of the bay and an ineffective demarcation between activities has led to severe congestion, potential conflict and a heightened risk of accidents.

At the southern end of the bay, the "entertainment area" is made up of restaurants, bars and night clubs built over the water on timber pilings, which is an encroachment of construction beyond the natural shoreline and is interfering with normal coastal functions and leading to erosion.

Water pollution: because of the lack of an adequate sewage system, water pollution and sea-bed pollution are so serious at Pattaya that sea bathing and diving are no longer possible. Pollution measurements taken in November 1988 in the bay of South Pattaya revealed a most probable number (MPN) of coliform bacteria 160 times greater than the maximum safety level, and at North Pattaya the contamination level was 1.4 times greater than the maximum safety level set for swimming at a coliform bacteria count of not more than 1,000 MPN/100 millilitres.

The major cause of pollution is overload of the treatment plant and an insufficient collection system. Over 200 hotels in the resort and many condominiums do not have to comply with official environmental standards. Some major hotels with water-treatment facilities keep them switched off to reduce costs. Pattaya City does not have an effective monitoring system for businesses and restaurants, which contribute to the waste-water problem.

Urbanisation: the accelerated construction at Pattaya of restaurants, hotels, boutiques, insurance companies and small shops has worsened traffic congestion, noise and overcrowding until, in the eyes of visitors and hoteliers, Pattaya has become a "concrete jungle" of buildings crammed too tightly together. Water shortages have threatened the resort during the summer for several recent years as demand for water has rapidly increased. Garbage collection is inadequate to deal with all the solid waste generated within the city. All natural drains and sewers discharge into the immediate sea.

Pattaya's future

As Pattaya is the centre of the Eastern Seaboard Region, attention has been focussed on the city's expansion and the growth of commerce and industry there. When the industrial development of the Eastern Seaboard is completed a failure to control pollution problems could become disastrous for the popular seaside resort. In view of this situation, the Royal Thai Government decided to implement a water-quality plan and to initiate a study that would lead to a master plan for development of the Pattaya area.

Water quality plan: proposed by the Office of the National Environment Board (ONEB) through the Ministry of Science, Technology and Energy. Short term aspects of the plans include:

- Expansion of the present water treatment facilities by the Civil Works Department for completion during 1991.

- City authorities to ensure effective management of water treatment facilities already present in large buildings, including hotels on the outskirts of Pattaya. Building owners, under the control of city authorities will see that treatment is carried out.
- Water quality in Pattaya canal will be controlled, and the efficiency of the canal's drainage system will be improved by a project due for completion within two years.
- Research is to be carried out on the possible impact on sea water quality of the proposed water treatment plans. An allocation of 1.6 million dollars was provided to the ONEB to complete this research within one year.
- Cooperation will be encouraged between ONEB and city authorities to control sea water quality in Pattaya Bay.
- A special committee is to be established by the Interior Ministry to oversee the operations of the plans to solve Pattaya's water pollution problems.
- The Pattaya city Administration Act 1987 on water treatment is to be strictly enforced.
- Water drainage from buildings and other operations are to be controlled in accordance with standards to be laid down by ONEB. The controls are to be implemented three months after ONEB sets the standards.
- Controls will be placed immediately on construction and the expansion of buildings.
- Attempts will be initiated within six months by Pattaya city to solve the water pollution problems caused by the trespass of Pattaya South into the sea.
- Long term aspects of the plans include:
  - Water treatment facilities are to be installed within three years in buildings outside the range of city facilities.
  - The city is to assume control of water treatment in South Pattaya.
  - A monitoring programme of the city's water quality is to be implemented immediately in accordance with a plan by ONEB. A budget of some US$16,000 a year has been allocated to the project.

Master plan study for the development of Pattaya Area: the objective of this plan is to draw up guidelines for developing a multi-functioning city with one focus on tourism and another on the function of Pattaya as the Eastern Seaboard regional centre including commerce and business. Priority projects proposed for implementation include: South Pattaya land reclamation and development of port facilities; beach restoration and development of a beach promenade; improvements to sewage treatment, rainwater drainage, and the canal; development of water supply pipeline and treatment plant; improvements in solid waste disposal; and road development. Goals of the plan include not only the acceleration of infrastructure development in order to catch up with urban development but also the conservation of an agreeable natural environment and the enhancement of the artistic and cultural environment. Acceptance of the plan is now being sought from several Royal Thai government agencies before it is submitted to Cabinet for approval.

Lessons learned from Pattaya

Pattaya serves well as an example of the national phenomenon of over development and poor planning. In the case of tourism, Thailand has made good progress in gaining a share of the market, but now tourism promotion and expansion are blamed for natural resource degradation.

Non-implemented tourism and environmental plans: Over the past decade, various documents have been prepared as a basis for ONEB and the Tourism Authority of Thailand (TAT) to tackle environmental problems and tourism development at Pattaya. These documents have included environmental guidelines for coastal zone management, the Eastern Seaboard environmental management plan and a master plan for tourism development. However, the ONEB and the TAT lack the authority and jurisdiction to compel implementing agencies to carry out the recommended strategies. Because the integrated comprehensive plans have not been implemented, a serious imbalance has developed between the supply of and need for facilities, particularly infrastructure.

Impacts of tourism growth: the rapid growth of tourism results in crowding and lack of privacy on the beach and excessive littering during the peak use periods. High rise buildings dominate Pattaya while scenery and nature, "green space", are diminished. The cost of living rises rapidly in the "concrete jungle", and local people sell their land and move out giving way to tourism development. Social and cultural disharmonies such as crime and prostitution become more and more obvious. As a result of these changes, Pattaya faces an uphill battle to retain its lucrative share of the tourist market, a share that has declined from 23% in 1983 to 16% in 1988. The visitors clearly recognise that Pattaya is no longer a peaceful place and its natural environment is so spoilt that it has lost its attraction. There are many overseas travel agents, worried about the pollution problem, that recommend other destinations.

Trends in development in beach tourism: the history of tourism at Pattaya has set the pattern for the development of coastal resort tourism in Thailand. During the first stage, small bungalows owned by local people dominate the resort, which mostly attract domestic visitors. As the tourism volume increases, the second stage begins when outsiders start buying land and establishing their own operations. During the third stage, hotels are constructed without being subject to proper zoning plans or environmental protection controls. Most local owners are replaced by outsiders with superior management skills and financial backing. The economic benefits begin to leak out of the community.

During the fourth stage, most hotel and restaurant owners are outsiders and more tourist income flows out of the area. Massive hotel developments adjacent to the shoreline spoil the scenery. Pollution of the sea becomes so serious that swimming is abandoned. During the fifth stage the volume of tourists falls off because of environmental degradation. The other popular Thai coastal resorts of Phuket and Samed are now following Pattaya into stage four while Samui begins to move into stage three.

The need for assessments of environmental impacts, recreational carrying capacity and limits of acceptable change: the Tourism Authority of Thailand has prepared master tourism plans for all well established coastal resorts in Thailand. These plans have lacked adequate environmental assessment and have contained too little knowledge of concern with recreational carrying capacity and the limits of acceptable change. The master plans focus mainly on development facilities and services, an approach that cannot meet the objective of preserving pristine coastal scenery while at the same time catering to an ever growing number of tourists.

Environmental assessment of physical, social and economic impacts on both macro and micro levels should be included in the earliest stage of tourism planning. There must be:

- clarification of the impacts of large tourism developments on the whole community and implementation of appropriate city planning;
- identification of physical constraints that might limit the potential of the area to service tourism; and,
- mitigation of unacceptable degradation of resources during construction and operation.

Estimation of recreational carrying capacity should be carried out prior to developing the master plan so that the potential of the area to carry recreational activities and to absorb the pollution generated by the activities can be quantified. Formulation of recreational carrying capacity requires that consideration be given to absorptive capacity when only low technology is in use and also after high technology is implemented.

A planning system including limits of acceptable change is required so that consideration is given to what resource and social conditions are acceptable and what management actions should be prescribed to maintain conditions on those limits.

Conclusion

By the year 2000, the number of tourists visiting Thailand could reach 12 million, according to at least one estimate. Yet, in 1990, with only about 3 million tourists visiting Thailand, the existing degradation of the resources attractive to tourists was already causing concern about the future, as the case of the sea coasts of Pattaya illustrates.

What Pattaya needs now is environmental preservation, not further promotion and development. Deplorably, the course of development at Pattaya is now being followed elsewhere in the country. For example, at Samed Island an overabundance of bungalows and food vendors are destroying the beauty of many beaches. Each of the major coastal resorts is taking similar unsound steps along the road to increasing environmental degradation while the costs of rectifying the mistakes increase substantially as the resort enters each successive stage of development.

Success in tourism has usually been measured in terms of the number of foreign visitors and the amount of foreign exchange they bring into the country. No matter how successful Thailand's tourism is by these measures, there remains a dark side to the development. The Pattaya experience shows that Thailand cannot any longer afford, economically or environmentally, to be complacent about the exploitation and destruction of its natural resources for immediate economic gain. Instead, if the country is to maintain economic benefits from coastal tourism, it needs to commit itself to rehabilitating the resource base.

TRAINING SESSION 3.2

CASE STUDY 2

The following case study is provided with permission from:
CLARIDGE, G. 1994 *Management Of Coastal Ecosystems In Eastern Sumatra: The Case Of Berbak Wildlife Reserve, Jambi Province,* In *Hydrobiologia* 285:287-302

The eastern lowlands of Sumatra comprise about 88,000 square kilometres, or approximately 18% of the island's total area. Most of these lowlands were originally peatswamp forest, freshwater swamp forest and mangroves. A significant proportion of the area is subject to tidal influence.

The lowlands have experienced a variety of land uses, firstly by the native people, who were mainly hunter-gatherers, later by the Buginese and Banjarese immigrants from Sulawesi and Kalimantan respectively, and more recently by transmigrants from Java, Bali and Madura.

Land uses have involved principally agriculture, logging and fishing, and a wide range of associated activities. As in most attempts to settle and convert wetlands to other uses, there have been many problems. The Berbak Wildlife Reserve located on the south-east coast of the Province of Jambi provides a microcosm of these problems. The issues and impacts evident in Berbak include nearly all of the issues and impacts affecting wetland areas elsewhere in the eastern lowlands and provide a useful case study.

The Asian Wetland Bureau and the Indonesian Directorate General of Forest Protection and Nature Conservation have carried out a two-year project which includes development of management of the Reserve and the preparation of an Environmental Profile for the lowland wetlands of Jambi Province as a background for regional planning. These components of the project are aimed at investigating and resolving management problems affecting the Reserve, and may be extrapolated to the solution of similar problems in other parts of the Sumatran lowlands

The Eastern Lowlands of Sumatra

The Eastern Lowlands of Sumatra make up some 18% of the island (88,000 square kilometres) in a strip running form Aceh in the north to Lampung in the south. They are at their widest in the central and southern parts (Provinces of Riau, Jambi and Sumatra Selatan). Most of the area consists of alluvial and marine deposits, frequently overlain by a layer of peat that may reach depths of twenty metres.

The majority of the eastern lowlands was originally covered by forest, mainly peatswamp and freshwater swamp forest, with riverine forest along the levees bordering the larger rivers and extensive mangrove belts along the coast.

Berbak Wildlife Reserve as a case study

Status: Berbak Wildlife Reserve in south-eastern Jambi Province was declared in 1935 by a decree of the Governor-General of the Netherlands Indies, following an initiative by the Netherlands Indies Society for Nature Conservation. At that time it had an area of around 190,000 hectares. Since then, in general, Dutch laws continued in force after Indonesian Independence, the Wildlife Reserve remained in existence and its management became the responsibility of the Indonesian Government.

- *Kerumutan Baru* in Riau, which was declared a Nature Reserve in 1979 but is now in poor condition, with all or most ecological values lost as a result of logging and settlement.
- *Padang Sugihan* in South Sumatra which was partially cleared and drained for a transmigration project before being declared a reserve
- *Siak Kecil* in Riau Province which was selectively logged before (and for a short time after) being gazetted in 1983, and which has been subjected to illegal logging ever since: and
- *Way Kambas* in Lampung, large areas of which have been logged.

Biological Diversity: in the area is extremely high. Despite limited surveys, 260 species of woody plants have been recorded, including 23 species of palms *(Arecaceae)* and 10 species of pandanus *(Pandanaceae)* and more than thirty species of mammal, including the Sumatran Tiger (*Panthera tigris sumatrae).*, Clouded Leopard (*Neofelis nebulosa)*, Tapir (*Tapirus indicus)* and Sumatran Rhinoceros (*Dicerorhinus sumatrensis)*, all of which are endangered.

Survey work in 1991 suggests that the Reserve may be one of the remaining strongholds for the False Gavial (*Tomistoma schlegelii)* in Sumatra and perhaps for its entire range in the wild (Cos, pers. comm.). Saltwater crocodiles (*Crocodylus porosus*) occur in at least one of the rivers of Berbak.

Regional benefits from the Reserve: The extensive peat domes of Berbak function as a reservoir of fresh water for the surrounding area, providing not only drinking water for local communities but also contributing to the prevention of saltwater intrusion into agricultural areas. They also help to regulate the runoff of rainwater from the area, thus limiting flooding in the adjacent communities.

Management: The Berbak Wildlife Reserve is managed by the Directorate-General for Forest Protection and Nature Conservation (PHPA) of the Forestry Department through a sub-section of the Province level Office of Natural Resources (KSDA) in Nipah Panjang.

The impact of settlement and population growth

Early settlement: Before the arrival of the Dutch the few settlements were mainly along the rivers. The most significant settlements were at the limits of tidal inundation which, as a result of the low topography, is often very far upstream. (Altitude seldom exceeds ten metres above sea level).

Berbak was apparently one of the traditional seasonal occupations sites of the Melayu people, although this would have been on only a very small scale. There has been a long history of Buginese migration from Sulawesi to what are now Riau and Jambi Provinces. They were followed by further waves of immigrants in the mid 1960's and in 1970. Waves of Buginese settled along the coast from Lampung to northern Riau.

These post 1950 Buginese settlers constituted the first major management problem for the reserve. They cleared the forest, then dug a geometric system of canals, designed both to drain the land and to irrigate it using the power of the tides to push freshwater into the rice fields. Crops were initially rice, gradually changing to coconut as problems with soil and drainage made the land unsuitable for rice.

In this way more than 11,000 ha of virgin mangrove and peatswamp forest was cleared throughout the coastal part of the Reserve, and water levels in adjacent areas were lowered.

The methods developed by the Buginese were later adopted by the government, with less success, in official transmigration programmes. Apart from lowering the watertable and thereby increasing the risk of fires by drying out the peat, drainage which is not properly regulated has other highly deleterious effects. For example:

- peat tends to subside after being drained, with the result that the ground surface is lower and floods and tides have a great influence;
- irreversible shrinkage of peat adversely affects its ability to retain water;
- potential acid-sulphate soils are exposed to air as a result of the lowered water table, thus causing acidification and rendering the soils unfit for agriculture.

Such has been the scale of settlement and logging operations that by 1989 only 30% of the original lowland forest remained in Sumatra, with only 18% of the freshwater swamp forest.

Pests: Agricultural activities in areas of cleared forest in the eastern lowlands generally lead to conflicts between people and wildlife because certain species become pests. Some animals, (eg. pigs, rats and probably monkeys) increase in numbers after partial clearing of an area, while others do not seem to increase but become pests when they come out of the remaining forest patches to raid crop areas or livestock. Deer, bears and tigers fall into this latter category.

The problems with pigs and rats have often been incorrectly attributed to the presence of remnant stands of primary forest. However, it is clear that these species actually do better in areas of secondary regrowth on areas of abandoned or logged land than they do in primary forest. (Whitten, 1989, pers. comm. various village heads, Berbak area).

Tigers and bears, on the other hand, prefer primary forest and move out of this to raid farmers' lands.

Problems for Reserve and wildlife managers arise through both the resentment that builds up against remaining forest areas which are seen as the source of pests, and the trapping, shooting or poisoning of protected and sometimes endangered species by farmers.

Fuel: Mangrove timber has traditionally been used as firewood in Indonesia, not only for daily cooking, but also for small scale industries such as production of coconut oil, palm sugar and lime. On the coast adjacent to the Berbak Reserve the formerly extensive mangrove zone has been almost completely removed. This can be attributed partly to cutting for fuel, partly to the demand for construction material and in part to the reclamation of the rearward areas for agriculture.

Construction material: The mangrove and freshwater forests provide materials for a wide range of construction purposes and this places a heavy and sometimes unsustainable pressure on the resource. For example, off the coast of the Berbak Reserve there are currently (1991) 42 large fish traps which would have required 12,600 3 metre poles for initial construction and up to 4,000 poles for maintenance each year.

- Mangrove timbers are also used for construction of houses, jetties and boats. Little wonder that the formerly extensive mangrove forests have virtually disappeared.
- The nipah palm (*Nypa fruticans*) which grows in the back areas of mangrove forest is used for thatching of roofs and walls and there is a continuing high demand that in the Berbak area is mainly satisfied by the nipah stands within the Reserve.
- Nibung (*Oncosperma tigillarium*) is used for house poles, floors and steps, as well as for road surfaces and foundations, and for fish trap supports. An average house requires 100 nibung poles five to eight metres long, and these need to be renewed every three to five years.
- There are approximately 600 houses in Air Hitam Laut, the largest village in the vicinity of Berbak. Of these, at least two-thirds use nibung in their construction which suggests an annual demand of 10,000 poles or around 3,500 to 4,500 trees for this one village.

Fresh water: supplies of drinking water are generally inadequate in the near-coastal settlement areas of the Eastern Lowlands. The marked dry season in the area means that water from rivers, drainage canals and shallow aquifers becomes brackish in the dry season. This is partly a natural occurrence due to reduced flows at this time of year. Brackish water is significantly increased in places by

reduction of outflow resulting from habitat alteration and increased saltwater intrusion following mangrove destruction. This deterioration of water quality is exacerbated in the canal systems by use of the canals as toilets, input of organic material (eg. household wastes and agricultural chemicals) and seepage of pesticides.

Settlers cannot rely on rainwater supplies, partly because of the uncertainty of rainfall during the latter stages of the dry season and partly because few households have sufficient water storage to cope with more than a 15 day dry spell.

Those people living on the larger rivers collect fresh water up to twenty kilometres upstream during dry seasons taking advantage of the water storage and flow regulation functions of the peatswamp forests in the area. Those away from rivers sometimes have to resort to using coconut milk for drinking for several months each year.

In Berbak people from the coastal villages typically collect fresh water inside the Reserve in the dry season. This leads to management problems, since it is difficult to determine whether people on the river are there solely for the purpose of collecting water.

The impact of economic development

Particularly in the early stages of settlement schemes, settlers have low levels of economic and social welfare until their agricultural production becomes established. In some instances, for example where sites have been located on deep peat or acid sulphate soils, this stage can persist for many years. Under such situations the settlers are forced to seek alternative sources of income, either in neighbouring towns, in more successful agricultural areas or through exploitation of forest products.

Typically the forest products that are exploited are timber, nibung, hipah, jelutung, rotan, fish and wildlife.

Timber: in many instances sawmills associated with logging concessions are located close to settlements. Settlers are able to sell any logs that they can extract from forests areas to the sawmills in order to supplement their incomes. According to Scholz (1983) the first few years of Buginese swamp agriculture are usually financed by the sale of timber. Transmigrants have also used the income from the timber resource in the remaining forest blocks to finance their departure from the transmigration site (James, pers. comm). The result of this uncontrolled exploitation is that remaining forest areas are often rapidly depleted, with a consequent loss of other economic and wildlife values.

Nibung: in addition to the cutting of nibung for local use, settlers sometimes become involved in commercial harvesting of nibung poles for export to other areas of the country. This can amount to a significant industry, with an estimated value in South Sumatra alone of Rp 400 million in 1988. Since the

harvesting is virtually unregulated this can have a significant impact on the viability of this vegetation type and in many places it has virtually ceased to exist.

Nipah: the production of tiles of nipah thatch can represent an important income supplement for settlers. An average family can earn Rp 5000 per day from this activity (1988 prices), which can be undertaken in the dry season when there are no pressing agricultural activities to be undertaken. Provided simple guidelines are followed, harvesting of nipah fronds should not have any significant effects on the resource, however it is an activity that brings people into the Reserve thereby providing opportunities for other, more environmentally damaging activities.

Jelutung: is the name given to the peatswamp forest tree *Dyera costulata* and also to the latex which is obtained from it. This latex has a variety of uses, including high quality chewing gum and bubble gum and for making certain types of cartons. Tapping of trees frequently results in the death of the tree after two to five years, but it is not clear whether this is an inevitable result of tapping, or whether it is because of the practice of trying to obtain the greatest yield in the short time, as has been suggested by some tappers.

Jelutung tapping sometimes provides an additional source of income for settlers, though it is more frequently carried out by organised teams from areas outside the Eastern Lowlands, such as the Batak people from Tapanuli area who have been gathering jelutung in the eastern Jambi area for generations. In such cases the income to the community usually comes only from 'taxes' which may be levied on the product by the local head.

Fish: None of the major ethnic groups in the Eastern Lowlands normally includes professional freshwater fishermen. As a result, while a proportion of the population turns to fishing in the rivers and wetlands of the area for supplementary income, they are not usually involved in large scale freshwater fishing operations, though cumulative catch figures can be high. A group of fewer than twenty fishermen took 1.5 tons of fish from a three kilometre stretch of one river in Berbak in four weeks in mid-1991. The majority of the catch was *tapah (Wallago sp)* which has been exterminated in some of the major river systems in the Eastern Lowlands and should be considered as endangered.

Typically, groups from outside the coastal lowlands who have fisheries backgrounds take advantage of the access provided by the settlements to fish the rivers.

These groups frequently use such unsustainable methods as setting permanent traps completely across rivers, and do considerable damage to large areas of vegetation in clearing living areas and collecting material to make traps.

In Berbak these groups of fishermen usually come from the Ogan Komering lebaks, where there is a long tradition of fishing rivers and lakes, but where a combination of unsuitable fishing practices and an annual ballot system for fishing rights have combined to make the fishery unsustainable. They usually attempt to settle inside the Reserve, but if detected and expelled by management

staff they may settle just outside the Reserve boundary and make forays into the Reserve when no management patrols are in the area.

Rotan: (rattan) is the stem of climbing palms and is harvested for a variety of uses, but principally for making furniture. The material harvested usually comes from the genera *Calamus* or *Korthalsia.* Before the imposition of a ban on the export of all but finished rotan products in 1989, rotan was by far Indonesia's most important non-timber forest product.

Rotan harvesting does not require a high level of skill, and is a common source of supplementary income among settlers in the Eastern Lowlands. In Berbak, rotan is harvested illegally by transmigrants from the schemes to the north and west of the Reserve, as well as by teams from outside the area. In general, harvesting is done without regard to sustainability, and fears have been expressed for the survival of the more popular rotan genera in the Reserve.

Wildlife Products: Hunting of wildlife for supplementary income is an activity which has the potential for obvious and unacceptable impacts on the conservation value of the Reserve.

Tiger hunting in particular is a profitable sideline, though income may not be regular. Virtually all parts of the tiger can be sold. In some instances skin dealers or others willing to deal in tiger products offer rewards for reports of tiger footprints, with a high reward for reports of territorial urine-marking sites.

In Berbak there are no reports of tiger-hunting inside the Reserve, though tiger hunting is carried on in the vicinity of villages adjacent to the boundary. Other species are hunted in the Reserve from time to time.

The Asian Bonytongue (*Scleropages formosus)* is a rare fish with two colour forms that occur in some of the rivers of the Eastern Lowlands. This fish represents a source of high income for minimal effort to the settlers of the region. A fully grown red specimen was sold in Singapore in 1986 for US$2700 (Giesen, 1987). There is an increase of fishing for the Asian Bonytongue in the wet season when this species breeds in the shallow floodwater adjacent to the rivers.

Social and cultural constraints to sustainable management

- Settlers in transmigration areas usually have no more than primary school education, so that it is not surprising that they generally have a low level of awareness of conservation legislation.
- In the Buginese villages adjacent to Berbak the village head is usually the person who was the leader of the group which first opened the area for settlement, or the son of that leader. These original groups were usually extended family groups. The combination of the special position of the leader of the original settlers, the cohesiveness of Buginese family ties, the well known independent character of the Buginese and the remoteness of these areas from central or provincial government can lead to problems for

government officials who seek to enforce controls on natural resource exploitation. Some prefer not to try.

Administrative constraints to sustainable management

- Any deficiencies in management of the Berbak reserve arose from poor discipline and motivation, concentration of staff and facilities in town headquarters, and the high rate of opening of new areas in the countryside. In addition to this is the lack of information about the values and qualities of the area's natural resources, and inadequacy of legislation, boundary identification and demarcation, and cross-sectoral coordination.
- The greater part of the existing information about Berbak has been collected adjacent to the lower reaches of the major rivers and along the coast, and is generally inventory data only. Information about movements of species or life histories is generally lacking.

Management plans

- Berbak has had a management plan, prepared by an FAO team (de Wulf & Rauf, 1982) since 1982. It is written in English, a language which none of the current management staff in Berbak understands, and, not surprisingly, they did not know of its existence at the commencement of a management implementation assistance programme by the Asian Wetland Bureau in 1991.
- Because of the remoteness of the location, low salary levels and the extent of the area to be covered with a limited number of staff, it is difficult to maintain discipline and motivation among field staff. Ideally the level of staffing should be twice the current figures.
- The nature conservation management field staff in Sumatra generally have no more than secondary schooling, and do not necessarily have any interest in biology or conservation before joining the PHPA. Training of field staff currently receives a low priority, though there are plans to remedy this situation in future.
- The PHPA now (1991) has five motor launches and six wooden canoes for patrolling the waterways of the Reserve. However, the funding of running and repair costs for these vessels is a continuing constraint on management patrolling.
- A substantial funding increase is still needed in 1991 if the management of the Berbak Reserve is to reach an effective level.
- Poor or inaccurate descriptions, over-generalised maps attached to official documents, and inability to locate official documents lead to ambiguity and confusion about reserve boundaries.

The future

Funding

- An improvement in the funding situation is essential if there is to be adequate information, manpower, training, motivation and discipline.

- There is a strong argument that, for areas of international significance such as Berbak, the international community should take on some of the burden of funding routine management.
- In the short-term the joint PHPA/AWB Sumatra Wetland Project with funding from the Dutch Government is in the final stages of assessing the management situation at Berbak and making an initial appraisal of the values of the area.
- An analysis of training needs revealed that the most urgent need was for management patrol training of field staff, and a ten-day course has been run by an AWB wetland management trainer with ongoing follow-up by an on-site management expert.

Cross-sectoral coordination

- The problem of availability of information has been partly addressed through reconnaissance surveys of the Reserve and a programme of management patrols to collect data, but it is clear that a well-planned inventory of major wildlife groups is needed over the whole Reserve. The development of a computer wetland database for the whole of Sumatra (later to be extended to the whole of Indonesia) is a part of the same project, and this will not only assist in placing the reserve in a regional perspective, but will also be able to be used as a management tool for the reserve.
- Ongoing efforts are being made to clarify the situation with regard to boundaries. A proposal for adoption of ecologically meaningful boundaries will be part of the management plan. The Department of Forestry is making funds available in its annual budget for the marking of boundaries.
- None of the above measures will be effective until there is a sure and consistent system of enforcement of laws. This will require as a first step substantial increases in the salary levels of all staff in management agencies to remove the need for them to seek supplementary income. If this is accompanied by basic training to ensure that staff understand the nature of their duties and have the minimum of skills and knowledge to carry these out there is a good chance that effective natural resource management will result.

Conclusion

Berbak Wildlife Reserve provides a good case study of the problems of management of coastal ecosystems in the Eastern Lowlands of Sumatra. In their nature and extent they are probably typical of the situation in many developing countries, particularly in areas of fairly recent settlement.

The important requirements needed to overcome these problems (funding; cross-sectoral coordination; clarification of legislation and boundaries; and law enforcement) are probably not within the power of the Indonesian Government to provide within a time scale that will allow the important values of the area to be maintained. Outside help will be needed.

Postscript (June 1992)
The Indonesian Government changed the status of the Berbak Wildlife Reserve to National Park in April 1992 (apparently to meet a target of a certain number of national parks in the country). This was contrary to a recommendation in the draft management plan that the Reserve not be declared a National Park without careful study of the effects it would have on its ability to manage the area for the conservation of wildlife.

Soon afterward (June 1992) the Indonesian Government terminated all Dutch aid projects in Indonesia, including the Sumatra Wetlands Project, so that important follow-up to the measures which had been proposed for a second phase of the project were not able to be undertaken.

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MODULE	**3** **Coastal Zone Uses and Impacts**
TRAINING SESSION	**3.3** **Sustainable Development of the Coastal Zone**
OBJECTIVE	To examine the meaning of the concept sustainable development of the coastal zone.
SIGNIFICANCE	Terms such as sustainable development, ecologically sustainable development, sustainable economic development and sustainable yield are culturally determined. Participants will examine the definition of sustainable development derived from the Brundtland report and examine its applicability to the area under study.
PRESENTATION	Lecture/workshop
TIME	Lecture (1 hour), Workshop (1 hour)
EQUIPMENT	Overhead projector, writing materials.

MODULE 3.3

SUSTAINABLE DEVELOPMENT OF THE COASTAL ZONE

Author: Dr David Lawrence

INTRODUCTION

State objective of the session; significance of the session and logical sequence of sessions in this module.

Participants will be presented with the political and historical processes from which the concept of sustainable development arose and examine the limitations and confusions which have arisen from the use of the term. It will be necessary to examine the international political dynamics that established the concept of sustainability as a goal for future economic development.

A number of key questions may need to be answered, for example: What is the difference between ecologically sustainable development, sustainable resource development and environmentally sustainable economic development? Is sustainable development a contradiction in terms which objects a masculine orientation to economic development and economic growth that marginalised women? Does sustainable development challenge the economic growth = development equation? Do the trainees see problems with utilising the term sustainability in their local area? What are the economic, environmental and cultural constraints on sustainability in the local area? How can these be overcome, or at least accommodated, within national coastal zone management structures and within national economic development programmes?

SESSION CONTENT

There are many different definitions of the term 'sustainable development' currently in use in the literature of development and environmental protection. The term originated in the 1970s when a major revision of development thinking presented challenges to the economic growth=development equation. The idea was that real development could not occur unless strategies were put in place which were not only environmentally sustainable, but which were also consistent with social and cultural values, and which encourage community participation in development project planning and implementation. The United Nations Conference on the Human Environment in Stockholm in 1972 popularised the term when it was suggested that few countries were giving due attention to environmental considerations when making policy and planning decisions. The outcome of that conference was also a linkage between poverty,

environmental degradation, underdevelopment and population growth. However, excessive resource use by the developed world, utilising resources owned by the poorer, developing world is a significant cause of environmental degradation. The reasons for environmental degradation are complex.

Following the Stockholm Conference, environmentalism has taken on new political roles. A World Conservation Strategy was produced in 1980 and action plans have been developed for East Asia, and the South Pacific. The World Conservation Strategy emphasises the maintenance of essential ecological processes and life support systems, preservation of genetic diversity, and sustainable utilisation of species and ecosystems (Barbier 1987: 101). In 1982, a major review of the Stockholm recommendations took place, and in 1992, the United Nations Conference on Environment and Development (UNCED) was held. UNEP took a major role in this meeting and the result was a restructuring of UN activities on the environment and the development of the concept of sustainability through the processes leading from the formation of the Colombo, Manila and Rarotonga Declarations. These statements of commitment to sustainable development were stimulated by international environmental politics and not from regional economic needs and aspirations.

The term 'sustainable development' became popular, and has become part of political rhetoric, since the publication of the Report of the World Commission on Environment and Development which provided the intellectual basis for the 1992 Earth Summit (United Nations Conference on Environment and Development UNCED) negotiations held in Rio de Janeiro. The World Commission report, also known as the Brundtland report, defined sustainable development as: "in meeting the needs of the present generations the ability of future generations to meet their needs is not compromised". The two basic components of sustainable development are: needs (especially those of the developing nations) and limitations (on the ability of the environment to meet present and future needs (Cincin-Sain 1993: 16).

'Sustainable development' contains a number of contradictions. The confusing multiplicity of slogans such as: sustainable development, ecologically sustainable development, sustainable yield and sustainable economic development confuse rather than clarify issues in developing countries. Sustainable development is an imprecise term which ignores the essential trade-offs between economic growth and conservation goals. In fact, critics of the sustainable development concept suggest that ecologically and sustainable are merely two modifiers to the real core of the phrase 'development' and that sustainable development does not challenge the economic growth=development model. The environment is externalised under most economic policy and even the Brundtland report, while advocating sustainability, stated that economic growth was a prerequisite to environmental protection and sustainable development. Attempts have been made to redefine 'sustainable development' to make it more analytically precise. Sustainable economic development for example is centred on increasing the material standard of the poor at the community level in ways that minimise resource depletion, environmental degradation, cultural disruption and social instability (Barbier 1983: 103). Economic sustainability seeks to find ways in which the economy is managed in order to preserve its productiveness. All

definitions emphasise the importance of balancing human needs and ecological limitations. It should also be understood that sustainable development is a Western cultural construct that sees nature as separate from, and able to be manipulated by, humankind. The developmentalist model is under challenge from critics, including feminists from the developing world, who view both science and economic development as products of an essentially Anglo, white, middle-class, male thinking that is reductionist (imposing a monopoly on knowledge and serving the interests of the global market economy), based on exploitation, profit maximisation and capital accumulation.

One major recommendation of the Earth Summit was that national management of coasts and oceans should be 'integrated in content and precautionary in ambit' (Cicin-Sain 1993: 12). The 40 chapter action plan from the conference (Agenda 21) can be summarised into two main concepts: interdependence and integration. There is a growing realisation that the world is facing a series of environmental crises at both the global level (threats to the viability of life on Earth) and local level (threats to the attainment of development and quality of life). Environmental stresses in the developed countries are created by patterns of production (eg. excessive use of natural resources and the generation of waste) and patterns of consumption (eg. over consumption). Global environmental problems, such as greenhouse gases, ozone depletion, toxic pollution are mainly generated in the developed nations. Environmental stresses in the developing countries result from poverty combined with overpopulation, urban growth and air and water pollution. Many environmental problems in developing countries are local in nature. However, as developing nations in the Asian region strengthen their economic base the environmental stresses also change.

The international economic system now also means that the export of natural resources from the developing nations to the developed is increasing with a corresponding increase in the movement of imported manufactured goods into developing nations. Interdependence necessitates integration. This integration is essentially between the environment and development (sustainable development), and between the developed and the developing nations of the Asian/Pacific region.

Sustainable development involves:

- Economic development to improve quality of life
- Environmentally appropriate development
- Development that is environmentally sensitive and makes appropriate use (and non-use) of natural resources while protecting ecological process and biological diversity
- Equitable development
- Intersocietal equity among different groups in society including respecting the rights of indigenous people, intergenerational equity protecting the rights of future generations and international equity, fulfilling obligations to other nations (Cincin-Sain 1993: 16).

Sustainable development means making decisions guided by a philosophy that emphasises the need for development that will improve the quality of peoples lives, that is environmentally sensitive, makes proper use of natural resources and protects essential ecological processes and biodiversity.

Agenda 21 described seven major programme areas for integrated coastal zone management strategies:

- integrated management and sustainable development of coastal and marine areas, including Exclusive Economic Zones (EEZ);
- marine environmental protection;
- sustainable use and conservation of living resources of the high seas;
- sustainable use and conservation of living marine resources under national jurisdiction;
- addressing critical uncertainties for the management of the marine environment and climate change;
- strengthening international, including regional, cooperation and coordination; and,
- sustainable development of small islands (Cicin-Sain 1993: 18)

Integrated management and sustainable development of coastal and marine areas

Agenda 21 called for nations to commit themselves to establish integrated policy and decision making processes and institutions for management and development of coastal and marine areas at both the national and local levels. Actions to be taken include:

- the preparation of coastal and marine use plans;
- environmental impact assessment and monitoring programmes;
- contingency planning for both human-induced and natural disasters;
- improvement of coastal settlements;
- conservation and restoration of critical habitats;
- integrated multisectoral planning (fishing and tourism for example);
- cooperation in the preparation of national guidelines for integrated planning and the development of policies for the maintenance of biological diversity and productivity of marine species and habitats under national jurisdictions.

There is also a strong call for the need to include traditional ecological knowledge and an understanding of social and cultural value systems into management of the coastal zone and a need to include local communities, and indigenous people, in decision-making (Cicin-Sain 1993: 18).

Marine environmental protection

Coastal nations were requested to increase their efforts to deal with both land-based and marine-based sources of marine pollution. A precautionary and anticipatory approach, rather than a reactive one, is needed to prevent marine environmental degradation. Priority areas are: sewage control, watershed management practices, control of land based pollution and anthropogenic inputs

of chemicals. Expansion of fishing activity has resulted in overutilisation and management problems.

Sustainable use and conservation of living marine resources of the high seas
States have been requested to commit themselves to the conservation and sustainable use of marine living resources in order to meet the objectives of the development of fisheries, the protection of endangered marine species, and the maintenance, or recovery of marine species at levels that may produce sustainable yields.

Sustainable use and conservation of living marine resources under national jurisdiction
The Law of the Sea provides the framework for the management of fisheries under national jurisdiction and in Exclusive Economic Zones. Major problem areas are: overfishing, unauthorised access to fishery areas, ecosystem degradation, poor research data, competition between artisanal and commercial fisheries, inadequate or inappropriate fishing technology. A number of objectives have been highlighted which have both developmental and conservation goals.

Addressing critical uncertainties for the management of the marine environment and climate change
Better information is required on the state of present ecosystems and more accurate predictions for the future. States were requested to commit themselves to improving the research base from both scientific and traditional ecological knowledge, developing management capabilities, capacity building and strengthening national institutions.

Strengthening international, including regional, cooperation and coordination
International cooperation is required to support national efforts and better coordination of programmes is needed. A multisectoral level approach is essential at all levels. Because of their special characteristics, small developing island states represent a special case of the challenge between development and environmental protection.

Sustainable development of small islands
A commitment to addressing the particular problems of development and environment needs of small island states is needed.

Integrated coastal zone management implies management of the coastal region as a whole in relation to local, regional, national and international goals by focussing on the interactions between various activities and resource demands. In practical terms this means integration of environmental protection goals into the economic and policy making processes.

CONCLUSION

Participants should have at least two or three handouts to read before the next session. It will be necessary to summarise the content of the session and to provide some brief lecture notes for future reference.

SESSION MATERIALS 3.3

- **OH 3.3.1** Sustainable Development
- **OH 3.3.2** Ecologically Sustainable Development
- **OH 3.3.3** Sustainable Yield
- **OH 3.3.4** Sustainable Economic Development

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Sustainable Development

Humanity has the ability to make development sustainable to ensure that it meets the needs of the present without comprimising the ability of future generations to meet their own needs.

Ecologically Sustainable Development

ESD means using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased. It encapsulates the need for communities to manage their renewable and non-renewable resources wisely and effectively for the long term benefit of both present and future generations'

Source: Department of Arts, Sport, the Environment and Territories 1991: 20.

Sustainable Yield

Usually applied to the forestry industry, sustainable yield is defined as: the amount of timber which can be harvested today without reducing future yields. The aim is to harvest up to or less than the rate of natural or managed regeneration

Source: Commission for the Future and the World Commission on Environment and Conservation, 1990: 44-45.

Sustainable Economic Development

'The primary concern of sustainable economic development, ... is to ensure that the poor have access to sustainable and secure livelihoods. At the national level, this calls for policies, regulations, and incentives, to induce economic behaviour that is environmentally rational ... the primary objective is reducing the absolute poverty of the world's poor through providing lasting and secure livelihoods that minimise resource depletion, environmental degradation, cultural disruption, and social instability'

Source: Barbier, 1983: 103.

MODULE 4

SOCIAL AND CULTURAL SYSTEMS

Authors: Dr David Lawrence and Sally Driml

OBJECTIVE

To understand the concept of sustainable development of the coastal zone; to develop skills in working in cross-cultural situations; and with social mapping techniques; to understand different social and cultural value systems and, to examine prospects for the integration of traditional ecological knowledge and customary management systems in the sustainable development of the coastal zone.

TRAINING SESSIONS

4.1 Social Mapping

4.2 Working in Cross-Cultural Situations

4.3 Traditional Ecological Knowledge (Indigenous Knowledge) of the Coastal Zone

4.4 Customary Management of the Coastal Zone

4.5 Economic Systems

BACKGROUND

The training programme will operate in an environment of social and cultural diversity and possibly even some cultural complexity. While this module establishes some common issues for discussion and examination, it does not set a formula applicable to all social and cultural systems. Each case study will be culturally specific and some preliminary understanding of the history, language, culture and value systems of each area will need to be understood by the instructors before the training commences.

For this reason, instructors should be briefed about the social, cultural, economic and political history of each area in which training in integrated coastal zone management will take place. The introduction should proceed along a series of logical paths aiming for a general understanding of the need to recognise and respect minority, and/or indigenous, cultural and social structures and ecological management systems. It is important that instructors be aware of the problems faced by minority cultures within the dominant culture, particularly if the coastal zone is inhabited by people from both the minority and the dominant societies.

Trainees will need to be encouraged to identify their own cultural groups, languages, religions etc, and will need to be encouraged to be open about the problems and prospects that they can find in establishing coastal zone management plans in the areas in which they will work. This may involve discussion of past colonial and current political dominance, social and cultural marginalisation and stratification, the problem of powerlessness of minority cultures and the role of women in development. It should be recognised that these may be sensitive topics that may not be openly nor easily discussed. It is therefore important that at least one instructor for this module be experienced in cross-cultural communication and be well briefed about the social and cultural values of the area under investigation.

Readings will be specific to each area. Reading materials would include general historical and cultural texts relevant to the area under study, some basic language training and a briefing of social values, attitudes and communication styles, etc. This introductory programme may be run as a one-or two-day briefing session conducted by local government officials, academics and representatives from indigenous communities before the commencement of the training course.

The Indonesian Government has acknowledged the need for a balance between economic growth and sustainable use of natural resources. The Government has established a target figure of 10 million ha of marine protected areas and progress has been made in developing a system of MPAs. However, management planning and implementation have been identified as the critical areas (Alder, Sloan and Uktolseya 1994). The factors affecting planning and management are:

- proximity to urban areas
- jurisdictional disputes
- coordination
- scientists' perceptions
- conflicting use
- community awareness and training

The first four points will be discussed elsewhere in this training programme. Conflicts arise mostly between traditional, or subsistence, fishers, commercial fishers and tourism developers. The zoning system, based on an agreed spatial separation of conflicting users, does not adequately address this conflict. Integrated coastal zone management is therefore required.

In Indonesia, coastal communities have the lowest standard of living in the country. Marine resources are exploited at a subsistence level that is part of an open access system. Participation in coastal zone management programmes will only occur when local communities perceive the direct social and economic benefits. Social and economic benefits can be achieved through participation in decision making, education programmes and community development programmes. However, most communities see commercial operations exploiting marine resources without restrictions and coastal developments, especially tourist operations, expanding and displacing communities from sources of livelihood, with no compensation and no opportunities for local participation. Exploitation of the marine environment has a long tradition in Indonesia. Strong opposition to marine conservation programmes would occur without local involvement in management. Long term commitments by local, regional and national governments in integrated marine conservation projects are needed.

Community participation in coastal zone management is essential in Indonesia. Public awareness and education programmes have a major role in marine conservation. National programmes focus on broad conservation issues, such as coral reef protection and sea turtle conservation; regional and local programmes are usually site-specific. Indonesian conservation legislation requires community participation but the implementation of programmes has been slow (Hutomo and others 1993). The major problems for Indonesia continue to be lack of surveillance, enforcement, research, funding and human resources.

This module will describe processes for community participation into local decision making.

In developing countries, where a significant proportion of the population relies on coastal marine resources for subsistence, the development of marine protected areas cannot proceed without community participation. Failure to involve the local people will only result in mistrust, alienation and disregard for rules and regulations governing marine conservation areas. However, there is a major conceptual leap between community involvement and community participation. Real participation is an exercise in power sharing. Involvement

can be merely tokenism or manipulation. Informing, placating and partnership may involve the community but not provide meaningful input into decision-making. Citizen power provides communities with the means to negotiate, seek compromises and influence powerholders and decision-makers as equal partners. In poor developing countries, participation must also be linked with income-generating activities and other mechanisms for raising the economic well-being of the people. A major area of involvement can be tourism but generally the economic benefits of tourism for local people are small.

Community participation expands the ownership of environmental problems. It provides a way in which communities can realise the nature and extent of environmental degradation at the local level, determine the cause of the problem, and participate in the means for a solution. The goals of community participation in coastal zone management is empowerment of local people to effect changes and to articulate needs and aspirations. Factors limiting community participation include: fragmentation of communities, social and cultural divisions and disputes, local political processes, inadequate funding, the need to take time to build consensus, bureaucratic inertia, educational and training levels. Similar problems exist in developed as well as in developing nations.

Notes to instructors:

This whole module would be best run as small group workshops using, as much as possible, slides, maps, videos and oral presentations. It should be noted that some of the readings listed may be applicable to more than one section of this module and may contain a number of parts or chapters of relevance.

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MODULE	**4.** **Social & Cultural Systems**
TRAINING SESSION	**4.1** **Social Mapping**
OBJECTIVE	To produce a broad-scale social map of the coastal zone under investigation. The aim will be to identify the social, cultural and economic groups inhabiting the coastal zone, to identify points of conflict, linkages between communities and relationships between communities and the local, provincial and national governments. To identify communities with traditional and historical affiliations to the coastal zone.
SIGNIFICANCE	Participants will be better able to prepare management plans for the coastal zone if they have a fuller understanding of the social and cultural dynamics of the region.
PRESENTATION	1 hour Lecture, full-day workshop
TIME	1 day
EQUIPMENT	Overhead projector, maps, charts, writing materials, paper.

TRAINING SESSION 4.1

SOCIAL MAPPING

Author: Dr David Lawrence

INTRODUCTION

Describe session objectives and the purpose of developing social maps. Social mapping identifies the social, cultural and economic groups inhabiting the region under discussion. Once these groups are identified, the points of conflict, the linkages between communities, and the relationships between the communities and the local, provincial and national governments can be recognised.

SESSION CONTENT

A broad social mapping of local cultural systems should be undertaken, using plans, maps of coasts, settlements, population figures, migrations etc. Identification of different cultural groups will allow for the identification of problem areas. It is important to identify related cultural groups and groups in conflict, for this is crucial to the success of coastal zone management. For example, in one estuary there may be three groups in conflict over resource use but nearby each group may have exclusive rights.

Linkages between peoples are also very important, e.g. who trades with the fishermen, who trades with the inland communities, etc. This can be undertaken by open discussion between trainees, and by the use of anthropological reports, government documents and oral evidence from local peoples.

Social mapping is a practical skill that can build teamwork and be a positive means for gaining local participation and support for the programme. It can also cause anger and frustration if mismanaged and poorly supervised. Social mapping takes time and the allocation of resources, boats, cars, equipment etc, should be well planned, and carefully managed.

One particular objective of social mapping is the identification of the traditional land owners of the coastal zone region. Through the social mapping process it will be possible to determine the role and position of the traditional, if not legal, land owners of the coastal resources under examination. A discussion of their problems and aspirations is important so that the base level of understanding is

comprehended in the beginning by the trainees.The traditional owners of the coastal zone may not be the legal owners, in which case, their involvement in management programmes will need to be assessed. It may be that unless they are involved, the programme will fail and their exclusion may result in further conflict, marginalisation and alienation. If the aim of the project is to establish local area management committees, then the nature and structure of the committees needs to be examined, and the level of economic and political powers given to the committees needs to be described.

Identify the people with historical affiliations to the coastal zone region. These people may be migrants, relocated people or squatters. There needs to be a discussion of the resource use activities of these groups and their political and economic positions with regard to the first group. These people may very well be the current owner/occupiers of the land, coastal areas, etc. It is important to identify any areas of conflict (both overt and covert) between the traditional and the historically affiliated peoples. The aim of this section is to identify groups with management and use rights to the coastal zone. All groups need to be represented in local area management committees, or advisory groups.

CONCLUSION

At the end of the session, participants should have copies of the coastal area under investigation, a broad scale social map of the area and some detailed knowledge of the social, cultural and economic dynamics of the region. Participants should have a detailed perspective on the nature of traditional resource ownership, historical affiliations to the coastal zone and the interaction between the two resource user groups.

SESSION ACTIVITIES 4.1

- List the cultural groups and their interactions in the regions. Using the regional map created in Module 1.2, make an overlay of a broad scale social map. Include different cultural groups, trade routes, traditional land owners, groups with historical affiliations to an area (migrants, relocated people etc.) and other cultural groups.

REFERENCES 4.1

Anthropological and cultural studies, particularly unpublished theses and reports, of regional and indigenous groups should be used as the basis for analysing the nature and extent of the human populations living adjacent to the coastal zone under examination.

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MODULE	**4.** **Social & Cultural Systems**
TRAINING SESSION	**4.2** **Working in Cross-Cultural Situations**
OBJECTIVE	To examine culturally correct and incorrect ways of working with minority groups living in the coastal zone, together with an understanding of the ethical, moral and religious implications of working with other cultures.
SIGNIFICANCE	Participants will need to understand the social and cultural difficulties they may face in working with minority cultures within their own societies.
PRESENTATION	Lecture and discussion
TIME	2 hours
EQUIPMENT	Overhead projector, writing materials

MODULE 4.2

WORKING IN CROSS-CULTURAL SITUATIONS

Author: Dr David Lawrence

INTRODUCTION

Explain the objectives of the session and discuss the problems which may be faced by trainers working with minority cultures.

To work effectively with minority cultures, managers must be aware of the culturally correct and incorrect ways of working with those groups. If managers want to people to change their behaviour they must also understand the ethical, moral and religious implications such changes may have for other cultures.

This training session outlines the key points to be considered when preparing to work with minority cultures.

SESSION CONTENT

Aspects of cultural sensitivity, the nature and extent of the impact of colonisation on regional economic and social systems, working with women in development, political marginalisation, the nature and importance of custom and religion, the ethics and morality of working with the knowledge and customs of minority peoples particularly the issue of intellectual property rights of minority groups and the powerless, are all important issues and will need to be understood by both instructors and trainees.

It is important to determine beforehand the nature and means by which the local community will benefit from participation in the coastal zone management process. There needs to be a full consultation and negotiation over the goals and outcomes of the work and a understanding that traditional ecological knowledge, for example, is never value free. The return to the local community may be in terms of self-determination, economic development, political autonomy, respect and/or money. Traditional owners should be seen as active participants as owners and managers and 'stakeholders', not as passive role players.

Local communities may have strongly held views on alternatives to development proposals and these may be in conflict with the goals and aims of the instructors and national and provincial governments. The aim of this session will be to prepare trainers with skills in dealing with potential conflicts.

differences of opinion regarding government proposals and development of the coastal zone and to provide trainers with skills in understanding social, cultural and economic constraints to sustainable development of the coastal zone.

In working with communities it is important to consider the nature of four separate, but interconnecting systems, which govern the way in which local people utilise natural resources:

- the economic system
- the subsistence/resource use base
- the social and cultural system
- the ecological system

The nature of each of these systems, and their interaction, needs to be understood. Social mapping will assist in providing a detailed survey of the first three important systems.

Ecological surveys of the population size, distribution, and characteristics of marine species will need to be undertaken as part of the procedures for the establishment of marine protected areas. Studies of the human environment add to the knowledge base.

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MODULE	**4.** **Social & Cultural Systems**
TRAINING SESSION	**4.3** **Traditional Ecological Knowledge (Indigenous Knowledge) of the Coastal Zone**
OBJECTIVE	To examine the importance, current strengths and weaknesses and opportunities for incorporation of traditional ecological knowledge (TEK), indigenous knowledge (IK) and customary marine tenure (CMT) of the coastal zone in management strategies.
SIGNIFICANCE	Understanding TEK (including CMT) will assist in evaluating potential constraints to ecologically sustainable development.
PRESENTATION	Lecture and workshop
TIME	Lecture (1 hour) and Workshop (2 hours)
EQUIPMENT	Reading materials, overhead projector, video projector, writing materials

TRAINING SESSION 4.3

TRADITIONAL ECOLOGICAL KNOWLEDGE (INDIGENOUS KNOWLEDGE) OF THE COASTAL ZONE

Author: Dr David Lawrence

INTRODUCTION

Explain the purpose of the session and the linkage between sessions 4.3 and 4.4.

SESSION CONTENT

A variety of terms are currently in use to describe the traditional environmental knowledge of indigenous peoples. Traditional ecological knowledge (TEK) has, to some extent, been surpassed by the term Indigenous Knowledge (IK) although in the marine environment the term Customary Marine Tenure (CMT) refers to both the knowledge of the physical marine environment, human use and the interaction between humankind, the environment and natural resources. Although traditional ecological knowledge is inadequate, and eurocentric, as a description for the complex range of human-environment interactions of indigenous people it is used for convenience.

Traditional ecological knowledge in Asia and the Pacific has been devalued by the impact of Western models of scientific rationalism, technology and methods of documentation. Traditional ecological knowledge and scientific knowledge are two distinct ways of understanding, focussing and expressing the nature of the physical reality. One system is embedded in instrumental knowledge, the other in practice. Traditional ecological knowledge should be respected, not treated as if it were gossip or folk story. Traditional ecological knowledge is usually presented by social scientists in particular as either folk taxonomies (ethnobiological or ethnozoological classifications) or as indigenous understandings of natural processes (relationships between people, plants, animals, and the spiritual and physical worlds). It also involves an understanding of environmental structures and processes (Lewis 1993).

Both western scientific methodology and traditional ecological knowledge may be made to connect and operate cooperatively although, in practice, examples of this are rare. There are many factors which mitigate against the inclusion of traditional ecological knowledge into mainstream ecological management. Traditional knowledge is linked to cultural and social practices, religion and local

power structures. In order to understand traditional ecological knowledge it must be seen within context and not simply as a locally determined means for resource management and exploitation. It is also important not to present unrealistic, idealised, notions of traditional resource management - the 'charmony with nature' myth.

It is important to demonstrate ways in which traditional ecological knowledge can assist in the promotion of ecologically sustainable development. It should also be recognised that the intent of many traditional land and resource use practices is explicitly conservation in purpose but it is also important to comprehend the contradictions between environmental and ecological knowledge and technological practice. For example, the cultural and dietary importance of the dugong to both Australian Aboriginal and Torres Strait Islander people is well documented in northern Australia. However, the introduction of outboard motors and metal dinghies has made dugong hunting more accessible to men who may not possess cultural knowledge about dugong life cycles and culturally appropriate distribution practices.

Disjunctions between beliefs and practices, between the ideal and the real, are not only found among the people of developed nations (Lewis 1993). It is an inevitable part of the human condition. For indigenous people undergoing periods of great social, cultural and economic stress the gap between belief and practice may be great.

One major problem in assessing the management potential of traditional ecological knowledge and integrating it into scientific management of the coastal zone is the localised, specific nature of traditional knowledge. Beliefs and practices vary from culture to culture, even between closely related cultures. Traditional ecological knowledge is localised information related to a particular geographical area, particular species and ecological processes. Indigenous people should not be expected to provide an understanding of global environmental issues. However, comparative analysis has shown that there are linkages and commonalities between the global and the local.

Indigenous adaptations involve long-term adjustments to specific environments. They provide a valuable time-depth not available to scientific models of human-environment interaction. Although traditional ecological knowledge is not scientific in the western cultural sense, it is a form of environmental understanding that can be compared, and support, scientific inquiry (Lewis 1993). For the scientist, traditional knowledge can provide qualitative information that parallels and explains scientific knowledge. While traditional ecological knowledge forms the basis of human behaviour that results in careful stewardship and husbanding of natural resources, the contexts and motivations in which that knowledge exists differ from the requirements of modern natural resource management (Healey 1993).

For modern resource managers, conservation and protection is part of a philosophy that seeks to balance human needs with preservation of the viability of ecological systems for the common good of all society. For indigenous people,

the objective of conservation and resource management is for the benefit of local communities, clan and kinship groups and even individuals. For indigenous committees, use of traditional knowledge provides recognition, and verification, of beliefs and practices and acknowledges the legitimate rights of indigenous people to participate in the management of the coastal zone.

There is an essentially political relationship between custodians of traditional knowledge and managers seeking to utilise that information. Managers are usually from the dominant social and economic cultural group, with westernised backgrounds and members of, or allied with, the dominant political associations within a nation state. Indigenous people are usually from minority groups and may be dispossessed of their lands, or socially and politically marginalised. Traditionalism is usually associated with those people on the periphery of the dominant political and economic system in modern nation states.

Consequently, the relationship between managers and researchers, on one hand, and indigenous people, on the other, is an unequal one. Power is concentrated in the hands of the managers and researchers and careful attention must be paid to this issue. This power can be abused by misuse of information gained by research and a lack of recognition of the social and cultural contexts in which traditional ecological knowledge exists (Healey 1993). The process by which traditional ecological knowledge is verified to satisfy the demands of scientific credibility can also result in a loss of ownership of information and a devaluation of the original social and cultural purpose. A good example of this is the scientific verification of customary Aboriginal fire ecology in northern Australia which has resulted in fire management regimes managed and controlled by non-Aboriginal people with almost no Aboriginal decision-making input.

Traditional ecological knowledge may also be a powerful weapon in the struggle for social and cultural autonomy, for land and sea rights, and in the preservation of cultural identity. The quality of local environmental knowledge, resource use information and the spiritual linkages between people and place is an important element in the presentation of claims to traditional land by Australian Aboriginal people, for example.

The Brundtland Commission drew attention to the contributions of indigenous people to sustainable development but also stated that the way of life of indigenous people, and the vast accumulations of traditional knowledge, are under threat from the processes of development that is leading to the gradual incorporation of local communities into larger national and global social and economic networks. The loss of traditional ecological knowledge will be a tragedy for all humankind, not just for indigenous peoples.

CONCLUSION

The nature and current position of traditional ecological knowledge for the area will need to be determined. Traditional ecological knowledge in Asia and the Pacific has been devalued by the impact of Western models of scientific rationalism and documentation. Traditional ecological knowledge and scientific knowledge are two distinct ways of understanding, focussing and expressing the nature of the physical reality. One system is embedded in instrumental knowledge, the other in practice. Traditional ecological knowledge should be respected, not treated as if it were gossip or folk story.

Both systems may be made to connect and operate cooperatively although, in practice, examples of this are rare. There are many factors which mitigate against the inclusion of traditional ecological knowledge into mainstream ecological management. Traditional knowledge is linked to cultural and social practices, religion and local power structures. In order to understand traditional ecological knowledge it must be seen within context and not simply as a locally determined means for resources management and exploitation.

At the end of the session participants will have identified the nature and extent of TEK and CMT for the area and be able to analyse the strengths and weaknesses in local ecological knowledge. Some perspective on the potential application of TEK will be gained.

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MODULE	**4.** **Social & Cultural Systems**
TRAINING SESSION	**4.4** **Customary Management of the Coastal Zone**
OBJECTIVE	To provide a means for the incorporation of traditional ecological knowledge and customary marine tenure systems into an integrated coastal zone management framework emphasising the value of community based management.
SIGNIFICANCE	Integrated coastal zone management will operate in a less conflictual situation and be more readily acceptable to the inhabitants of the coastal zone if it incorporates an understanding of the social and cultural system and takes into account community concerns and needs.
PRESENTATION	Lecture and workshop
TIME	Lecture (1 hour) and Workshop (2 hours)
EQUIPMENT	Maps, charts and information from sessions 3.3-3.5, overhead projector, writing materials

MODULE 4.4

CUSTOMARY MANAGEMENT OF THE COASTAL ZONE

Author: Dr David Lawrence

INTRODUCTION

Explain the objectives of the session and the importance of integrating information gained from previous sessions

The aim of this session is to develop understanding and respect for the traditional managerial and custodial role of traditional societies and to attempt to incorporate elements of the customary management into an integrated coastal zone management system. Customary management systems are under threat from internal and external forces, such as the cash economy, outmigration, lack of knowledge of custom, internal disputes within communities, political pressures, developments on the coast, the impact of squatters, refugees and poachers etc.

It is important to identify these issues and to examine the contemporary situation. What has happened to this traditional system? Has it been completely lost or merely suppressed? It is also important for instructors to realise that minority groups may wish to use coastal zone management plans as vehicles for other community expressions, e.g. land rights, political self-determination, etc. There may be other agendas not easily understood from outside the culture.

It is also important to inform trainees that resource management models are not being presented as practices to be borrowed or replicated but as guidelines for the development of processes for creating new, and strengthening the old, forms of relationships between people and their environment and for developing local models of coastal zone management. The aim is not to find the perfect management model and apply it, but to find a management solution acceptable to all parties (dominant and minority) that will serve the basis for the evolution of better forms.

It may not be possible to resolve local conflicts through coastal zone management but the coastal zone management plan may be a vehicle for inter-group communication and local area management committee meetings may play an important role in formalising the conflict discussion and conflict resolution processes. It is important to stress that the best solution may be a local

one, and one based on community based management rather than on legalistic or bureaucratic structures. However, a community based system needs continual support and encouragement from the powerful players and the position of the national, or provincial bureaucracy must be understood and utilised.

SESSION CONTENT

Indigenous people traditionally managed their resources. They used resources available to them, made choices about the rate of resource use, and modified ecosystems in selective ways to increase the availability of resources. A principal management objective was to maintain a mode of production which not only had material benefits but which reproduced the cultural system. The constant factor was sustainability. Indigenous economics were organised in order to minimise risk, rather than accumulate wealth. By utilising a variety of habitats and by modifying habitats, indigenous people avoided risks and maintained stable ecological systems.

Biodiversity was encouraged by creation of estates composed of several dispersed and ecologically diverse parcels of land, by assigning different subsistence tasks to men and women, using swidden agricultural systems, and by combining hunting and horticulture with fishing and gathering. Overconsumption and overproduction was avoided by complex patterns of exchange and gift giving and by favouring labour-saving and energy-efficient production methods. Populations were maintained below the maximum carrying capacity of the land and human access to resources controlled by communal patterns of land-tenure.

However, sustainability could only be maintained when people were more or less satisfied with their share of resources, opportunities and access to power. The strength of indigenous societies was through the institutions of kinship, sharing and consensus decision-making. Challenges to indigenous land and marine resource use and ownership have occurred as a result of settlement change, loss of land, cultural disruption, the impact of the cash economy and new patterns of consumption, new technologies and external political pressures.

Although the knowledge, observance and management practices associated with customary marine tenure may have undergone radical changes during the historic period, in many parts of the coastal zone they continue to exist in varying degrees. Indigenous people seek increased participation in all aspects of the management of the coastal zone. The important issues for indigenous people in coastal zone management are:

- recognition of traditional land, sea and resource rights
- protection of heritage sites, cultural knowledge and the environment
- participation in coastal zone management and decision-making processes
- involvement in and benefits from commercial fishing in the coastal zone (Resource Assessment Commission 1993).

Security of resource rights

The most widespread threat to indigenous peoples' resource management practices is the failure of nation states to respect and protect indigenous rights of control over land and sea country, under customary ownership.

Securing land rights and sea and resource rights is the first step in rebuilding indigenous social, economic and cultural institutions. The International Labour Organisation Convention on Indigenous and Tribal Peoples No.169 (1989) provides five general principles for minimum protection of land and resource use rights:

- ownership and possession of lands
- rights to use lands not occupied by indigenous people but to which they have customary access for subsistence and other activities
- rights to adequate processes for the resolution of claims and for acquiring additional lands under national land-reform measures
- rights to control their own development, and to use, conserve and manage all natural resources pertaining to their land, and to be protected from environmental degradation
- rights to participate in decision-making regarding the disposition of state-owned mineral resources, and not to be removed from land without consent (Schmider 1991).

Many indigenous people consider areas of the sea to be integral parts of their traditional lands or 'country'. In northern Australia, for example, anthropological research has shown that distinctive Australian Aboriginal and Torres Strait Islander maritime cultures continue to exist and records describe systems of indigenous coastal maritime tenure rights relating to both inshore and offshore areas. However, the legal and social recognition of these rights and management practices has not been readily acknowledged by the dominant non-Aboriginal society. This is a common pattern in many developing and developed societies where indigenous minorities continue to struggle for official recognition of customary marine resource use rights.

CONCLUSION

Community-based management of the coastal zone has value not only for the nation but also for the community. At the end of the module, participants should have a more detailed understanding of the nature and extent of traditional resource usage, historical affiliations, TEK and CMT and customary management systems, even if only from an historical perspective. Incorporating this information into integrated coastal zone management is a complex process. At the end of this module, participants will have gained some idea of the dynamics of local social and cultural systems and on the constraints on applying local knowledge to ICZM.

SESSION ACTIVITIES 4.4

MAPPING EXERCISE

- Using information gathered in this module, create an overlay of traditionally owned areas in the coastal zone where customary management systems are still applied.

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MODULE	**4** **Social & Cultural Systems**
TRAINING SESSION	**4.5** **Economic Systems**
OBJECTIVE	To provide an understanding of the economic links between coastal resources and sustainable community benefits.
SIGNIFICANCE	The workings of economic systems determine the rate of use of coastal zone resources and understanding of existing economic systems is the first step towards ICZM.
PRESENTATION	Lecture and Workshop
TIME	1 or 2 1 hr Lectures, 2 hr Workshop
EQUIPMENT	OH Maps as used for previous workshops. A field trip to look at local markets or major export industries could be useful.

TRAINING SESSION 4.5

ECONOMIC SYSTEMS

Author: Sally Driml

INTRODUCTION

Why is the study of economic systems important to Integrated Coastal Zone Management? The natural resources of the coastal zone are valuable components of economies based on subsistence, barter and cash. Resources such as fish, agricultural land and tourist attractions provide the basis for the well-being of many of the world's coastal communities. The imperative to use natural resources of the coastal zone to provide for these economies is ironically the driving force behind human actions which may threaten the viability of the resources. Threats may come in the form of over-harvesting, pollution, and destruction of habitat.

Market-based economic systems contribute to resource depletion by ignoring values of the environment not given monetary values in markets, ignoring links between the economy and environment and taking too short a time perspective to resource use.

This training session aims to introduce concepts of the links between coastal resources and economies. An understanding of the forces which cause people to use coastal resources in either sustainable or unsustainable ways is the essential starting point to managing for sustainable use.

It is assumed throughout that the desirable goal for the use of natural resources of the coastal zone is in a sustainable manner, that is, one which will ensure the maintenance of a healthy environment and a flow of economic benefits over the long run.

SESSION CONTENT

The Economic System and the Environment

- **OH 4.5.1 The Economic System and the Environment**

A simple model of the links between an economic system and the environment is shown in OH 4.5.1. The model shows that the processes of production and consumption, or what is usually thought of as the 'economic system', are dependent on the natural environment as a source of raw materials and as a life support system, and as a dump for residuals. What is important for ecologically sustainable development is the *rate* of extraction and dumping of residuals.

Many environmental systems can support certain rates of harvesting or modification and can assimilate certain rates of waste disposal, whilst retaining the ability to continue to do so in the future. Beyond these sustainable rates of use, there is degradation or collapse of environmental systems. (The sustainable rates differ for different resources and pollutants.) Thus, it is important to recognise the links between the demands placed by the processes in the economic system and the environment as part of integrated coastal zone management.

OH 4.5.1 can also be used to illustrate some important concepts in the discipline of economics. Unfortunately, much economic analysis tends to concentrate on the processes occurring in the box labelled 'economic system' and ignore the links with the environment. In recent years, the study of what is labelled 'ecological economics' has increased, with the aim of recognising the interdependence of economic and environment systems. There are limitations to our ability to apply ecological economics and they arise from two sources. Firstly, our understanding of biophysical and ecological processes is limited. Secondly, to include environmental resources in economic analysis, we need to place a monetary value on them. In many cases, markets do not exist for extracting resources or dumping waste and it is seen to be free of charge. But these actions do have a cost because the supply of natural resources is limited. Methods for placing a value on the use of environmental resources are presented in this Module.

The nature of economies in the coastal zone in the ASEAN Region.
The economy of any country is made up of economies of its regions which are in turn made up of the economies of cities, towns and smaller communities. In the ASEAN Region, some coastal communities remain at basically a subsistence level while others have undergone a partial or full transition to be cash based. The degree to which coastal zone communities are self sufficient or are linked to broader economies either by cash or trade in goods has implications for demands on coastal zone resources. Sustainable use of coastal resources is perhaps a more 'natural' outcome in communities which are subsistence based. When systems develop which allow resources derived from natural environments to be exchanged for manufactured goods and for services from inside or outside the community, the pressure for exploitation increases. The other force which

increases the pressure on coastal resources is population increase, which may be felt even in subsistence based communities. These two forces of change - to cash economies and population increase - are operating throughout the ASEAN Region, with implications for coastal zone resources. The analysis methods and valuation techniques described in Module 6.3 have all been applied in the context of both developing and developed countries and are all relevant to countries in the ASEAN region.

Coastal Zone resources as economic resources.
The economic benefits of natural environments arise from the four main functions they serve for humans.

1. Resources, such as fish, may be extracted from them.
2. They serve as repositories for waste emissions which result from production and consumption.
3. They provide flows of amenity services to individuals. It is useful to distinguish between (a) services which involve active uses such as on-site tourism; and (b) services which involve only passive uses, such as when individuals derive satisfaction simply from the knowledge that ecosystems exist now (termed 'existence value') and will continue to do so for future generations (termed 'bequest value').
4. They provide life support services necessary for human existence, such as regulation of the composition of the atmosphere.

The natural resources of the coastal zone comprise a set of physical and biological systems. These may be interpreted as existing or potential resources for human use depending on our preferences and the technology which we possess to use the resources. A single feature of the ecosystem may have more than one resource value. For example, reef fish have value as a food resource, as an attraction for tourism, for recreational fishing, an existence value and a place in a functioning ecosystem.

Resources may be classified as potentially renewable and non-renewable. The imperatives for sustainable development mean we should manage potentially renewable resources on a renewable basis where possible. Threats to this come from overuse of the resource itself and damage from other sources. The usual interpretation of how to use non-renewable resources, such as minerals, for sustainable development is to use some of the benefits realised when they are used for reinvestment in projects that will provide future income for the community.

An example of the range of resource values arising from natural environments is provided in the following table which focusses uses and functions of mangroves. The values usually measured in markets are indicated with an asterisk (*). All other values are non-market values (see below) and techniques from ecological economics can be applied to estimate monetary values for many of these.

- **OH 4.5.2 Mangroves as Economic Resources**

Market and non-market values

Market values are the monetary values (or barter values) that goods and services gain when traded in conventional markets. The market price is the result of the interaction of the forces of demand for consumption of the good and the cost of supply. Many of the resources of the natural environment do not have monetary values conveniently attached to them to allow them to be taken into account in economic analysis. These are often termed 'non-market' goods. In other cases, goods such as fish derived from natural environments may have a market price, but this may not accurately reflect the real cost of supply, for example, if harvests are above sustainable levels and are leading to loss of the resource.

Historically, there is no market because natural environments have been owned in common by communities and access and use has been free of charge. It is possible to create markets for some of these goods, but impossible to do so for other goods. It is possible, for example, to create a market for tourism access to natural environments by charging an entry fee to national parks and reserves. It is not possible to create markets for 'public goods'. Public goods are those which are not divisible into individual pieces able to be used exclusively by one person. Examples are clean air and biodiversity.

In Module 6.3, a number of techniques to place monetary values on natural environments and their services are described. These can be used to value non-market goods and services and to adjust prices of those inaccurately valued. There are philosophical and practical limits to our ability to place monetary values on all services of natural environments. The techniques of ecological economics allow at least a partial valuation which can improve decision making for sustainable development.

1. Regional Economic Models

One way to understand the interactions in an economy is to build an economic model which can then be used to examine the impacts throughout the economy of changes in any part of the economy. Economic models exist for entire countries or for regions, including coastal regions. To date, most models have been built for the 'economic system' as illustrated in **OH 4.5.1.** In some cases, these have been linked with simplified models of natural systems directly associated with economic activity, for example, a commercial fishery. We will come back to this later but first we look at the models of 'economic systems'.

Models of economies are simplified by dividing the economy into sectors. These usually include agriculture, mining, manufacturing, services, etc. Sectors may be further subdivided, e.g. agriculture can be divided into fishing, forestry, farming. The most simple form of regional economic model is termed an 'Input/Output' model. This takes a matrix form with all the sectors set out as rows and columns and additional rows for labour and imports and columns for consumption in the region, exports and profits, see **OH 4.5.3.** The values placed in the columns show the inputs into production for that sector, e.g. crops from agriculture used in food processing. The values along the rows show the outputs, e.g. how much processed food is exported. These simple models of economies can give a great

deal of information. They can show how much is imported and exported from a region. They show how much employment is supported, how much money stays in a region in the form of wages and profits and how much is returned to investors outside the region. Through mathematical manipulation of the matrix, 'multipliers' can be calculated. Multipliers show the effect of an increase in output or employment in one sector on the whole economy. For example, a $1 increase in output from agriculture may have a total effect of that $1 plus another $1 across all other sectors. One job created in agriculture may mean the equivalent of another 0.5 of a job is created somewhere else in the economy. A proposed change, such as investment in a new fish processing plant, can be modelled to see the consequences throughout the economy.

The actual models in use in many countries are more sophisticated than the illustration here although they follow the same general principles. Regional input/output models have been used in Australia to show the importance to coastal regional economies of tourism, recreation and fishing in the Great Barrier Reef Marine Park, see (case study 4.5). These type of models have application in Integrated Coastal Zone Management because they allow illustration of the integrated nature of the economies of coastal zones.

A limitation of these models is that there is little recognition of the important part played by natural environment resources. In fact, they give the impression that use of the environment is free. The models could be misused if for example, we were to keep modelling the benefits of increases in fish catch without recognising limits to sustainable catches.

In a number of cases, models of ecological systems have been linked to the economy models. In the simplest of these cases, the link is established between the natural resource being used, e.g. fish or logs, and the economy input output model. A natural environment model is used to determine fish growth or timber production. The aim of ecological economics is to develop this type of modelling to take account of all the important impacts associated with taking fish or logs from the ecosystem. For example, fishing often not only removes the target species (which is what is modelled in the simple models) but also removes or kills by-catch and reduces food sources for animals higher in the food chain.

- **OH 4.5.3 Economy Input/Output**

TRAINING SESSION 4.5

CASE STUDY 1

Regional economic modelling of a coastal region, the Great Barrier Reef, Australia

The Great Barrier Reef Marine Park lies adjacent to the coast of the state of Queensland, Australia. The Marine Park is multiple-use and supports commercial tourism and fishing industries as well as private recreation by local people. There is considerable interaction between these reef based industries and the economies of coastal Queensland. The commercial industries depend on shore-based suppliers of vessels, fuel, repairs and maintenance, food etc. Fish catch is processed on shore. Many tourists stay in accommodation on the mainland and visit the reef on day trips. Recreational boat owners also spend a considerable amount of money with shore based suppliers of boats and equipment etc.

A study was undertaken to model the contribution to coastal regional economies by industries and activities that exist due to the natural resources of the Great Barrier Reef. Regional economic models already existed for Queensland coastal regions but were not detailed enough for this analysis. The models were modified by creating separate sectors for commercial fishing, tourism, recreational fishing and research. Additional data on the reef based sectors was collected through economic surveys of the sectors.

The enhanced models were used to describe the dollar value of output (sales of fish, expenditure by tourists and recreationists) and employment generated by the reef based activities. Multipliers were calculated to show, for example, how an increase in commercial fish catch contributes to employment throughout the economy. A $1 million increase in sales of fish supports around 72 extra jobs in the coastal regions, 40 in fishing and the rest in other industries. By comparison, an increase of $1 million in revenue from tourism supports around 50 extra jobs.

These models can be used to examine the potential economic impacts on coastal economies of policy options, especially where several activities are competing for use of the same resource and trade-offs need to be made. These models do not have an ecological component and so must be used with other information on resource use limits when predicting impacts of increased resource use.

Source: Driml (1987)

SESSION ACTIVITIES 4.5

Think about your local coastal region. List all the economic activities. Include subsistence and cash based activities. What types of goods and services are imported into and exported from your region?

Identify which economic activities in your region are directly and indirectly dependent on natural environment resources. Include extraction of resources, input of wastes, conversion of natural areas into other land uses and uses which are non-extractive, such as tourism. (Remember that tourism can be non-extractive at some locations, such as reefs, but require conversion of other resources to provide accommodation, boat harbours etc). Illustrate the economic links on the map of the region you have been working with in previous modules.

Identify which links are measured in market values and which have non-market values. Think about the rate at which the natural environment resources are being used. What would constitute a sustainable level of natural resource use? What controls exist in the system of government, social systems or the economic system to maintain resource use at sustainable levels?

Mapping Exercise
On an overlay of your regional map, identify the major economic activities in the coastal zone and illustrate the economic limits between the natural resources and the economic activities.

SESSION MATERIALS 4.5

- **OH 4.5.1** The Economic System and the Environment
- **OH 4.5.2** Mangroves as Economic Resources
- **OH 4.5.3** Economy Input Output

REFERENCES 4.5

There are a number of textbooks available that cover the full range of ecological and environmental economics. Useful books are by Tietenberg (1992) and Common (1988). The major international journals covering this area are *Ecological Economics* and the *Journal of Environmental Economics and Management*.

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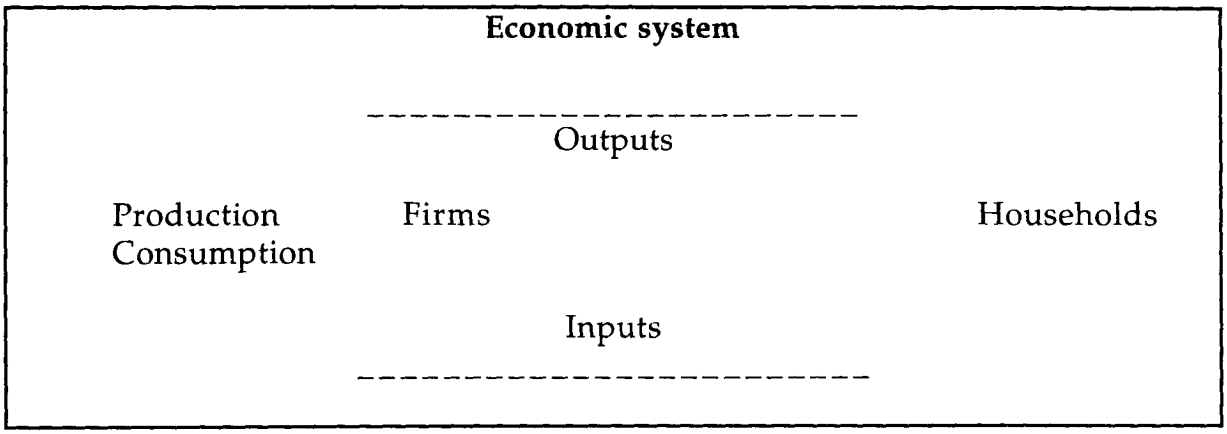
The Economic System and the Environment



Source: Tietenberg (1992)

Mangroves as Economic Resources

Mangrove uses	*Mangrove functions*
Sustainable production uses Timber* Firewood* Woodchips* Charcoal* Fish* Crustaceans* Shellfish* Tannins* Nipa* Medicine* Honey* Traditional hunting, fishing, gathering Genetic resources	**Regulatory or carrier functions** Erosion prevention (shoreline) Erosion prevention (riverbank) Storage and recycling human waste and pollutants Maintenance of biodiversity Provision of migration habitat Provision of nursery grounds Nutrient supply Nutrient regeneration Coral reef maintenance and protection Habitat for indigenous people Recreation sites
Conversion uses Industrial/urban land use* Aquaculture* Salt ponds* Rice fields* Plantations* Mining* Dam sites*	**Information functions** Spiritual and religious information Cultural and artistic inspiration Educational, historical and scientific information Potential information

Source: Ruitenbeek (1994).

Economy Input Output

	Purchasing Sectors					
Selling sectors	Agriculture	Manu-facturing	Services	Sales in region	Exports	Total output
Agriculture	$20 million	$10 m	$30 m	$20 m	$20 m	$100 m
Manu-facturing	$10 m					
Services	$30 m					
Households (labour)	$30 m					
Imports	$10 m					
Total input	$100 m					

Economy Input Output Model: Example of flows in and out of the Agricultural sector in a regional economy.

MODULE 5

INTERNATIONAL ENVIRONMENTAL AGREEMENTS AND ARRANGEMENTS FOR SUSTAINABLE DEVELOPMENT

Author: Kim Looi Ch'ng

OBJECTIVE

To examine the United Nations Conference of Environment and Development (UNCED 1992) and its outcomes, to discuss major international legislation relating to ICZM as well as legislation, treaties and programs relevant to ICZM at a national level.

TRAINING SESSIONS

5.1 The Earth Summit on Environment and Development

5.2 International Marine Institutions/Arrangements and Instruments

MODULE	**5.** **International Environmental Agreements and Arrangements for Sustainable Development**
TRAINING SESSION	**5.1** **The Earth Summit on Environment and Development**
OBJECTIVE	To examine the United Nations Conference of Environment and Development (UNCED 1992) and its outcomes.
SIGNIFICANCE	UNCED is a major advance in international cooperation on development and environmental issues. Agenda 21 presents a framework for international cooperation and coordination of activities within the United Nations system. It will be crucial to national/regional efforts in establishing and implementing ICZM plans.
PRESENTATION	Lecture, workshop
TIME	1 hour lecture 1 hour workshop
EQUIPMENT	Overhead projector, white board or black board and writing materials and lecture and workshop materials

TRAINING SESSION 5.1

THE EARTH SUMMIT ON ENVIRONMENT AND DEVELOPMENT

Author: Kim Looi Ch'ng

INTRODUCTION

Welcome participants to the session and explain that you will be discussing international instruments, institutions/organisations, programmes for sustainable development and the opportunities they offer with regards to ICZM. Over the past few decades, nations have found it necessary to tackle shared issues on conservation of species, resource management, and the management of the environment through international cooperation and coordination. The United Nations system, the NGOs, intergovernmental and other international organisations have been used as focal points for these cooperative activities. Many of these activities have evolved into Conventions and Agreements on specific issues. An estimated 180 multilateral environment agreements have been developed and endorsed by governments. The on-going evolution of international environmental instruments reflects international agreement on both on-going and new environmental issues.

The culmination, at least in this century, of all these international cooperative activities is in the United Nations Conference on Environment and Development (UNCED) which took place in Rio de Janeiro from 3 to 14 June 1994. UNCED, not only reaffirms the Declaration of the United Nations Conference on the Human Environment, adopted at Stockholm on 16 June 1972, but it "also seeks to build upon it, with the goal of establishing a new and equitable global partnership through the creation of new levels of cooperation among States, key sectors of societies and people, working towards international agreements which respect the interest of all and protect the integrity of the global environmental and developing system, recognizing the integral and interdependent nature of the Earth..." (Preamble to the Rio Declaration on Environment and Development). The following discussion highlights the very comprehensive and far-reaching programme on sustainable development which has emerged, namely Agenda 21. Participants are asked to read Agenda 21 which is attached to this module before beginning this session.

SESSION CONTENT

- Give an overview of Agenda 21, Chapter 17 and its relevance to integrated management and sustainable development of coastal and marine areas, including the exclusive economic zone. Of relevance also are Sections B: Marine environmental protection, Section D: Sustainable use and conservation of marine living resources under national jurisdiction, Section F: Strengthening international, including cooperation and coordination and Section G: Sustainable development of small islands.

  Agenda 21 should be discussed in conjunction with the Rio Declaration on Environment and Development and the Convention on Biodiversity and the Statement of Forest Principles.

- Give an overview of the Biodiversity Convention and the Framework Convention on Climate Change and their relevance to ICZM, in particular to the part in the former where all contracting parties are mandated to develop or maintain regulations for the protection of ecosystems, natural habitats and all species in their natural surroundings, and to promote "environmentally sound and sustainable development in areas adjacent to protected areas ...".

- Give an overview of the Statement of Forest Principles and how the conservation of forests relate to the concept of ICZM.

The UNCED has its beginning in the United Nations Conference on the Human Environment in Stockholm, Sweden, in June 1992, when 113 nations and many organizations from around the world reached a consensus that was framed in a Declaration and Action Plan. This was the forerunner of a global agenda for cooperation on environmental issues. The Conference initiated the establishment of an environment unit in government organisations of many participating countries and the establishment of the United Nations Environment Programme (UNEP) to coordinate issues concerning the environment in the United Nations system. UNEP was also intended to act as focal point for cooperation and coordination of environment-related activities on a global basis.

The Stockholm Conference also initiated the World Commission on Environment and Development, known as the Brundtland Commission. It is the Commission's 1987 report which provided the push and the direction for the direction for the concept for the 1992 UNCED.

Although the Earth Summit in Rio Builds on the First World Conference at Stockholm, there were huge differences between the achievements attained at the two world conferences. Whereas the Stockholm Conference focused primarily on the conservation and enhancement of the human environment, the UNCED seeked to resolve the need of human kind to develop and the need to protect the environment, namely, the need for economic development to be sustainable.

This is a significant achievement. The world's politicians have come together and conceded that environment has an impact on economic development and therefore the life of every human being. The Summit was also sui generis in that it was held after the Cold War. It no longer concentrates on the East/West strained relationship but rather on North/South dialogue on trade, economics and the environment.

Five major achievements emerged from the Earth's Summit:

- Agenda 21 - a very comprehensive and far-reaching programme for global action to bring into effect the change to sustainable development;
- The Rio Declaration on Environment an Development - a set of principles defining the rights and responsibilities of States with respect to the matter;
- The Forest Principles - a set of principles to support the sustainable management of forests on a global basis;
- Two legally binding conventions - the Convention on Biodiversity and the Framework Convention on Climate Change which was adopted by more than 150 countries at the Conference. The former convention aims to prevent the extinction of biologically diverse species and the latter to prevent global climate change.

Agenda 21

International legal instruments and mechanisms

Agenda 21 addresses the crucial issues on environment in today's world and also aims at preparing the world for the challenges of the 21st century. It looks at the environmental issues which need to be resolved if the existence of the human race is to be ensured. It evinces a global consensus and political commitment at the highest level on development and environment cooperation. Albeit, its successful implementation is the responsibility of governments, competency and capacity of these governments to establish appropriate national strategies, plans and policies and processes are the essential elements in achieving this. *In this context, international cooperation is an extremely important element* in support of such efforts. The involvement of the United Nations system, in particular UNEP, other international organisations, including NGOs and intergovernmental bodies, and regional organisations are crucial to the success of achieving the aims of Agenda 21.

New and additional financial resources have to be made available to developing countries to pay for the incremental costs to undertake the necessary actions to achieve the development and environmental objectives of Agenda 21. Financial resources are also required to build capacity in international, regional and national institutions to implement Agenda 21.

Agenda 21 also provided for the development and review of international agreements and instruments with respect to sustainable development and the

procedures and mechanisms necessary to foster and assess the implementation of these agreements and instruments.

International/Regional/National Institutional Mechanisms

In order to understand the goals and objectives of sustainable development, there is a need to understand the interaction and linkages between economic, social and environment dimensions. Institutions will need to be established to carry out research and make recommendations as to how environmental considerations can be incorporated into regional/national/local policies and plans.

National arrangements need to be put in place to facilitate the preparation and funding for the establishment of national strategies in support of the objectives and goals of Agenda 21. Each country will need to incorporate the obligations under the Framework Convention on Climate Change (FCCC), Convention on Biodiversity and Agenda 21 into the country's national programmes and action plans for development. The establishment of these strategies require the collaboration of all major groups: in the private and corporate sectors, the international and regional communities, including donor countries and consortia when international development assistance is required. The three implementing agencies of the Global Environment Facility (GEF), namely the World Bank, United Nations Development Programme (UNDP) and UNEP should be called upon to play the essential roles in the provision of assistance for incremental cost in establishing the required strategies, programmes and action plans.

Institutional ameliorations are required to establish a conceptual framework in Agenda 21 within which policy and programme initiatives can be linked and upon which priorities can be agreed upon.

In accordance to this requirement, the United Nations Commission for Sustainable Development had been established in 1993 and has started to meet to review the progress in the implementation of Agenda 21 and to bring into conformance with Agenda 21 goals, intergovernmental decision-making on environment and development issues.

Secondly the UN General Assembly will provide regular review of Agenda 21.

The other UN institutions involved are ECOSO and the Administrative Committee on Coordination (ACC), which serve to coordinate the activities of different UN agencies on environment and development. An important objective of the Commission and the inter-agency process is to enhance the relationship between the UN system and the international financial institutions, such as the banks (e.g. the Asian Development Bank), and also with the ever-increasing numbers of regional and multilateral organisations, such as the Association of the South East Asia Nations (ASEAN), the South Pacific Forum (SPF), the European Community and the Latin American Economic System.

In the area of data collection, environmental monitoring and expert assessment, recommendations are for strengthening existing institutions such as the

Earthwatch, the inter-agency environmental monitoring programme coordinated by UNEP and the establishment of a similar Development Watch to coordinate economic and social statistics and analysis.

Agenda 21 also calls for regional and sub-regional cooperation in capacity building, networking, formulation of policies and programmes dealing with transboundary environment issues and ecosystems. Agenda 21 recommends the establishment of regional consultative mechanisms that incorporate both NGOs and relevant bilateral and multilateral donors to coordinate and review the implementation of Agenda 21 and donor programmes.

In order for countries to obtain maximum benefit from the programmes of international institutions, it is important for them to coordinate their representation in the different intergovernmental organisations, in such a way as to consistently reflect their countries' positions.

Chapter 17

Agenda 21 contains 40 chapters. It is divided into 4 major areas: social and economic dimensions; conservation and management of resources and development; strengthening the role of major groups; and means of implementation. All the chapters have relevance to sustainable development and therefore ICZM whether indirectly or directly, and all chapters have to be considered if the aims of sustainable development are to be achieved. The most pertinent chapter which deals directly with environmental issues in the marine and coastal areas is chapter 17.

In this chapter, Agenda 21 focusses on precautionary measures to attain the goals of sustainable development. It calls for integrated coastal management as a means to reduce pollution and degradation of the environment. It calls for the strengthening and commitment to international agreements and guidelines, including the Montreal Guidelines for the Protection of the Marine Environment form Land-Based Sources of Pollution. It advocates for improved monitoring and compliance with international protocols and agreements and establishment of stricter international regulations to reduce the risk of accidents. It recommends establishing ocean spill response centres, a global database on marine pollution, and mandatory port facilities to collect garbage, oil and chemical residue from ships and vessels.

This chapter also calls for the addressing of the problem of overfishing of migratory fish on the high seas. It calls for the restoration and maintenance of marine species at sustainable levels and complementary measures such as effective monitoring and regulation of flag fishing vessels by nations.

Framework Convention on Climate Change

The Framework Convention on Climate Change (FCCC) was developed because growing evidence showed that the earth is getting warmer as a result of man's activities, such as large-scale burning of fossil fuels and the cutting of forests that absorb carbon dioxide. The impacts of such a global warming will be rising sea levels and changes in rainfall and evaporation patterns which will cause drought and desertification in some parts of the world, and storms and flooding in others.

The earth's temperature is adequately warm to allow life to exist by greenhouse gases (water vapour, carbon dioxide, ozone, methane, and nitrous oxide) and clouds which trap infrared radiation (heat), thereby reducing the amount of heat the earth loses to the atmosphere. In increasing the greenhouse gases, the above-mentioned human activities raise the temperature of the earth.

The FCCC's major objective is the stabilising of the atmospheric greenhouse gases (GHG) concentrations "at levels that would prevent unsafe anthropogenic interference with the climate system". Both developing countries and developed countries have obligations to undertake in the Convention. Activities include formulation of national policies and programmes and promotion of research, transfer of technology and information exchange aimed at reducing the GHG to certain levels.

As ICZM deals with the marine and coastal areas, it is obvious from the above that the FCCC has implications on the establishment of national ICZM plans as it deals with sea level rise and the resulting consequences to marine resources.

The Biodiversity Convention

Biodiversity can be categorised into three levels: ecosystem diversity, species diversity and genetic diversity. The maintenance of each is critical towards the attainment of the goals of sustainable development. Species diversity is a vital resource for medicines, food and other uses. Ecosystem diversity is essential for conserving adequate and varied life-support systems. Genetic diversity is crucial for the continued ability of these life-support systems to adapt to new environmental conditions.

The main objectives of the Convention are to conserve biodiversity, to use the components of the biodiversity on a sustainable basis, and to ensure that the benefits accruing from the use of genetic resources are shared among relevant parties in a fair and equitable manner.

Parties to the Convention are obliged to ensure that their activities within the areas under their jusridiction do not cause environmental damage to areas out side their control or jurisdiction.

All contracting parties to the Convention are mandated to develop (if not already developed) or maintain (if already developed) regulations for the protection of all endangered plants and animals and to promote the protection of ecosystems, natural habitats and all animal and plant species in their natural surroundings, and to recommend the establishment of buffer zones to protected areas in order to ensure the long-term protection of the protected areas.

Following on from the above, it is observed that the Biodiversity Convention has implications in the establishment of national ICZM plans. The obligations of the Convention would need to be addressed within the broader framework of Marine Protected Areas (MPAs) and that for ICZM.

The Rio Declaration on Environment and Development
The Rio Declaration on Environment and Development identified two major concerns, namely, the degradation of the environment and its ability to sustain life, and the intrinsic interrelationship between the long-term economic progress and the need for environmental conservation.

The Rio Declaration is not a legally binding document and contains 27 principles.

SESSION ACTIVITIES 5.1

- At the end of the session participants are requested to use the framework provided by Agenda 21 and, taking into consideration the legal and institutional mechanisms for environmental management, draft out proposed strategies for their countries with regards to the implementation of Agenda 21.
- Participants are also asked to discuss the implications of Agenda 21, chapter 17 for their region/country.
- Ask participants to discuss the implications of the FCCC on their countries' policies and programmes for development.
- Participants are requested to examine the implications of the rights and obligations of Parties to the Convention on the policies and plans for conservation of marine and coastal biodiversity in their home countries, and to make recommendations for any short comings observed.
- Participants will be asked to discuss the implication of the Statement of Forest Principles on ICZM.

SESSION MATERIALS 5.1

- **OH 5.1.1** Agenda 21 Chapter 17, Action for Coastal States
- **OH 5.1.2** Sections of Agenda 21 Chapter 17
- **OH 5.1.3** Section A, Chapter 17
- **Attachment 1** The Rio Declaration
- **Attachment 2** Agenda 21, Chapter 17 Action for Coastal States

Agenda 21, Chapter 17
Action for Coastal States

Chapter 17 calls for Coastal States to:

- Apply preventive, cautionary and anticipatory rather than a reactive approach so as to avoid degradation of the marine environment, as well as to reduce the risk of long-term or irreversible adverse effects upon it;
- Ensure prior assessment of activities that may have significant adverse impacts upon the marine environment;
- Integrate protection of the marine environment into relevant general environmental, social, and economic development policies;
- Develop economic incentives, where appropriate, to apply clean technologies and other means consistent with the internalisation of environmental costs, such as the polluter pays principle, in order to avoid degradation of the marine environment;
- Improve standards of coastal populations, particularly in developing countries, to contribute to reducing the degradation of the coastal and marine environment.

Source: Agenda 21

Sections of Agenda 21

Chapter 17 is divided into the following sections:

A Integrated management and sustainable development of coastal and marine areas, including exclusive economic zones

B Marine environmental protection

C Sustainable use and conservation of marine living resources of the high seas

D Sustainable use and conservation of marine living resources under national jurisdiction

E Addressing critical uncertainties for the management of the marine environment and climate change

F Strengthening international, including regional, cooperation and coordination

G Sustainable development of small islands

Source: Agenda 21

Section A, Chapter 17

The most relevant section to ICZM is section A.

The objectives of this section call on coastal states to:

"Commit themselves to integrated management and sustainable development of coastal areas and the marine environment under their national jurisdiction."

To this end, it is necessary to, *inter alia*:

- Provide for an integrated policy and decision-making process, including all involved sectors, to promote compatibility and a balance of uses;
- Identify existing and projected uses of coastal areas and their interactions;
- Concentrate on well-defined issues concerning coastal management;
- Apply preventive and precautionary approaches in project planning and implementation, including prior assessment and systematic observation of the impacts of major projects;
- Promote the development and application of methods, such as national resource and environmental accounting, that reflect changes in value resulting from uses of coastal and marine areas, including pollution, marine erosion, loss of resources and habitat destruction;
- Provide access, as far as possible, for concerned individuals, groups and organisations to relevant information and opportunities for consultation and participation in planning and decision-making at appropriate levels.

Source: Agenda 21

MODULE	**5.** **International Environmental Agreements and Arrangements for Sustainable Development**
TRAINING SESSION	**5.2** **International Marine Institutions/Arrangements and Instruments**
OBJECTIVE	To discuss major international legislation relating to ICZM as well as legislation, treaties and programs relevant to ICZM at a national level.
SIGNIFICANCE	It is important that managers understand the international context of legislation, treaties and programs relevant to ICZM in their regions.
PRESENTATION	Lecture and workshop
TIME	1 hour
EQUIPMENT	Overhead projector, whiteboard or blackboard and writing materials. Ask participants to prepare information about legislation, treaties and agreements relevant to ICZM for their regions before attending this session.

TRAINING SESSION 5.2

INTERNATIONAL MARINE INSTITUTIONS/ARRANGEMENTS AND INSTRUMENTS

Author: Kim Looi Ch'ng

INTRODUCTION

Welcome participants to the session and explain that the following lecture will cover international marine institutions/agreements and instruments and also others which relate to the conservation and sustainable management of the marine and coastal areas. Participants will need to discuss the impacts of these international institutions/agreements and instruments on the national policies and plans for the management of the coastal and marine areas of their countries and how these international elements can be used to supplement the national efforts.

National boundaries do not reflect marine realms, processes and efforts to conserve the marine resources and associated ecosystems, which are needed to transcend legal boundaries to reflect the dynamic nature of the marine world. Countries in the region need to cooperate to understand the nature of the problems both at a national and regional level and to work together to resolve these problems through the establishment of regional institutions and instruments that will address the "physical and biological realities of the sea" (Norse, 1993).

To be effective, management of marine and coastal resources and associated ecosystems needs to include all areas that will directly or indirectly impact on the coastal and marine areas. ICZM will therefore include the management of impacts which originate beyond the physical boundary of the coastal and marine areas. ICZM should be complemented by management of Large Marine Ecosystems (LME); a concept which will invariably involve the management of regional seas (and straits) through regional cooperative efforts.

The multiplicity of jurisdictions and the relationship between economic activities and the seas have led to the establishment of several marine intergovernmental organisations involving three areas of cooperation, namely maritime law, shipping and navigation, fisheries management and marine sciences. These intergovernmental organisations would normally work towards the establishment of conventions and protocols which, if ratified by participating states, would be reflected in their national legislations, allowing them to implement the provisions of the convention within their own jurisdiction. The

ratification of these coventions imposed certain obligations on the participating states, its citizens, registered vessels and aircrafts.

These legal frameworks are often developed through laborious and contentious negotiations, which can take years. However, often they are the only means by which matters on the high seas beyond the waters of the territorial seas and the exclusive economic zone can be addressed (Kenchington, 1990). For example, the United Nations Convention on the Law of the Sea (UNCLOS) took more than 10 years to develop and gain the necessary international endorsement. The contentious area of negotiation in UNCLOS involves the right of access to seabed mining in the area beyond national jurisdiction.

SESSION CONTENT

Multilateral treaties

There are several multilateral treaties which directly or indirectly relate to marine areas and ICZM, that require ratification by countries and strict enforcement before they can prove effective in their goals.

United Nations Convention on the Law of the Sea (UNCLOS)

- Give a brief description of UNCLOS and discuss the implications it has on ICZM.

The United Nations Convention on the Law of the Sea (UNCLOS) was negotiated from 1973 to 1982 in the Third United Nations Conference on the Law of the Sea before it was adopted in December 1982 by 119 nations. UNCLOS entered into force with the deposit of the 60th instrument of ratification in November 1994. Even before UNCLOS entered into force, certain of its provisions had become customary international law. These provisions were mainly those relating to the rights and obligations of coastal states in the territorial sea, the Exclusive Economic Zone (EEZ), the continental shelf and international navigation.

Of significance to the goals of sustainable development of coastal and marine areas and associated ecosystems, is that Chapter 17 of Agenda 21 recognises UNCLOS as providing a comprehensive regulatory framework for the protection and preservation of the marine environment to maintain and improve its life-support and productive capacities.

UNCLOS, which is divided into 17 parts, contains 320 articles and 9 annexes, governing all aspects of the oceans: the limits of national jurisdiction over the oceans; access to the seas; protection and preservation of the marine environment; navigation; exploitation and conservation of the living resources; marine scientific research; seabed mining and exploitation of other non-living resources; and the settlement of disputes.

An important aspect of the Convention is the incorporation of the principle that the rights and benefits provided in the Convention carry certain concomitant duties and obligations. In concomitance with the goals of sustainable development, the general principles and policies in the Convention aim to prevent, reduce and control pollution throughout the marine environment in relation to the exercise of specific rights and duties of States.

Articles 61 to 68 relate to the rights of exploitation in the EEZ. The notion of sustainable development is seen in Article 61, which begins by stating that "the coastal State, taking into account the best scientific evidence available to it, shall ensure through proper conservation and management measures that the maintenance of the living resources in the exclusive economic zone is not endangered by over-exploitation. As appropriate, the coastal State and competent international organisations, whether subregional or regional or global, shall co-operate to this end". It goes on further to say "Such measures shall also be designed to maintain or restore populations of harvested species at levels which can produce the maximum sustainable yield, ... In taking such measures the coastal State shall take into consideration the effects on species associated with or dependent upon harvested species with a view to maintaining or restoring populations of such associated or dependent species above levels at which their reproduction may become seriously threatened."

Articles 116 to 120 relate to the conservation and management of the living resources in the high seas. Article 117 provides the right for all nations to fish in the area, but at the same imposes duties on these states to "take, or to co-operate with other States in taking such measures for their repective nationals as may be necessary for the conservation of the living resources of the high seas." In addition, Article 118 mandates that "States shall co-operate with each other in the conservation and management of living resources in the areas of the high seas." The Convention is further augmented in this part in several important aspects, in particular with regard to pollution and safety regulations and scientific research.

Part XII of the Convention relates to the protection and preservation of the marine environment. Article 192 states that "States have the obligation to protect and preserve the marine environment." Article 194 further enhances this article by stating that "States shall take, individually or jointly as appropriate, all measures ... that are necessary to prevent, reduce and control pollution of the marine environment from any source, ... ".

Section 5 of Part XII relates to international rules and national legislation to prevent, reduce and control pollution of the marine environment. Of significance to ICZM is Article 207 where that mandatory term of "shall" is used in calling upon states to "adopt laws and regulations to prevent, reduce, and control pollution of the marine environment from land-based sources, including rivers, estuaries, pipelines, and outfall structures ...". In addition, Articles 210 and 211 relate to the adoption of regulations to prevent pollution of the marine environment by dumping and from vessels.

Part XIII ensures the right to conduct and promote scientific research, whilst Part V provides for settlement of disputes through peaceful means.

UNCLOS, in dealing with environmental matters of global concern, namely in ecological and environmental issues - as seen in the general principles and policies governing prevention, reduction and control of pollution throughout the marine environment and in the specific rights and duties of States which, if effectively undertaken, will ensure the attainment of their environmental and ecological goals - is observed to be supportive of the principles embodied in the concept of ICZM.

The Antarctic Treaty System (ATS)

In as much as all life on the Antarctica depends indirectly or directly on the sea for its food, conservation in the Antarctica is intimately linked with conservation of the marine environment. The Antarctic Treaty of 1959 and its subsidiary conventions deal with the legal position of those countries that have territorial claim and those that do not recognise these claims, besides establishing a framework for scientific and conservation activities in the area. The Treaty has over the years established the following conventions to deal with matters such as mineral exploitation, the conservation of animals and plants, waste disposal and management, and the prevention of marine pollution:

(i) The Protocol on Environmental Protection to the Antarctic Treaty, 1991;

(ii) Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR);

(iii) The Convention for the Conservation of Antarctic Seals.

In general the ATS has several problems, such as those relating to threats due to increasing tourism, and those posed by mining and exploitation of the living marine resources. These threats exist simply because of the ATS and its protocols and the inability to provide sufficient protection for the living resources and the associated environment.

International Fishery Treaties

Because fish are by nature far ranging animals, and therefore do not conform to man-made national boundaries, international cooperation is essential for the proper management of the world's fisheries. Over the years, several international fishery treaties and authorities have been established to manage the exploitation of the fish resources by the offshore fishing fleets that throng the international "common" waters. Such treaties and authorities include:

(i) The International Commission for the Northwest Atlantic Fisheries (ICNAF);
(ii) The International North Pacific Fisheries Commission (INPFC);
(iii) The North Atlantic Salmon Conservation Organization (NASCO);
(iv) The Northwest Atlantic Fisheries Organization (NAFO);
(v) The International Pacific Halibut Commission (IPHC);

(vi) The International Commission for the Conservation of Atlantic Tuna (ICCAT); and

(vii) The South Pacific Fisheries Forum Agency.

International cooperation is essential to ensure a sustainable management of the world's fish resources and this can be achieved based on the guidelines provided by the earlier fishery treaties and UNCLOS.

The International Maritime Organization (IMO) and its Relation to the International Convention for the Prevention of Marine Pollution from Ships (MARPOL)

In the earlier years international management of the marine environment was focused primarily on the problems of pollution arising from the transportation of "increasing quantities of increasingly diverse and increasingly toxic materials by ships" (Kenchington, 1992). In response to this trend, the United Nations International Maritime Co-ordinating Organization, later known (in 1982) as the International Maritime Organization was established in 1959 to provide a framework and a mechanism for international cooperation with regard to the regulation of shipping and in particular with the effect of shipping on the marine environment.

Over the years since its establishment, the IMO has developed several conventions and protocols in an attempt to manage marine pollution from ships. These conventions and protocols include:

(i) The International Convention for the Prevention of Pollution of the Sea by Oil, 1971;

(ii) The International Convention relating to Intervention on the High Seas in cases of Oil Pollution Damage, 1969;

(iii) The International Convention on Civil Liability for Oil Pollution Casualties, 1969;

(iv) The International convention on the Establishment of an International Fund for Compensation for Oil Damage, 1971;

(v) The Protocol relating to Intervention on the High Seas in cases of Marine Pollution, by Substances other than Oil, 1969;

(vi) The Convention on the Prevention of Marine Pollution by Dumping Wastes and Other Matters, 1972; and

(vii) The International Convention for the Prevention of Marine Pollution from Ships, 1973 (amended 1978 and 1992) (MARPOL 73/78/92).

From this list of protocols, it can be observed that concerns which initially focused on oil pollution control, have slowly develop into a more organized *modus operandi* covering specific forms of operation with the aim to reduce marine pollution. MARPOL 73/78 through the adoption of subsequent annexes,

now addressed five types of pollution by ships - oil (Annex 1), noxious liquid substances in bulk (Annex II), harmful substances in packages (Annex III), sewage (Annex IV) and garbage (Annex V).

MARPOL 73/78 provides the authority to impose strict conditions for the transport of the various substances described above, including imposing a "penalty" if their transportation into/through particularly sensitive areas which have been declared by IMO as areas to be avoided, takes place. These areas include ecologically important sites such as the Galapagos Islands and spawning areas for species of ecologically or commercially important species of living organisms. Apparently areas which are outside these protected zones do not enjoy this "special protection". In addition, MARPOL allows disposal of wastes in submerged ecosystems even when sensitive habitats exist. In such cases the minimum limits of discharge, which are meant to protect such sensitive habitats, are not applicable.

MARPOL also allows some enclosed and semi-enclosed seas with restricted circulation additional protection by declaring them "special areas". Such examples are the Baltic, Mediterranean, Black and Red Seas, the Persian/Arabian Gulf and the Gulf of Aden. In these areas prohibition or strict limitation of discharge of various polluting substances is imposed.

The area in which MARPOL has been most successful is in limiting discharges in nearshore areas, particularly within the territorial waters of 12 nautical miles.

As a whole, MARPOL is not comprehensive enough to be able to control and prevent all types of ship-generated pollution.

The London Dumping Convention came into force in 1975. This convention legitimises ocean dumping by imposing a minimum standard for dumping of almost all substances except those listed in Annex I. An obvious deficiency in the convention is that it depends on the sincerity of contracting parties to act within the bounds of the convention.

Intergovernmental Organizations

The various systems in the United Nations provide mechanisms for cooperation at a global level in several areas in which participating states have interests. These intergovernmental organizations (IGOs) can influence policies of participating governments. Four main IGOs which can play a role in assisting states to fulfil their goals of sustainable development of their marine and coastal areas are the International Whaling Commission (IWC), the Food and Agriculture Organization (FAO), the International Maritime Organization (IMO) and the United Nations Environment Programme (UNEP).

The International Whaling Commission

The International Whaling Commission was established by the International Convention for the Regulation of Whaling (ICRW), which entered into force in 1948 with the ratification of 14 whaling nations. The convention is aimed at the conservation of whales and the management of the whaling industry on a global scale.

The International Whaling Commission imposed a moratorium on commercial whaling in the 1985 - 86 period. The moratorium was continued in subsequent years. However, it faces fierce opposition from traditionally whaling nations such as Japan, Iceland and Norway. Nor has the moratorium ended whaling as exceptions are allowed on the grounds of the need for indigenous peoples' subsistence and on scientific grounds, which has led to substantial annual kills of the animals.

The United Nations Food and Agriculture Organization (FAO)

The FAO is the largest agency in the UN system. It has a Fishery Department which, through its 25 bilateral and multilateral fisheries commissions, is responsible for the coordination of efforts to manage and develop the world's living marine and freshwater resources on a sustainable basis. However the role of FAO is only advisory and it therefore cannot really play a very strong role in the regulation of the world's fishery catches.

The United Nations Environment Programme (UNEP)

The United Nations Environment Programme was established by the United Nations General Assembly following the recommendations of the Stockholm Conference on the Human Environment to "serve as a focal point for environmental action and coordination within the United Nations system". The Governing Council of UNEP has specified this environmental action as "embodying a holistic all embracing transsectorial approach to resolving environmental problems, dealing not only with the consequences but also with the causes of environmental degradation". In this sense, UNEP's environmental action can be seen to be very supportive of the concept and principles embodied in ICZM.

A regional approach has been adopted in the Stockholm Action Plan and in subsequent Governing Council decisions. UNEP's Regional Seas Programme, which was established to deal with the complexity of the environmental issues of the oceans in an integrated holistic manner on a regional basis, became the main stay of UNEP's oceans and coastal area programme. The approach is in line with the recognition given by United Nations Conference on Environment and Development (UNCED) to the fact that "the marine environment - including the oceans and all the seas and adjacent coastal area - forms an integrated whole that is an essential component of the global life-supported system and a positive asset that presents the opportunities for sustainable development (chapter 17, Agenda 21)". Chapter 17 of Agenda 21 goes on further to call for new approaches to marine and coastal area management that are "integrated in content and precautionary and anticipatory in ambit".

The Regional Seas Programme is a global programme which strives to address and resolve common coastal and marine environmental issues in selected shared areas of water through cooperative efforts.

There are presently 10 regional seas programmes, in which 120 coastal States and Territories are participating members. The Regional Seas Programme is action-oriented and addresses both the impacts and the causes of environmental degradation. It incorporates a comprehensive and holistic

approach to environmental issues which are addressed under the broad framework of integrated marine and coastal resources and associated ecosystems management. Recently, land-based sources of pollution have become an important component of the programme, which means that, in addressing the issues with regards to the management of coastal and marine areas, the management of watersheds and the relevant river basins becomes an important component of the holistic approach being adopted.

SESSION MATERIALS 5.2

- **OH 5.2.1** UNEP's oceans and coastal programme
- **OH 5.2.2** UNEP's role in global monitoring of the oceans
- **OH 5.2.3** UNEP'S Regional Seas Programme

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UNEP's oceans and coastal programme falls into three closely linked areas

(i) the global marine environment;

(ii) the regional marine environment; and

(iii) the living marine resources.

UNEP's role in the global monitoring of the oceans

UNEP's role in the global monitoring of the ocean is seen in its involvement in numerous global programmes, among which are:

- A global environmental assessment programme known as Earthwatch;
- The Global Environmental Monitoring System (GEMS);
- The international referral system for sources of environmental information (Infoterra); and
- The International Register of Potentially Toxic Chemicals (IRPTC)

UNEP Regional Seas Programme

Two elements are the cornerstones of the UNEP Regional Seas Programme:

(a) Cooperation among States of the regions; and

(b) Coordination of the technical work of the programme is done through the United Nations system and other competent international and regional intergovernmental organisations.

The Rio declaration on environment and development

Preamble

The United Nations Conference on Environment and Development, met at Rio de Janeiro from 3 to 14 June 1992:

- to reaffirm the Declaration of the United Nations Conference on the Human Environment, adopted at Stockholm on 16 June 1972, and to build upon it;
- with the goal of establishing a new and equitable global partnership through the creation of new levels of cooperation among States, key sectors of societies and people;
- to work towards international agreements which respect the interests of all and protect the integrity of the global environmental and developmental system; and
- to recognise the integral and interdependent nature of the Earth, our home.

The Conference proclaimed that:

Principle 1
Human beings are at the centre of concerns for sustainable development. They are entitled to a healthy and productive life in harmony with nature.

Principle 2
States have, in accordance with the Charter of the United Nations and the principles of international law, the sovereign right to exploit their own resources pursuant to their own environmental and developmental policies, and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction.

Principle 3
The right to development must be fulfilled so as to equitably meet developmental and environmental needs of present and future generations.

Principle 4
In order to achieve sustainable development, environmental protection shall constitute an integral part of the development process and cannot be considered in isolation from it.

Principle 5
All States and all people shall cooperate in the essential task of eradicating poverty as an indispensable requirement for sustainable development, in order to decrease the disparities in standards of living and better meet the needs of the majority of the people of the world.

Principle 6
The special situation and needs of developing countries, particularly the least developed and those most environmentally vulnerable, shall be given special priority. International actions in the field of environment and development should also address the interests and needs of all countries.

Principle 7
States shall cooperate in a spirit of global partnership to conserve, protect and restore the health and integrity of the earth's ecosystem. In view of the different contributions to global environmental degradation, States have common but differentiated responsibilities. The developed countries acknowledge their responsibility in the international pursuit of sustainable development in view of the pressures their societies place on the global environment and of the technologies and financial resources they command.

Principle 8
To achieve sustainable development and a higher quality of life for all people, States should reduce and eliminate unsustainable patterns of production and consumption and promote appropriate demographic policies.

Principle 9
States should cooperate to strengthen endogenous capacity-building for sustainable development by improving scientific understanding through exchanges of scientific and technological knowledge, and by enhancing the development, adaptation, diffusion and transfer of technologies, including new and innovative technologies.

Principle 10
Environmental issues are best handled with the participation of all concerned citizens, at the relevant level. At the national level, each individual shall have appropriate access to information concerning the environment that is held by public authorities, including information on hazardous materials and activities in their communities, and the opportunity to participate in decision-making processes. States shall facilitate and encourage public awareness and participation by making information widely available. Effective access to judicial and administrative proceedings, including redress and remedy, shall be provided.

Principle 11
States shall enact effective environmental legislation. Environmental standards, management objectives and priorities should reflect the environmental and developmental context to which they apply. Standards applied by some countries may be inappropriate and of unwarranted economic and social cost to other countries, in particular developing countries.

Principle 12
States should cooperate to promote a supportive and open international economic system that would lead to economic growth and sustainable development in all countries, to better address the problems of environmental degradation. Trade policy measures should not constitute a means of arbitrary or

unjustifiable discrimination or a disguised restriction on international trade. Unilateral actions to deal with environmental challenges outside the jurisdiction of the importing country should be avoided. Environmental measures addressing trans boundary or global environmental problems should, as far as possible, be based on an international consensus.

Principle 13
States shall develop national law regarding liability and compensation for the victims of pollution and other environmental damage. States shall also cooperate in an expeditious and more determined manner to develop further international law regarding liability and compensation for adverse effects of environmental damage caused by activities within their jurisdiction or control to areas beyond their jurisdiction.

Principle 14
States should effectively cooperate to discourage or prevent the relocation and transfer to other States of any activities and substances that cause severe environmental degradation or are found to be harmful to human health.

Principle 15
In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, the lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.

Principle 16
National authorities should endeavour to promote the internalisation of environmental costs and the use of economic instruments, taking into account the approach that the polluter should, in principle, bear the cost of pollution, with due regard to the public interest and without distorting international trade and investment.

Principle 17
Environmental impact assessment, as a national instrument, shall be undertaken for proposed activities that are likely to have a significant adverse impact on the environment and which are subject to a decision of a competent national authority.

Principle 18
States shall immediately notify other States of any natural disasters or other emergencies that are likely to produce sudden harmful effects on the environment of those States. Every effort shall be made by the international community to help States so afflicted.

Principle 19
States shall provide prior and timely notification and relevant information to potentially affected States on activities that may have a significant adverse trans boundary environmental effect and shall consult with those States at an early stage and in good faith.

Principle 20
Women have a vital role in environmental management and development. Their full participation is essential to achieve sustainable development.

Principle 21
The creativity, ideals and courage of the youth of the world should be mobilised to forge a global partnership in order to achieve sustainable development and ensure a better future for all.

Principle 22
Indigenous people and their communities, and other local communities, have a vital role in environmental management and development because of their knowledge and traditional practices. States should recognise and duly support their identity, culture and interests and enable their effective participation in the achievement of sustainable development.

Principle 23
The environment and natural resources of people under oppression, domination and occupation shall be protected.

Principle 24
Warfare is inherently destructive of sustainable development. States shall respect international law providing protection for the environment in times of armed conflict and cooperate in its further development, as necessary.

Principle 25
Peace, development and environmental protection are interdependent and indivisible.

Principle 26
States shall resolve all their environmental disputes peacefully and by appropriate means in accordance with the Charter of the United Nations.

Principle 27
States and people shall cooperate in good faith and in a spirit of partnership in the fulfilment of the principles embodied in this Declaration and in the further development of international law in the field of sustainable development.

AGENDA 21, CHAPTER 17

UN 1992 *Draft Agenda 21, Rio Declaration, Forest Principles,* United Nations Conference on Environment and Development (Rio de Janeiro, 3-14 June, 1992)

CHAPTER 17

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.

Introduction

17.1 The marine environment - including the oceans and all seas and adjacent coastal areas - forms an integrated whole that is an essential component of the global life support system and a positive asset that presents opportunities for sustainable development. International law, as reflected in the provisions of the United Nations Convention on the Law of the Sea 1/, 2/ referred to in this chapter of Agenda 21, sets forth rights and obligations of States and provides the international basis upon which to pursue the protection and sustainable development of the marine and coastal environment and its resources. This requires new approaches to marine and coastal area management and development, at the national, subregional, regional and global levels, approaches that are integrated in content and are precautionary and anticipatory in ambit, as reflected in the following programme areas:

- Integrated management and sustainable development of coastal areas, including exclusive economic zones;
- Marine environmental protection;
- Sustainable use and conservation of marine living resources of the high seas;
- Sustainable use and conservation of marine living resources under national jurisdiction;
- Addressing critical uncertainties for the management of the marine environment and climate change;
- Strengthening international, including regional, cooperation and coordination;
- Sustainable development of small islands.

17.2. The implementation by developing countries of the activities set forth below shall be commensurate with their individual technological and financial capacities and priorities in allocating resources for development needs and ultimately depends on the technology transfer and financial resources required and made available to them. 4/, 5/.

PROGRAMME AREAS

A. Integrated Management And Sustainable Development Of Coastal And Marine Areas, Including Exclusive Economic Zones

Basis for action

17.3. The coastal area contains diverse and productive habitats important for human settlements, development and local subsistence. More than half the world's population lives within 60 km of the shoreline, and this could rise to three quarters by the year 2020. Many of the world's poor are crowded in coastal areas. Coastal resources are vital for many local communities and indigenous people. The exclusive economic zone (EEZ) is also an important marine area where the States manage the development and conservation of natural resources for the benefit of their people. For small island States or countries, these are the areas most available for development activities.

17.4. Despite national, subregional, regional and global efforts, current approaches to the management of marine and coastal resources have not always proved capable of achieving sustainable development, and coastal resources and the coastal environment are being rapidly degraded and eroded in many parts of the world.

Objectives

17.5. Coastal States commit themselves to integrated management and sustainable development of coastal areas and the marine environment under their national jurisdiction. To this end, it is necessary to, *inter alia*:

- Provide for an integrated policy and decision-making process, including all involved sectors, to promote compatibility and a balance of uses;
- Identify existing and projected uses of coastal areas and their interactions:
- Concentrate on well-defined issues concerning coastal management;
- Apply preventive and precautionary approaches in project planning and implementation, including prior assessment and systematic observation of the impacts of major projects;
- Promote the development and application of methods, such as national resource and environmental accounting, that reflect changes in value resulting from uses of coastal and marine areas, including pollution, marine erosion, loss of resources and habitat destruction;
- Provide access, as far as possible, for concerned individuals, groups and organisations to relevant information and opportunities for consultation and participation in planning and decision-making at appropriate levels.

Activities

Management-related activities

Each coastal State should consider establishing, or where necessary strengthening, appropriate coordinating mechanisms (such as a high-level policy planning body) for integrated management and sustainable development of coastal and marine areas and their resources, at both the local and national levels. Such mechanisms should include consultation, as appropriate, with the academic and private sectors, non-governmental organisations, local

communities, resource user groups, and indigenous people. Such national coordinating mechanisms could provide, *inter alia*, for:

- Preparation and implementation of land and water use and siting policies;
- Implementation of integrated coastal and marine management and sustainable development plans and programmes at appropriate levels;
- Preparation of coastal profiles identifying critical areas, including eroded zones, physical processes, development patterns, user conflicts and specific priorities for management;
- Prior environmental impact assessment, systematic observation and follow-up of major projects, including the systematic incorporation of results in decision-making;
- Contingency plans for human induced and natural disasters, including likely effects of potential climate change and sea level rise, as well as contingency plans for degradation and pollution of anthropogenic origin, including spills of oil and other materials;
- Improvement of coastal human settlements, especially in housing, drinking water and treatment and disposal of sewage, solid wastes and industrial effluents;
- Periodic assessment of the impacts of external factors and phenomena to ensure that the objectives of integrated management and sustainable development of coastal areas and the marine environment are met;
- Conservation and restoration of altered critical habitats;
- Integration of sectoral programs on sustainable development for settlements, agriculture, tourism, fishing, ports and industries affecting the coastal area;
- Infrastructure adaptation and alternative employment;
- Human resource development and training;
- Public education, awareness and information programmes;
- Promoting environmentally sound technology and sustainable practices;
- Development and simultaneous implementation of environmental quality criteria.

17.7. Coastal States, with the support of international organisations, upon request, should undertake measures to maintain biological diversity and productivity of marine species and habitats under national jurisdiction. *Inter alia*, these measures might include: surveys of marine biodiversity, inventories of endangered species and critical coastal and marine habitats; establishment and management of protected areas; and support of scientific research and dissemination of its results.

Data and information

17.8. Coastal States, where necessary, should improve their capacity to collect, analyse, assess and use information for sustainable use of resources, including environmental impacts of activities affecting the coastal and marine areas. Information for management purposes should receive priority support in view of the intensity and magnitude of the changes occurring in the coastal and marine areas. To this end, it is necessary to, *inter alia*:

- Develop and maintain databases for assessment and management of coastal areas and all seas and their resources;
- Develop socio-economic and environmental indicators;

- Conduct regular environmental assessment of the state of the environment of coastal and marine areas;
- Prepare and maintain profiles of coastal area resources, activities, uses, habitats and protected areas based on the criteria of sustainable development;
- Exchange information and data.

17.9. Cooperation with developing countries, and, where applicable, subregional and regional mechanisms, should be strengthened to improve their capacities to achieve the above.

International and regional cooperation and coordination

17.10. The role of international cooperation and coordination on a bilateral basis and, where applicable, within a subregional, interregional, regional or global framework, is to support and supplement national efforts of coastal States to promote integrated management and sustainable development of coastal and marine areas.

17.11. States should cooperate, as appropriate, in the preparation of national guidelines for integrated coastal zone management and development, drawing on existing experience. A global conference to exchange experience in the field could be held before 1994.

Means of implementation

Financing and cost evaluation*

* (These paragraphs contain matters relating to means of implementation, including cost estimates, which are indicative secretariat figures provided pursuant to Preparatory Committee decision 3/2. They remain in brackets as they have not been negotiated).

[**17.12.** The total cost estimate for all countries to implement integrated management and sustainable development of coastal areas and exclusive economic zones is approximately $85 billion through the year 2000. The cost estimate for developing countries would be approximately $50 billion, or about $6 billion per year for 1993-2000.]

[**17.13.** Of the $6 billion annual estimated costs, about $50 million per year between 1993 and 2000 is proposed for catalytic funding to support programmes for integrated management and sustainable development of coastal areas. Of this, $36 million is proposed to assist developing countries with technical cooperation and training for institutional strengthening, improvement of databases, upgrading of research and management capacity, implementation of pilot demonstration projects and production of detailed operational guidelines, plus $6 million to address global issues. The sum of $8 million is proposed to help strengthen global and regional organisations in this field.]

Scientific and technological means

17.14. States should cooperate in the development of necessary coastal systematic observation, research and information management systems. They should provide access to and transfer environmentally safe technologies and

methodologies for sustainable development of coastal and marine areas to developing countries. They should also develop technologies and endogenous scientific and technological capacities.

17.15. International organisations, whether subregional, regional or global, as appropriate, should support coastal States, upon request, in these efforts, as indicated above, devoting special attention to developing countries.

Human resource development

17.16. Coastal States should promote and facilitate the organisation of education and training in integrated coastal and marine management and sustainable development for scientists, technologists, managers (including community-based managers) and users, leaders, indigenous peoples, fisherfolk, women and youth, among others. Management and development, as well as environmental protection concerns and local planning issues should be incorporated in educational curricula and public awareness campaigns, with due regard to traditional ecological knowledge and socio-cultural values.

17.17. International organisations, whether subregional, regional or global, as appropriate, should support coastal States, upon request, in the areas indicated above, devoting special attention to developing countries.

Capacity-building

17.18. Full cooperation should be extended, upon request, to coastal States in their capacity-building efforts and, where appropriate, capacity-building should be included in bilateral and multilateral development cooperation. Coastal States may consider, *inter alia*:

- Ensuring capacity-building at the local level;
- Consulting on coastal and marine issues with local administrations, the business community, the academic sector, resource user groups and the general public;
- Coordinating sectoral programmes while building capacity;
- Identifying existing and potential capabilities, facilities and needs for human resources development and scientific and technological infrastructure;
- Developing scientific and technological means and research;
- Promoting and facilitating human resource development and education;
- Supporting "centres of excellence" in integrated coastal and marine resource management;
- Supporting pilot demonstration programmes and projects in integrated coastal and marine management.

B. Marine environmental protection

Basis for action

17.19. Degradation of the marine environment can result from a wide range of sources. Land-based sources contribute 70 per cent of marine pollution, while maritime transport and dumping-at-sea activities contribute 10 per cent each. The contaminants that pose the greatest threat to the marine environment are, in variable order of importance and depending on differing national or regional situations, sewage, nutrients, synthetic organic compounds, sediments, litter and

plastics, metals, radionuclides, oil/hydrocarbons and polycyclic aromatic hydrocarbons (PAHs). Many of the polluting substances originating from land-based sources are of particular concern to the marine environment since they exhibit at the same time toxicity, persistence and bioaccumulation in the food chain. There is currently no global scheme to address marine pollution from land-based sources.

17.20. Degradation of the marine environment can also result from a wide range of activities on land. Human settlements, land use, construction of coastal infrastructure, agriculture, forestry, urban development, tourism and industry can affect the marine environment. Coastal erosion and siltation are of particular concern.

17.21. Marine pollution is also caused by shipping and sea-based activities. Approximately 600,000 tons of oil enter the oceans each year as a result of normal shipping operations, accidents and illegal discharges. With respect to offshore oil and gas activities, currently machinery space discharges are regulated internationally and six regional conventions to control platform discharges have been under consideration. The nature and extent of environmental impacts from offshore oil exploration and production activities generally account for a very small proportion of marine pollution.

17.22. A precautionary and anticipatory rather than a reactive approach is necessary to prevent the degradation of the marine environment. This requires, *inter alia*, the adoption of precautionary measures, environmental impact assessments, clean production techniques, recycling, waste audits and minimisation, construction and/or improvement of sewage treatment facilities, quality management criteria for the proper handling of hazardous substances, and a comprehensive approach to damaging impacts from air, land and water. Any management framework must include the improvement of coastal human settlements and the integrated management and development of coastal areas.

Objectives

17.23. States, in accordance with the provisions of the United Nations Convention on the Law of the Sea on protection and preservation of the marine environment, commit themselves, in accordance with their policies, priorities and resources, to prevent, reduce and control degradation of the marine environment so as to maintain and improve its life-support and productive capacities. To this end, it is necessary to:

- Apply preventive, precautionary and anticipatory approaches so as to avoid degradation of the marine environment, as well as to reduce the risk of long-term or irreversible adverse effects upon it;
- Ensure prior assessment of activities that may have significant adverse impacts upon the marine environment;
- Integrate protection of the marine environment into relevant general environmental, social and economic development policies;
- Develop economic incentives, where appropriate, to apply clean technologies and other means consistent with the internalisation of environmental costs,

such as the polluter pays principle, so as to avoid degradation of the marine environment;
- Improve the living standards of coastal populations, particularly in developing countries, so as to contribute to reducing the degradation of the coastal and marine environment.

[**17.24.** States agree that provision of additional financial resources, through appropriate international mechanisms, as well as access to cleaner technologies and relevant research, would be necessary to support action by developing countries to implement this commitment.] 4/

Activities

Management-related activities

Prevention, reduction and control of degradation of the marine environment from land-based activities

17.25. In carrying out their commitment to deal with degradation of the marine environment from land-based activities, States should take action at the national level and, where appropriate, at the regional and subregional levels, in concert with action to implement programme area A, and should take account of the Montreal Guidelines for the Protection of the Marine Environment from Land-Based Sources.

17.26. To this end, States, with the support of the relevant international environmental, scientific, technical and financial organisations, should cooperate, *inter alia*, to:
- Consider updating, strengthening and extending the Montreal Guidelines, as appropriate;
- Assess the effectiveness of existing regional agreements and action plans, where appropriate, with a view to identifying means of strengthening action, where necessary, to prevent, reduce and control marine degradation caused by land-based activities;
- Initiate and promote the development of new regional agreements,where appropriate;
- Develop means of providing guidance on technologies to deal with the major types of pollution of the marine environment from land-based sources, according to the best scientific evidence;
- Develop policy guidance for relevant global funding mechanisms; 4/
- Identify additional steps requiring international cooperation.

17.27. The UNEP Governing Council is invited to convene, as soon as practicable, an intergovernmental meeting on protection of the marine environment from land-based activities.

17.28. As concerns sewage, priority actions to be considered by States may include:

- Incorporating sewage concerns when formulating or reviewing coastal development plans, including human settlement plans;
- Building and maintaining sewage treatment facilities in accordance with national policies and capacities and international cooperation available;
- Locating coastal outfalls so as to maintain an acceptable level of environmental quality and to avoid exposing shell fisheries, water intakes and bathing areas to pathogens;
- Promoting environmentally sound co-treatments of domestic and compatible industrial effluents, with the introduction, where practicable, of controls on the entry of effluents that are not compatible with the system;
- Promoting primary treatment of municipal sewage discharged to rivers, estuaries and the sea, or other solutions appropriate to specific sites;
- Establishing and improving local, national, subregional and regional, as necessary, regulatory and monitoring programmes to control effluent discharge, using minimum sewage effluent guidelines and water quality criteria and giving due consideration to the characteristics of receiving bodies and the volume and type of pollutants.

17.29. As concerns other sources of pollution, priority actions to be considered by States may include:

- Establishing or improving, as necessary, regulatory and monitoring programmes to control effluent discharges and emissions, including the development and application of control and recycling technologies;
- Promoting risk and environmental impact assessments to help ensure an acceptable level of environmental quality;
- Promoting assessment and cooperation at the regional level, where appropriate, with respect to the input of point source pollutants from new installations;
- Eliminating the emission or discharge of organohalogen compounds that threaten to accumulate to dangerous levels in the marine environment;
- Reducing the emission or discharge of other synthetic organic compounds that threaten to accumulate to dangerous levels in the marine environment;
- Promoting controls over anthropogenic inputs of nitrogen and phosphorus that enter coastal waters where such problems as eutrophication threaten the marine environment or its resources;
- Cooperating with developing countries, through financial and technological support, to maximise the best practicable control and reduction of substances and wastes that are toxic, persistent or liable to bio-accumulate and to establish environmentally sound land-based waste disposal alternatives to sea dumping;
- Cooperating in the development and implementation of environmentally sound land-use techniques and practices to reduce run-off to water-courses and estuaries which would cause pollution or degradation of the marine environment;
- Promoting the use of environmentally less harmful pesticides and fertilisers and alternative methods for pest control, and considering the prohibition of those found to be environmentally unsound;

- Adopting new initiatives at national, subregional and regional levels for controlling the input of non-point source pollutants, which require broad changes in sewage and waste management, agricultural practices, mining, construction and transportation.

17.30. As concerns physical destruction of coastal and marine areas causing degradation of the marine environment, priority actions should include control and prevention of coastal erosion and siltation due to anthropogenic factors related to, *inter alia*, land-use and construction techniques and practices. Watershed management practices should be promoted so as to prevent, control and reduce degradation of the marine environment.

Prevention, reduction and control of degradation of the marine environment from sea-based activities

17.31. States, acting individually, bilaterally, regionally or multilaterally and within the framework of IMO and other relevant international organisations, whether subregional, regional or global, as appropriate, should assess the need for additional measures to address degradation of the marine environment:

a) From shipping, by:

- Supporting wider ratification and implementation of relevant shipping conventions and protocols;
- Facilitating the processes in the first dot point, providing support to individual States upon request to help them overcome the obstacles identified by them;
- Cooperating in monitoring marine pollution from ships, especially from illegal discharges (e.g., aerial surveillance), and enforcing MARPOL discharge, provisions more rigorously;
- Assessing the state of pollution caused by ships in particularly sensitive areas identified by IMO and taking action to implement applicable measures, where necessary, within such areas to ensure compliance with generally accepted international regulations;
- Taking action to ensure respect of areas designated by coastal States, within their exclusive economic zones, consistent with international law, in order to protect and preserve rare or fragile ecosystems, such as coral reefs and mangroves;
- Considering the adoption of appropriate rules on ballast water discharge to prevent the spread of non-indigenous organisms;
- Promoting navigational safety by adequate charting of coasts and ship-routing, as appropriate;
- Assessing the need for stricter international regulations to further reduce the risk of accidents and pollution from cargo ships (including bulk carriers);
- Encouraging IMO and IAEA to work together to complete consideration of a code on the carriage of irradiated nuclear fuel in flasks on board ships;
- Revising and updating the IMO Code of Safety for Nuclear Merchant Ships and considering how best to implement a revised code;
- Supporting the ongoing activity within IMO regarding development of appropriate measures for reducing air pollution from ships;
- Supporting the ongoing activity within IMO regarding the development of an international regime governing the transportation of hazardous and noxious

substances carried by ships and further considering whether the compensation funds similar to the ones established under the Fund Convention would be appropriate in respect of pollution damage caused by substances other than oil;

b) From dumping, by:
- Supporting wider ratification, implementation and participation in relevant Conventions on dumping at sea, including early conclusion of a future strategy for the London Dumping Convention;
- Encouraging the London Dumping Convention parties to take appropriate steps to stop ocean dumping and incineration of hazardous substances;

c) From offshore oil and gas platforms, by assessing existing regulatory measures to address discharges, emissions and safety and assessing the need for additional measures;

d) From ports, by facilitating establishment of port reception facilities for the collection of oily and chemical residues and garbage from ships, especially in MARPOL special areas, and promoting the establishment of smaller scale facilities in marinas and fishing harbours.

17.32. IMO and as appropriate, other competent United Nations organisations, when requested by the States concerned, should assess, where appropriate, the state of marine pollution in areas of congested shipping, such as heavily used international straits, with a view to ensuring compliance with generally accepted international regulations, particularly those related to illegal discharges from ships, in accordance with the provisions of Part III of the United Nations Convention on the Law of the Sea.

17.33. States should take measures to reduce water pollution caused by organotin compounds used in anti-fouling paints.

17.34. States should consider ratifying the Convention on Oil Pollution Preparedness, Response and Cooperation, which addresses, *inter alia*, the development of contingency plans on the national and international level, as appropriate, including provision of oil-spill response material and training of personnel, including its possible extension to chemical spill response.

17.35. States should intensify international cooperation to strengthen or establish, where necessary, regional oil/chemical-spill response centres and/or, as appropriate, mechanisms in cooperation with relevant subregional, regional or global intergovernmental organisations and, where appropriate, industry-based organisations.

Data and information

17.36. States should, as appropriate, and in accordance with the means at their disposal and with due regard for their technical and scientific capacity and resources, make systematic observations on the state of the marine environment. To this end, States should, as appropriate, consider:

- Establishing systematic observation systems to measure marine environmental quality, including causes and effects of marine degradation, as a basis for management;
- Regularly exchanging information on marine degradation caused by land-based and sea-based activities and on actions to prevent, control and reduce such degradation;
- Supporting and expanding international programmes for systematic observations such as the mussel watch programme, building on existing facilities with special attention to developing countries;
- Establishing a clearing-house on marine pollution control information, including processes and technologies to address marine pollution control and to support their transfer to developing countries and other countries with demonstrated needs; 5/
- Establishing a global profile and database providing information on the sources, types, amounts and effects of pollutants reaching the marine environment from land-based activities in coastal areas and sea-based sources;
- Allocating adequate funding for capacity-building and training programmes to ensure the full participation of developing countries, in particular, in any international scheme under the organs and organisations of the United Nations system for the collection, analysis and use of data and information. 4/

Means of implementation

Financing and cost evaluation*

Land-based activities

[**17.37.** Since many activities on land have impacts on the marine environment, the cost estimates to control the major sources of pollution and other impacts are very high. A crude extrapolation based on a few regional studies in semi-enclosed seas gives figures ranging from $5-20 billion per year over 20 years for the necessary investments. On the other hand, the benefits gained from protecting major economic activities in marine and coastal areas far outweigh the costs in the regions studied. Mechanisms such as user fees and charges for pollution violations are needed to raise the necessary sums from those most directly concerned and best able to bear the costs, and to channel the revenues into construction and operation of the necessary facilities. For technical cooperation with developing countries to implement Agenda 21 activities, the following amounts are proposed: $14 million in direct assistance, $4 million to address global issues and $2 million to strengthen international organisations, for a total of $20 million per year. This amount needs to be complemented by major activities contained in other programme areas.]

Sea-based activities

[**17.38.** An estimated $84 million per year is needed to build waste reception facilities in ports in developing countries. This will require special funding mechanisms such as loans or grants from international agencies, including the Global Environment Facility or a system of "Reception Facility Funds", with the assistance of IMO. Income should be raised from shipping to cover at least the operation and maintenance of these facilities, if not to reimburse the capital investment.]

[**17.39.** Provision of oil-spill response materials and equipment, apart from the larger countries that have already invested hundreds of millions of dollars in stockpiles, is estimated at $50 million per year from 1993 to 2000. To this should be added $40 million per year for technical cooperation and capacity-building in developing countries, all with reference to global issues, including $6 million to strengthen international organisations.]

Scientific and technological means

17.40. National, subregional and regional action programmes will, where appropriate, require [technological cooperation,] technology transfer and financial resources, particularly where developing countries are concerned, including:

- Assistance to industries in identifying and adopting clean production or cost-effective pollution control technologies;
- Planning development and application of low-cost and low-maintenance sewage installation and treatment technologies for developing countries;
- Equipment of laboratories to observe systematically human and other impacts on the marine environment;
- Identification of appropriate oil- and chemical-spill control materials, including low-cost locally available materials and techniques, suitable for pollution emergencies in developing countries;
- Study of the use of persistent organohalogens that are liable to accumulate in the marine environment to identify those that cannot be adequately controlled and to provide a basis for a decision on a time schedule for phasing them out as soon as practicable;
- Establishment of a clearing-house for information on marine pollution control, including processes and technologies to address marine pollution control, and support for their transfer to developing and other countries with demonstrated needs. 5/

Human resource development

17.41. States individually or in cooperation with each other and with the support of international organisations, whether subregional, regional or global, as appropriate, should:

- Provide training for critical personnel required for the adequate protection of the marine environment as identified by training needs' survey at the national, regional or subregional levels;
- Promote the introduction of marine environmental protection topics into the curriculum of marine studies programmes;
- Establish training courses for oil- and chemical-spill response personnel, in cooperation, where appropriate, with the oil and chemical industries;

- Conduct workshops on environmental aspects of port operations and development;
- Strengthen and provide secure financing for new and existing specialised international centres of professional maritime education; 4/
- States should, through bilateral and multilateral cooperation, support and supplement the national efforts of developing countries as regards human resource development in relation to prevention and reduction of degradation of the marine environment.

Capacity-building

17.42. National planning and coordinating bodies should be given the capacity and authority to review all land-based activities and sources of pollution for their impacts on the marine environment and to propose appropriate control measures.

17.43. Research facilities should be strengthened or, where appropriate, developed in developing countries for systematic observation of marine pollution, environmental impact assessment and development of control recommendations and should be managed and staffed by local experts.

17.44. Special arrangements will be needed to provide adequate financial and technical resources to assist developing countries in preventing and solving problems associated with activities that threaten the marine environment.

17.45. An international funding mechanism should be created for the application of appropriate sewage treatment technologies and building sewage treatment facilities, including grants or concessional loans from international agencies and appropriate regional funds, replenished at least in part on a revolving basis by user fees. 4/

17.46. In carrying out these programme activities, particular attention needs to be given to the problems of developing countries that would bear an unequal burden because of their lack of facilities, expertise or technical capacities.

C. Sustainable use and conservation of marine living resources of the high seas

Basis for action

17.47. Over the last decade, fisheries on the high seas have considerably expanded and currently represent approximately 5 per cent of total world landings. The provisions of the United Nations Convention on the Law of the Sea on the marine living resources of the high seas sets forth rights and obligations of States with respect to conservation and utilisation of those resources.

17.48. However, management of high seas fisheries, including the adoption, monitoring and enforcement of effective conservation measures, is inadequate in many areas and some resources are overutilised. There are problems of unregulated fishing, overcapitalisation, excessive fleet size, vessel reflagging to escape controls, insufficiently selective gear, unreliable databases and lack of sufficient cooperation between States. Action by States whose nationals and

vessels fish on the high seas, as well as cooperation at the bilateral, subregional, regional and global levels, is essential particularly for highly migratory species and straddling stocks. Such action and cooperation should address inadequacies in fishing practices, as well as in biological knowledge, fisheries statistics and improvement of systems for handling data. Emphasis should also be on multi-species management and other approaches that take into account the relationships among species, especially in addressing depleted species, but also in identifying the potential of underutilised or unutilised populations.

Objectives

17.49. States commit themselves to the conservation and sustainable use of marine living resources on the high seas. To this end, it is necessary to: 4/

- Develop and increase the potential of marine living resources to meet human nutritional needs, as well as social, economic and development goals;
- Maintain or restore populations of marine species at levels that can produce the maximum sustainable yield as qualified by relevant environmental and economic factors, taking into consideration relationships among species;
- Promote the development and use of selective fishing gear and practices that minimise waste in the catch of target species and minimise by-catch of non-target species;
- Ensure effective monitoring and enforcement with respect to fishing activities;
- Protect and restore endangered marine species;
- Preserve habitats and other ecologically sensitive areas;
- Promote scientific research with respect to the marine living resources in the high seas;

[• Cooperate to ensure that high seas fishing does not have an adverse impact on the marine living resources under the national jurisdiction of coastal states.]

17.50. Nothing in paragraph **17.49** above restricts the right of a State or the competence of an international organisation, as appropriate, to prohibit, limit or regulate the exploitation of marine mammals on the high seas more strictly than provided for in that paragraph. States shall cooperate with a view to the conservation of marine mammals and, in the case of cetaceans, shall in particular work through the appropriate international organisations for their conservation, management and study.

17.51. The ability of developing countries to fulfil the above objectives is dependent upon their capabilities, including the financial, scientific and technological means at their disposal. Adequate financial, scientific and technological cooperation should be provided to support action by them to implement these objectives. 4/

Activities

Management-related activities

17.52 States should take effective action, including bilateral and multilateral cooperation, where appropriate at the subregional, regional and global levels, to ensure that high seas fisheries are managed in accordance with the provisions of

the United Nations Convention on the Law of the Sea. In particular, they should:

- Give full effect to these provisions with regard to fisheries populations whose ranges lie both within and beyond exclusive economic zones (straddling stocks);
- Give full effect to these provisions with regard to highly migratory species;
- Negotiate, where appropriate, international agreements for the effective management and conservation of fishery stocks;
- Define and identify appropriate management units;
- Develop guidelines for better implementation of the provisions of the United Nations Convention on the Law of the Sea on high seas fisheries.

[17.53. States whose [nationals] [vessels] fish for straddling stocks on the high seas and the coastal States in whose exclusive economic zones such stocks occur, should cooperate with a view to agreeing on measures [applicable on the high seas] necessary to ensure the conservation and sustainable use of such stocks. Such measures should:

- Be consistent with measures applied by the coastal States within the exclusive economic zones;
- Give effect to the special interest and responsibility of the coastal State with respect to the portion of the straddling stocks beyond the exclusive economic zones;]

[17.54. States whose [nationals] [vessels] fish for stocks of highly migratory species on the high seas and coastal States in whose exclusive economic zones such stocks occur, should cooperate with a view to agreeing on measures [applicable on the high seas] necessary to ensure the conservation and sustainable use of such stocks. Such measures should:

- Fully recognize the sovereign rights of the coastal States in their exclusive economic zones;
- Take into account the special interest of the coastal States in these stocks outside their exclusive economic zones, thereby avoiding adverse impacts on such stocks within their exclusive economic zones.]

17.55. States should ensure that fishing activities by vessels flying their flags on the high seas take place in a manner so as to minimise incidental catch.

17.56. States should take effective action consistent with international law to monitor and control fishing activities by vessels flying their flags on the high seas to ensure compliance with applicable conservation and management rules, including full, detailed, accurate and timely reporting of catches and effort.

17.57. States should take effective action, consistent with international law, to deter reflagging of vessels by their nationals as a means of avoiding compliance with applicable conservation and management rules for fishing activities on the high seas.

17.58. States should prohibit dynamiting, poisoning and other comparable destructive fishing practices.

17.59. States should fully implement General Assembly resolution 46/215 on large-scale pelagic drift-net fishing.

17.60. States should take measures to increase the availability of marine living resources as human food by reducing wastage, post-harvest losses and discards, and improving techniques of processing, distribution and transportation.

Data and information

17.61. States, with the support of international organisations, whether subregional, regional or global, as appropriate, should cooperate to:

- Promote enhanced collection of data necessary for the conservation and sustainable use of the marine living resources of the high seas:
- Exchange on a regular basis up-to-date data and information adequate for fisheries assessment;
- Develop and share analytical and predictive tools, such as stock assessment and bioeconomic models;
- Establish or expand appropriate monitoring and assessment programmes.

International and regional cooperation and coordination

17.62. States, through bilateral and multilateral cooperation and within the framework of subregional and regional fisheries bodies, as appropriate, and with the support of other international intergovernmental agencies, should assess high seas resource potentials and develop profiles of all stocks (target and non-target).

17.63. States should, where and as appropriate, ensure adequate coordination and cooperation in enclosed and semi-enclosed seas and between subregional, regional and global intergovernmental fisheries bodies.

17.64. Effective cooperation within existing subregional, regional or global fisheries bodies should be encouraged. Where such organisations do not exist, States should, as appropriate, cooperate to establish such organisations.

17.65. States with an interest in a high seas fishery regulated by an existing subregional and/or regional high seas fisheries organisation of which they are not members should be encouraged to join that organisation, where appropriate.

17.66. States recognise:

- The responsibility of the International Whaling Commission for the conservation and management of whale stocks and the regulation of whaling pursuant to the 1946 International Convention for the Regulation of Whaling;
- The work of the International Whaling Commission Scientific Committee in carrying out studies of large whales in particular, as well as of other cetaceans;
- The work of other organisations, such as the Inter-American Tropical Tuna Commission and the Agreement on Small Cetaceans in the Baltic and North Sea under the Bonn Convention, in the conservation, management and study of cetaceans and other marine mammals.

17.67. States should cooperate for the conservation, management and study of cetaceans.

Means of implementation

Financing and cost evaluation*

[**17.68.** The costs of developing sustainable uses of high seas resources should be borne by utilising countries. The principal costs of research and management systems on the high seas should also be supported by the States [and the various users]. However, the catalytic funding required to improve the database and scientific knowledge, the effectiveness of fisheries management bodies, and the participation of all coastal countries, especially developing ones, in this effort is estimated at $12 million per year for this global issue, including $5 million to strengthen international and regional organisations.]

Scientific and technological means

17.69. States, with the support of relevant international organisations, where necessary, should develop collaborative technical and research programmes to improve understanding of the life cycles and migrations of species found on the high seas, including identifying critical areas and life stages.

17.70. States, with the support of relevant international organisations, whether subregional, regional or global, as appropriate, should:

- Develop databases on the high seas marine living resources and fisheries;
- Collect and correlate marine environmental data with high seas marine living resources data, including the impacts of regional and global changes brought about by natural causes and by human activities;
- Cooperate in coordinating research programmes to provide the knowledge necessary to manage high seas resources.

Human resources development

17.71. Human resources development at the national level should be targeted at both development and management of high seas resources, including training in high seas fishing techniques and in high seas resource assessment, strengthening cadres of personnel to deal with high seas resource management and conservation and related environmental issues, and training observers and inspectors to be placed on fishing vessels.

Capacity-building

17.72. States, with the support, where appropriate, of relevant international organisations, whether subregional, regional or global, should cooperate to develop or upgrade systems and institutional structures for monitoring, control and surveillance, as well as the research capacity for assessment of marine living resource populations.

17.73. Special support, including cooperation among States, will be needed to enhance the capacities of developing countries in the areas of data and information, scientific and technological means, and human resource development in order to participate effectively in the conservation and sustainable utilisation of high seas marine living resources.

D. Sustainable use and conservation of marine living resources under national jurisdiction 6/

Basis for action

17.74. Marine fisheries yield 80 to 90 million tons of fish and shellfish per year, 95 per cent of which is taken from waters under national jurisdiction. Yields have increased nearly fivefold over the past four decades. The provisions of the United Nations Convention on the Law of the Sea on marine living resources of the exclusive economic zone and other areas under national jurisdiction set forth rights and obligations of States with respect to conservation and utilisation of those resources.

17.75. Marine living resources provide an important source of protein in many countries and their use is often of major importance to local communities and indigenous people. Such resources provide food and livelihoods to millions of people and, if sustainably utilised, offer increased potential to meet nutritional and social needs, particularly in developing countries. To realise this potential requires improved knowledge and identification of marine living resource stocks, particularly of underutilised and unutilised stocks and species, use of new technologies, better handling and processing facilities to avoid wastage, and improved quality and training of skilled personnel to manage and conserve effectively the marine living resources of the exclusive economic zone and other areas under national jurisdiction. Emphasis should also be on multi-species management and other approaches that take into account the relationships among species.

17.76. Fisheries in many areas under national jurisdiction face mounting problems, including local overfishing, unauthorised incursions by foreign fleets, ecosystem degradation, overcapitalisation and excessive fleet sizes, underevaluation of catch, insufficiently selective gear, unreliable databases, and increasing competition between artisanal and large-scale fishing, and between fishing and other types of activities.

17.77. Problems extend beyond fisheries. Coral reefs and other marine and coastal habitats, such as mangroves and estuaries, are among the most highly diverse, integrated and productive of the Earth's ecosystems. They often serve important ecological functions, provide coastal protection, and are critical resources for food, energy, tourism and economic development. In many parts of the world, such marine and coastal systems are under stress or are threatened from a variety of sources, both human and natural.

Objectives

17.78. Coastal States, particularly developing countries and States whose economies are overwhelmingly dependent on the exploitation of the marine living resources of their exclusive economic zones, should obtain the full social and economic benefits from sustainable utilisation of marine living resources within their exclusive economic zones and other areas under national jurisdiction. 4/

17.79. States commit themselves to the conservation and sustainable use of marine living resources under national jurisdiction. To this end, it is necessary to: 4/

- Develop and increase the potential of marine living resources to meet human nutritional needs, as well as social, economic and development goals;
- Take into account traditional knowledge and interests of local communities, small-scale artisanal fisheries and indigenous people in development and management programmes;
- Maintain or restore populations of marine species at levels that can produce the maximum sustainable yield as qualified by relevant environmental and economic factors, taking into consideration relationships among species;
- Promote the development and use of selective fishing gear and practices that minimise waste in the catch of target species and minimise by-catch of non-target species;
- Protect and restore endangered marine species;
- Preserve rare or fragile ecosystems, as well as habitats and other ecologically sensitive areas.

17.80. Nothing in paragraph 17.79 above restricts the right of a coastal State or the competence of an international organisation, as appropriate, to prohibit, limit or regulate the exploitation of marine mammals more strictly than provided for in that paragraph. States shall cooperate with a view to the conservation of marine mammals and in the case of cetaceans shall in particular work through the appropriate international organisations for their conservation, management and study.

17.81. The ability of developing countries to fulfil the above objectives is dependent upon their capabilities, including the financial, scientific and technological means at their disposal. Adequate financial, scientific and technological cooperation should be provided to support action by them to implement these objectives. 4/

Activities

Management-related activities

17.82. States should ensure that marine living resources of the exclusive economic zone and other areas under national jurisdiction are conserved and managed in accordance with the provisions of the United Nations Convention on the Law of the Sea.

[17.83 or 17.84 *bis*. States should give attention to issues related to the conservation and management of straddling stocks, migratory species and access to surplus.]

or

[17.83 or 17.84 *bis*. States should implement the provisions of the United Nations Convention on the Law of the Sea with regard to straddling stocks, migratory species and access to surplus.]

17.84. Coastal States, individually or through bilateral and/or multilateral cooperation and with the support, as appropriate of international organisations, whether subregional, regional or global, should *inter alia*:

- Assess the potential of marine living resources, including underutilised or unutilised stocks and species, by developing inventories, where necessary, for their conservation and sustainable use;
- Implement strategies for the sustainable use of marine living resources, taking into account the special needs and interests of small-scale artisanal fisheries, local communities and indigenous people to meet human nutritional and other development needs;
- Implement, in particular in developing countries, mechanisms to develop mariculture, aquaculture and small-scale, deep-sea and oceanic fisheries within areas under national jurisdiction where assessments show that marine living resources are potentially available;
- Strengthen their legal and regulatory frameworks, where appropriate, including management, enforcement and surveillance capabilities, to regulate activities related to the above strategies;
- Take measures to increase the availability of marine living resources as human food by reducing wastage, post-harvest losses and discards, and improving techniques of processing, distribution and transportation;
- Develop and promote the use of environmentally sound technology under criteria compatible with the sustainable use of marine living resources, including assessment of the environmental impact of major new fishery practices;
- Enhance the productivity and utilisation of their marine living resources for food and income.

17.85. Coastal States should explore the scope for expanding recreational and tourist activities based on marine living resources, including those for providing alternative sources of income. Such activities should be compatible with conservation and sustainable development policies and plans.

17.86. Coastal States should support the sustainability of small-scale artisanal fisheries. To this end, they should, as appropriate:

- Integrate small-scale artisanal fisheries development in marine and coastal planning, taking into account the interests and, where appropriate, encouraging representation of fishermen, small-scale fisherworkers, women, local communities and indigenous people;
- Recognise the rights of small-scale fishworkers and the special situation of indigenous people and local communities, including their rights to utilisation and protection of their habitats on a sustainable basis;
- Develop systems for the acquisition and recording of traditional knowledge concerning marine living resources and environment and promote the incorporation of such knowledge into management systems.

17.87. Coastal States should ensure that, in the negotiation and implementation of international agreements on the development or conservation of marine living resources, the interests of local communities and indigenous people are taken into account, in particular their right to subsistence.

17.88. Coastal States, with the support, as appropriate, of international organisations should conduct analyses of the potential for aquaculture in marine and coastal areas under national jurisdiction and apply appropriate safeguards as to the introduction of new species.

17.89. States should prohibit dynamiting, poisoning and other comparable destructive fishing practices.

17.90. States should identify marine ecosystems exhibiting high levels of biodiversity and productivity and other critical habitat areas and should provide necessary limitations on use in these areas, through, *inter alia*, designation of protected areas. Priority should be accorded, as appropriate, to:

- Coral reef ecosystems;
- Estuaries;
- Temperate and tropical wetlands, including mangroves;
- Seagrass beds;
- Other spawning and nursery areas.

Data and information

17.91. States, individually or through bilateral and multilateral cooperation and with the support, as appropriate, of international organisations, whether subregional, regional or global, should:

- Promote enhanced collection and exchange of data necessary for the conservation and sustainable use of the marine living resources under national jurisdiction;
- Exchange on a regular basis up-to-date data and information necessary for fisheries assessment;
- Develop and share analytical and predictive tools, such as stock assessment and bioeconomic models;
- Establish or expand appropriate monitoring and assessment programmes;
- Complete or update marine biodiversity, marine living resource and critical habitat profiles of exclusive economic zones and other areas under national jurisdiction, taking account of changes in the environment brought about by natural causes and human activities.

International and regional cooperation and coordination

17.92. States, through bilateral and multilateral cooperation, and with the support of relevant United Nations and other international organisations, should cooperate to:

- Develop financial and technical cooperation to enhance the capacities of developing countries in small-scale and oceanic fisheries, as well as in coastal aquaculture and mariculture; 4/
- Promote the contribution of marine living resources to eliminate malnutrition and to achieve food self-sufficiency in developing countries, *inter alia*, by minimising post-harvest losses and managing stocks for guaranteed sustainable yields;
- Develop agreed criteria for the use of selective fishing gear and practices to minimise waste in the catch of target species and minimise by-catch of non-target species;

- Promote seafood quality, including through national quality assurance systems for seafood, in order to promote access to markets, improve consumer confidence and maximise economic returns.

17.93. States should, where and as appropriate, ensure adequate coordination and cooperation in endorsed and semi-enclosed seas and between subregional, regional and global intergovernmental fisheries bodies.

17.94. States recognise:
- The responsibility of the International Whaling Commission for the conservation and management of whale stocks and the regulation of whaling pursuant to the 1946 International Convention for the Regulation of Whaling;
- The work of the International Whaling Commission Scientific Committee in carrying out studies of large whales in particular, as well as of other cetaceans;
- The work of other organisations, such as the Inter-American Tropical Tuna Commission and the Agreement on Small Cetaceans in the Baltic and North Sea under the Bonn Convention, in the conservation, management and study of cetaceans and other marine mammals.

17.95. States should cooperate for the conservation, management and study of cetaceans.

Means of implementation

Financing and cost evaluation*

[**17.96.** The total cost to restructure the fisheries sector is estimated at up to $6 billion per year, excluding investments needed to organise sector reconversion to reduce overcapitalisation. The catalytic funding proposed to implement the above activities at the national and regional levels is on the order of $60 million annually to accelerate development and improve management, including $4 million to strengthen regional and international organisations.]

Scientific and technological means

17.97. States, with the support of relevant intergovernmental organisations, as appropriate, should:
- Provide for the transfer of environmentally sound technologies to develop fisheries, aquaculture and mariculture, particularly to developing countries;
- Accord special attention to mechanisms for transferring resource information and improved fishing and aquaculture technologies to fishing communities at the local level;
- Promote the study, scientific assessment and use of appropriate traditional management systems;
- Consider observing, as appropriate, the FAO/ICES Code of Practice for Consideration of Transfer and Introduction of Marine and Freshwater Organisms;
- Promote scientific research on marine areas of particular importance for marine living resources, such as areas of high diversity, endemism and productivity and migratory stopover points.

Human resource development

17.98. States individually, or through bilateral and multilateral cooperation and with the support of relevant international organisations, whether subregional, regional or global, as appropriate, should encourage and provide support for developing countries, *inter alia*, to:

- Expand multidisciplinary education, training and research on marine living resources, particularly in the social and economic sciences;
- Create training opportunities at national and regional levels to support artisanal (including subsistence) fisheries, to develop small-scale use of marine living resources and to encourage equitable participation of local communities, small-scale fish workers, women and indigenous people;
- Introduce topics relating to the importance of marine living resources in educational curricula at all levels.

Capacity-building

17.99. Coastal States, with the support of relevant subregional, regional and global agencies, where appropriate, should:

- develop research capacities for assessment of marine living resource populations and monitoring;
- Provide support to local fishing communities, in particular those that rely on fishing for subsistence, indigenous people and women, including, as appropriate, the technical and financial assistance to organise, maintain, exchange and improve traditional knowledge of marine living resources and fishing techniques, and upgrade knowledge on marine ecosystems;
- Establish sustainable aquaculture development strategies, including environmental management in support of rural fish-farming communities;
- Develop and strengthen, where the need may arise, institutions capable of implementing the objectives and activities related to the conservation and management of marine living resources.

17.100. Special support, including cooperation among States, will be needed to enhance the capacities of developing countries in the areas of data and information, scientific and technological means and human resource development in order to enable them to participate effectively in the conservation and sustainable use of marine living resources under national jurisdiction.

E. Addressing critical uncertainties for the management of the marine environment and climate change

Basis for action

17.101. The marine environment is vulnerable and sensitive to climate and atmospheric changes. Rational use and development of coastal areas, all seas and marine resources, as well as conservation of the marine environment, requires the ability to determine the present state of these systems and to predict future conditions. The high degree of uncertainty in present information inhibits effective management and limits the ability to make predictions and assess environmental change. Systematic collection of data on marine environmental parameters will be needed to apply integrated management approaches and to predict effects of global climate change and of atmospheric

phenomena, such as ozone depletion, on living marine resources and the marine environment. In order to determine the role of the oceans and all seas in driving global systems and to predict natural and human-induced changes in marine and coastal environments, the mechanisms to collect, synthesise and disseminate information from research and systematic observation activities need to be restructured and reinforced considerably.

17.102. There are many uncertainties about climate change and particularly about sealevel rise. Small increases in sealevel have the potential of causing significant damage to small islands and low-lying coasts. Response strategies should be based on sound data. A long-term cooperative research commitment is needed to provide the data required for global climate models and to reduce uncertainty. Meanwhile, precautionary measures should be undertaken to diminish the risks and effects, particularly on small islands and on low-lying and coastal areas of the world.

17.103. Increased ultraviolet radiation derived from ozone depletion has been reported in some areas of the world. An assessment of its effects in the marine environment is needed to reduce uncertainty and to provide a basis for action.

Objectives

17.104. States, in accordance with provisions of the United Nations Convention on the Law of the Sea on marine scientific research, commit themselves to improve the understanding of the marine environment and its role on global processes. To this end, it is necessary to:

- Promote scientific research on and systematic observation of the marine environment within the limits of national jurisdiction and high seas including interactions with atmospheric phenomena, such as ozone depletion;
- Promote exchange of data and information resulting from scientific research and systematic observation and from traditional ecological knowledge and ensure its availability to policy makers and the public at the national level;
- Cooperate with a view to the development of standard inter-calibrated procedures, measuring techniques, data storage and management capabilities for scientific research on and systematic observation of the marine environment.

Activities

Management-related activities

17.105. States should consider, *inter alia*:

- Coordinating national and regional observation programmes for coastal and near-shore phenomena related to climate change and for research parameters essential for marine and coastal management in all regions;
- Providing improved forecasts of marine conditions for the safety of inhabitants of coastal areas and for the efficiency of maritime operations;
- Cooperating with a view to adopting special measures to cope with and adapt to potential climate change and sealevel rise, including the development of globally accepted methodologies for coastal vulnerability assessment,

modelling and response strategies particularly for priority area such as small islands and low-lying and critical coastal areas;
- Identifying ongoing and planned programmes of systematic observation of the marine environment, with a view to integrating activities and establishing priorities to address critical uncertainties for oceans and all seas;
- Initiating a programme of research to determine the marine biological effects of increased levels of ultraviolet rays due to the depletion of the stratospheric ozone layer and to evaluate the possible effects.

17.106. Recognising the important role that oceans and all seas play in attenuating potential climate change, IOC and other relevant competent United Nations bodies, with the support of countries having the resources and expertise, should carry out analysis, assessments and systematic observation of the role of oceans as a carbon sink.

Data and information

17.107. States should consider, *inter alia*:
- Increasing international cooperation particularly with a view to strengthening national scientific and technological capabilities for analysing, assessing and predicting global climate and environmental change;
- Supporting the role of the IOC in cooperation with WMO, UNEP and other international organisations in the collection, analysis and distribution of data and information from the oceans and all seas, including as appropriate, through the proposed Global Ocean Observing System, giving special attention to the need for IOC to develop fully the strategy for providing training and technical assistance for developing countries through its Training, Education and Mutual Assistance (TEMA) programme;
- Creating national multisectoral information bases, covering the results of research and systematic observation programmes:
- Linking these databases to existing data and information services and mechanisms, such as World Weather Watch and Earthwatch:
- Cooperating with a view to the exchange of data and information and its storage and archiving through the world and regional data centres:
- Cooperating to ensure full participation of developing countries, in particular, in any international scheme under the organs and organisations of the United Nations system for the collection, analysis and use of data and information.

International and regional cooperation and coordination

17.108. States should consider bilaterally and multilaterally and in cooperation with international organisations, whether subregional, regional, interregional or global, where appropriate:
- Providing technical cooperation in developing the capacity of coastal and island States for marine research and systematic observation and for using its results;
- Strengthening existing national institutions and creating, where necessary, international analysis and prediction mechanisms in order to prepare and exchange regional and global oceanographic analyses and forecasts and to provide facilities for international research and training at national, subregional and regional levels, where applicable.

17.109. In recognition of the value of Antarctica as an area for the conduct of scientific research, in particular research essential to understanding the global environment, States carrying out such research activities in Antarctica should, as provided for in Article III of the Antarctic Treaty, continue to:

- Ensure that data and information resulting from such research are freely available to the international community;
- Enhance access of the international scientific community and specialised agencies of the United Nations to such data and information, including the encouragement of periodic seminars and symposia.

17.110. States should strengthen high-level inter-agency, subregional, regional and global coordination, as appropriate, and review mechanisms to develop and integrate systematic observation networks. This would include:

- Review of existing regional and global databases;
- Mechanisms to develop comparable and compatible techniques, validate methodologies and measurements, organise regular scientific reviews, develop options for corrective measures, agree on formats for presentation and storage, and communicate the information gathered to potential users;
- Systematic observation of coastal habitats and sealevel changes, inventories of marine pollution sources and reviews of fisheries statistics;
- Organisation of Periodic assessments of ocean and all seas and trends.

17.111. International cooperation, through relevant organisations within the United Nations system, should support countries to develop and integrate regional systematic long-term observation programmes, when applicable, into the Regional Seas Programmes in a coordinated fashion to implement, where appropriate, subregional, regional and global observing systems based on the principle of exchange of data. One aim should be the predicting of the effects of climate-related emergencies on existing coastal physical and socio-economic infrastructure.

17.112. Based on the results of research on the effects of the additional ultraviolet radiation reaching the Earth's surface, in the fields of human health, agriculture and marine environment, States and international organisations should consider taking appropriate remedial measures.

Means of implementation

Financing and cost evaluation*

[**17.113.** The estimate of costs to ensure participation in the implementation of the recommendations in this section needs to be reconsidered in the light of conclusions on financial matters.]

17.114. Developed countries should provide the financing for the further development and implementation of the proposed Global Ocean Observing System.

Scientific and technological means

17.115. To address critical uncertainties through systematic coastal and marine observations and research, coastal States should cooperate in the development of procedures that allow for comparable analysis and soundness of data. They should also cooperate on a subregional and regional basis, through existing programmes where applicable, share infrastructure and expensive and sophisticated equipment, develop quality assurance procedures and develop human resources jointly. Special attention should be given to transfer of scientific and technological knowledge and means to support States, particularly developing countries, in the development of endogenous capabilities.

17.116. International organisations should support, when requested, coastal countries in implementing research projects on the effects of additional ultraviolet radiation.

Human resource development

17.117. States, individually or through bilateral and multilateral cooperation and with the support, as appropriate, of international organisations whether subregional, regional or global, should develop and implement comprehensive programmes, particularly in developing countries, for a broad and coherent approach to meeting their core human resource needs in the marine sciences.

Capacity-building

17.118. States should strengthen or establish as necessary, national scientific and technological oceanographic commissions or equivalent bodies to develop, support and coordinate marine science activities and work closely with international organisations.

17.119. States should use existing subregional and regional mechanisms, where applicable, to develop knowledge of the marine environment, exchange information, organise systematic observations and assessments, and make the most effective use of scientists, facilities and equipment. They should also cooperate in the promotion of endogenous research capabilities in developing countries.

Strengthening international, including regional, cooperation and coordination

Basis for action

17.120. It is recognised that the role of international cooperation is to support and supplement national efforts. Implementation of strategies and activities under the programme areas relative to marine and coastal areas and seas requires effective institutional arrangements at national, subregional, regional and global levels, as appropriate. There are numerous national and international, including regional, institutions, both within and outside the United Nations system, with competence in marine issues, and there is a need to improve coordination and strengthen links among them. It is also important to ensure that an integrated and multisectoral approach to marine issues is pursued at all levels.

Objectives

17.121. States commit themselves, in accordance with their policies, priorities and resources, to promote institutional arrangements necessary to support the implementation of the programme areas in this chapter. To this end, it is necessary, as appropriate, to:

- Integrate relevant sectoral activities addressing environment and development in marine and coastal areas at national, subregional, regional and global levels, as appropriate;
- Promote effective information exchange and, where appropriate, institutional linkages between bilateral and multilateral national, regional, subregional and interregional institutions dealing with environment and development in marine and coastal areas;
- Promote within the United Nations system, regular intergovernmental review and consideration of environment and development issues with respect to marine and coastal areas;
- Promote the effective operation of coordinating mechanisms for the components of the United Nations system dealing with issues of environment and development in marine and coastal areas, as well as links with relevant international development bodies.

Activities

Management-related activities

Global

17.122. The General Assembly should provide for regular consideration, within the United Nations system, at the intergovernmental level of general marine and coastal issues, including environment and development matters, 8/ and should request the Secretary-General and executive heads of United Nations agencies and organisations to:

- Strengthen coordination and develop improved arrangements among the relevant United Nations organisations with major marine and coastal responsibilities, including their subregional and regional components;
- Strengthen coordination between those organisations and other United Nations organisations, institutions and specialised agencies dealing with development, trade and other related economic issues, as appropriate;
- Improve representation of United Nations agencies dealing with the marine environment in United Nations system-wide coordination efforts;
- Promote, where necessary, greater collaboration between the United Nations agencies and subregional and regional coastal and marine programmes;
- Develop a centralised system to provide for information on legislation and advice on implementation of legal agreements on marine environmental and development issues.

17.123. States recognise that environmental policies should deal with the root causes of environmental degradation, thus preventing environmental measures from resulting in unnecessary restrictions to trade. Trade policy measures for environmental purposes should not constitute a means of arbitrary or unjustifiable discrimination or a disguised restriction on international trade. Unilateral actions to deal with environmental challenges outside the

jurisdiction of the importing country should be avoided. Environmental measures addressing international environmental problems should, as far as possible, be based on an international consensus. Domestic measures targeted to achieve certain environmental objectives may need trade measures to render them effective. Should trade policy measures be found necessary for the enforcement of environmental policies, certain principles and rules should apply. These could include, *inter alia*, the principle of non-discrimination; the principle that the trade measure chosen should be the least trade-restrictive necessary to achieve the objectives; an obligation to ensure transparency in the use of trade measures related to the environment and to provide adequate notification of national regulations; and the need to give consideration to the special conditions and development requirements of developing countries as they move towards internationally agreed environmental objectives.

Subregional and regional

17.124. States should consider, as appropriate:

- Strengthening, and extending where necessary, intergovernmental regional cooperation, the Regional Seas Programmes of UNEP, regional and subregional fisheries organisations and regional commissions;
- Introduce, where necessary, coordination among relevant United Nations and other multilateral organisations at the subregional and regional levels, including consideration of co-location of their staff;
- Arrange for periodic intraregional consultations:
- Facilitate access to and use of expertise and technology through relevant national bodies to subregional and regional centres and networks, such as the Regional Centres for Marine Technology.

Data and information

17.125. States should, where appropriate:

- Promote exchange of information on marine and coastal issues;
- Strengthen the capacity of international organisations to handle information and support the development of national, subregional and regional data and information systems, where appropriate. This could also include networks linking countries with comparable environmental problems:
- Further develop existing international mechanisms such as Earthwatch and GESAMP.

Means of implementation

Financing and cost evaluation*

[**17.126.** The proposed cost for strengthening regional cooperation is $12 million per year in additional support for international organisations and regional coordinating units, and at least $25 million annually in further direct support to activities at the regional level. Improving international coordination and strengthening the global role of the United Nations system implement Agenda 21 in oceans and coastal areas would cost a proposed $12 million per year, which would approximately double present expenditures and would catalyse and coordinate much larger national expenditures.]

Scientific and technological means, human resource development and capacity-building

17.127. The means of implementation outlined in the other programme areas marine and coastal issues, under the sections on Scientific and technological means, human resource development and capacity-building are entirely relevant for this programme area as well. Additionally, States should, through international cooperation, develop a comprehensive programme for meeting the core human resource needs in marine sciences at all levels.

Sustainable development of small islands

Basis for action

17.128. Small island developing States, and islands supporting small communities are a special case both for environment and development. They are ecologically fragile and vulnerable. Their small size, limited resources, geographic dispersion and isolation from markets, place them at a disadvantage economically and prevent economies of scale. For small island developing States the ocean and coastal environment is of strategic importance and constitutes a valuable development resource.

17.129. Their geographic isolation has resulted in their habitation of a comparatively large number of unique species of flora and fauna, giving them a very high share of global biodiversity. They also have rich and diverse cultures with special adaptations to island environments and knowledge of the sound management of island resources.

17.130. Small island developing States have all the environmental problems and challenges of the coastal zone concentrated in a limited land area. They are considered extremely vulnerable to global warming and sealevel rise, with certain small low-lying islands facing the increasing threat of the loss of their entire national territories. Most tropical islands are also now experiencing the more immediate impacts of increasing frequency of cyclones, storms and hurricanes associated with climate change. These are causing major set-backs to their socio-economic development.

17.131. Because small island development options are limited, there are special challenges to planning for and implementing sustainable development. Small island developing States will be constrained in meeting these challenges without the cooperation and assistance of the international community.

Objectives

17.132. States commit themselves to addressing the problems of sustainable development of small island developing States. To this end, it is necessary:

- To adopt and implement plans and programmes to support the sustainable development and utilisation of their marine and coastal resources, including meeting essential human needs, maintaining biodiversity and improving the quality of life for island people;
- To adopt measures which will enable small island developing States to cope effectively, creatively and sustainably with environmental change and to mitigate impacts and reduce the threats posed to marine and coastal resources.

Activities

Management-related activities

17.133. Small island developing States, with the assistance as appropriate of the international community and on the basis of existing work of national and international organisations, should:

- Study the special environmental and developmental characteristics of small islands, producing an environmental profile and inventory of their natural resources, critical marine habitats and biodiversity;
- Develop techniques for determining and monitoring the carrying capacity of small islands under different development assumptions and resource constraints;
- Prepare medium- and long-term plans for sustainable development that emphasise multiple use of resources, integrate environmental considerations with economic and sectoral planning and policies, define measures for maintaining cultural and biological diversity and conserve endangered species and critical marine habitats;
- Adapt coastal area management techniques, such as planning, siting and environmental impact assessments, using Geographical Information Systems (GIS), suitable to the special characteristics of small islands, taking into account the traditional and cultural values of indigenous people of island countries;
- Review the existing institutional arrangements and identify and undertake appropriate institutional reforms essential to the effective implementation of sustainable development plans, including intersectoral coordination and community participation in the planning process;
- Implement sustainable development plans, including the review and modification of existing unsustainable policies and practices;
- Based on precautionary and anticipatory approaches, design and implement rational response strategies to address the environmental, social and economic impacts of climate change and sealevel rise, and prepare appropriate contingency plans;
- Promote environmentally sound technology for sustainable development within small island developing States and identify technologies that should be excluded because of their threats to essential island ecosystems.

Data and information

17.134. Additional information on the geographic, environmental, cultural and socio-economic characteristics of islands should be compiled and assessed to assist in the planning process. Existing island databases should be expanded and geographic information systems developed and adapted to suit the special characteristics of islands.

International and regional cooperation and coordination

17.135. Small island developing States, with the support, as appropriate, of international organisations, whether subregional, regional or global, should develop and strengthen inter-island, regional and interregional cooperation and information exchange, including periodic regional and global meetings on

sustainable development of small island developing States with the first global conference on the sustainable development of small island developing States, to be held in 1993.

17.136. International organisations, whether subregional, regional or global, must recognise the special development requirements of small island developing States and give adequate priority in the provision of assistance, particularly with respect to the development and implementation of sustainable development plans.

Means of implementation

Financing and cost evaluation*

[**17.137.** Technical cooperation costs to implement these activities amount to $7 million per year. A programme on integrated planning for sustainable development of islands will cost about $130 million per year, to be financed by private and public sources. About $40 million could come from the international community. Since many small islands will never develop an adequate economic or population base that can provide all of the services necessary for a reasonable quality of life, some external support will frequently be required on a continuing basis. In addition, the need to maintain the island share of global biodiversity will further limit development options and should be supported by the international community with at least $3 million per year.]

Scientific and technical means

17.138. Centres for the development and diffusion of scientific information and advice on technical means and technologies appropriate to small island developing States, especially with reference to the management of the coastal zone, the exclusive economic zone and marine resources, should be established or strengthened, as appropriate, on a regional basis.

Human resource development

17.139. Since populations of small island developing States cannot maintain all necessary specialisations, training for integrated coastal management and development should aim to produce cadres of managers or scientists, engineers and coastal planners able to integrate the many factors that need to be considered in integrated coastal management. Resource users should be prepared to execute both management and protection functions and to apply the polluter pays principle and support the training of their personnel. Educational systems should be modified to meet these needs and special training programmes developed in integrated island management and development. Local planning should be integrated in educational curricula of all levels and public awareness campaigns developed with the assistance of non-governmental organisations and indigenous coastal populations.

Capacity-building

17.140. The total capacity of small island developing States will always be limited. Existing capacity must therefore be restructured to meet efficiently the immediate needs for sustainable development and integrated management. At

the same time, adequate and appropriate assistance from the international community must be directed at strengthening the full range of human resources needed on a continuous basis to implement sustainable development plans.

17.141. New technologies that can increase the output and range of capability of the limited human resources should be employed to increase the capacity of very small populations to meet their needs. The development and application of traditional knowledge to improve the capacity of countries to implement sustainable development should be fostered.

Notes

1/ References to the United Nations Convention on the Law of the Sea in this chapter of Agenda 21 do not prejudice the position of any State with respect to signature, ratification of or accession to the Convention.

2/ References to the United Nations Convention on the Law of the Sea in this chapter of Agenda 21 do not prejudice the position of States which view the Convention as having a unified character.

3/ Where there is uncertainty on sovereignty or no agreement over delimitation, nothing in the programme areas of this chapter should be interpreted as prejudicing the rights of the States involved in a dispute of sovereignty or in the delimitation of the maritime areas concerned.

4/ To be re-examined in the light of discussions on financial issues at the Conference.

5/ To be re-examined in the light of the discussions on transfer of technology at the Conference.

6/ The following changes were suggested by the Chairman of Working Group II for consideration at the Conference with a view to resolving the issues that remain in brackets in programme areas C and D.

Programme area C

1. Delete paragraph 17.49 (h).

2. Replace paragraph 17.52 (e) with paragraph 17.52 *bis.*, which reads:

   17.52 *bis.* States should convene, as soon as possible, an intergovernmental conference, under United Nations auspices, taking into account relevant activities at the subregional, regional and global levels, with a view to promoting effective implementation of the provisions of the United Nations Convention on the Law of the Sea on straddling fish stocks and highly migratory fish stocks. The conference should identify and assess existing problems related to the conservation and management of such fish stocks, consider means of improving cooperation among States and formulate appropriate recommendations.

3. Delete paragraph 17.53.

4. Delete paragraph 17.54.

Programme area D

1. Delete paragraph 17.83 or 17.84 *bis* and insert a new paragraph 17.84 *bis*, which reads:

> 17.84 *bis*. States, in implementing the provisions of the United Nations Convention on the Law of the Sea, should address the issues of straddling stocks and highly migratory species, and taking fully into account the objective set out in paragraph 17.78, access to the surplus of allowable catches.

7/ Location of this paragraph, if it is included, is still under consideration.

8/ May need to be reviewed in the light of the outcome of discussions on general follow-up to the Conference.

MODULE 6

KEY INFORMATION FOR MANAGERS

Authors: Marc Hockings, Kim Looi Ch'ng,
Deborah Cavanagh and Sally Driml

OBJECTIVES

Information is a critical element in any management system. The quality of information and its accessibility will have a direct and immediate impact on the quality of management decisions. These considerations are even more important in attempting to establish an integrated, multi-sectoral approach to coastal zone management. This Module will examine the nature of information required by coastal zone managers and how it may be collected and managed within a multi-sectoral system.

Communication is also an essential component of ICZM as it informs all the stakeholders and makes them aware of their role in the management strategy. Managers must be aware of the power of communication and its role in gaining support for their programs. This Module will emphasise the importance of communications in ICZM management and outline a strategy for planning a communications programme.

Business ventures are often undertaken in the coastal zone because of perceived economic benefits that will result from the enterprise. It is important for managers to understand the assumptions upon which economic analyses are based and to be capable of integrating less tangible, environmental values into decisions. Training Session 6.3 will provide an introduction to economic analysis for project evaluation and techniques for valuing environmental resources.

Sustainable resource use frequently requires adjustments in economic systems. Training Session 6.4 examines the range of economic instruments of potential use in ICZM.

TRAINING SESSIONS

MODULE	**6.** **What do Managers Need to Know?**
TRAINING SESSION	**6.1** **Information Needs for Management**
OBJECTIVE	To discuss the nature of information required by coastal zone managers and how this information can be collected and managed within a multi-sectoral system.
SIGNIFICANCE	Information is a critical element in any management system. The quality of information and its accessibility will have a direct and immediate impact on the quality of management decisions. These considerations are even more important in attempting to establish an integrated, multi-sectoral approach to coastal zone management.
PRESENTATION	Combined lecture and workshop
TIME	Half day
EQUIPMENT	OH, large sheets of paper and marker pens

TRAINING SESSION 6.1

INFORMATION NEEDS FOR MANAGEMENT

Author: Marc Hockings and Kim Looi Ch'ng

INTRODUCTION

Explain the general importance of information to managers. If possible, illustrate the point with a couple of locally relevant examples - one where managers have been able to assemble appropriate information to guide decision making and one where critical information was missing.

The importance of information lies not in having a complete inventory of all information that could conceivably be collected on a topic but in being able to readily access relevant information at the time it is needed (usually when a decision has to be made). Having the right information will not ensure that managers make the right decisions but access to good information is generally a pre-condition for good decision making.

- Outline the distinctions between data, information, knowledge and wisdom. Discuss how too much of the wrong sort of data can actually block effective management.

Some definitions of terms:

Data:	facts assumed to be a matter of observation
Information:	data communicated or received concerning some fact or circumstance; data that has been interpreted to some extent
Knowledge:	acquaintance with facts, truths or principles from study or investigation; implies a level of understanding of the system or issue
Wisdom:	knowledge of what is true or right coupled with just judgement as to action; implies a capacity to apply knowledge to reach sound judgements.

"Data does not equal information, information does not equal knowledge; and most importantly of all, knowledge does not equal wisdom. We have oceans of data, rivers of information, small puddles of knowledge and the odd drop of wisdom.
...none of us can hope to be fully conversant with the knowledge of our time. Indeed, no one can even hope to know 'everything' in his or her own field of study anymore (Henry Nix. Keynote Address, A national geographic

information system - an achievable objective? AURISA 1990, quoted in Brown and Burke, 1993).

We now face a crisis entirely of our own making: we are drowning in information. We have generated more data, statistics, words, formulas, images, documents and declarations than we can possibly absorb. And rather than create new ways to understand and assimilate the information we already have, we simply create more, and at an increasingly rapid pace... So when faced with the problem of ignorance, we immediately create more and more information without seeming to realise that while it may be valuable, it is no substitute for knowledge - much less wisdom. Indeed by generating raw data in much larger quantities than ever before, we have begun to interfere with the process by which information eventually becomes knowledge. When it is allowed to run its normal course, the process actually resembles fermentation: information is first distilled into knowledge, which is then - sometimes - fermented into wisdom. Now, however, so much more information is collected each day than ever before, that the slow process by which it is converted to knowledge has been overwhelmed by an avalanche of new data." (Al Gore, 1993)

- Have the participants discuss the relevance of these quotes above in relation to coastal zone management and how they should respond, as managers, to this issue.

In 1597 Frances Bacon said that knowledge itself is power. This remains as true today as it was 400 years ago. Shared access to information is important in promoting a co-operative, multi-sectoral management system for the coastal zone.

Information is not distributed equally amongst all the stakeholders involved or interested in the management of an area or issue. To some extent a new classification of wealth is emerging in the world - the information-rich and the information-poor. Such differences in access to information affect the power relationships that exist between stakeholders in the coastal zone. Co-operative management systems are only likely to work successfully when information is shared and available to all stakeholders.

SESSION CONTENT

Types of information required for management

- Discuss the types of information that are required by coastal zone managers.

There are many ways in which information needs could be categorised depending on how you wish to group topics. One broad categorisation is a division into biophysical, cultural, social, economic and management spheres but other groupings are possible. The integration of information across these spheres is a necessary precondition for a multi-sectoral approach to coastal zone management.

Baseline data and an understanding of the relationships among the key factors will enable the identification and prioritisation of management issues and is crucial to the success of an ICZM approach.

Baseline data on the coastal resources systems of the management area includes:

- Biological and environmental aspects - resource inventories, determination of environmental linkages and processes, identification, monitoring and evaluation of environmental changes, physical quantification of environmental impacts;
- Social and economic aspects;
- Institutional, legal and organisational aspects - rights and obligations with regards to coastal resources use, organisational jurisdictions, responsibilities, structures and coordination; and
- Sectoral indicators - optimum yield or target production rates used to make projections of the area's development potential and goals. (Scura et al. 1992)

The first job in identifying and prioritizing management issues is to compile and synthesise into a readily usable form a coastal environmental profile comprising all secondary data on the biophysical aspects of the area; the socio-economic features characterising the nature and significance of resource-dependant activities in the area; and the existing legal and institutional provisions for management of the area for which the management plan is to be prepared.

The information collected is then analysed to determine the trends and relationships among key factors in the area. Information or possible positive and negative impacts of sectoral development activities on the environment and conflicts between sectoral activities can also be measured or gauged through the process of impact assessments.

Development of such a database will therefore allow the planners to identify:

- the major management issues and their causes;
- priorities amongst the various issues;
- the information gaps on which follow-up research should be focussed;
- conflict between sectors; and
- possible management options.

The strong regional focus and participatory planning approaches that underpin integrated coastal zone management mean that factual knowledge alone is insufficient for decision making. Local knowledge, aspirations and interests are all necessary inputs into the management system.

Local information can be particularly important in identifying regional developmental and environmental issues that should be addressed through the planning and management process.

- At this point in the Training Session refer to Session Activities 6.1 and conduct Exercise 1. Allow about 45 minutes to complete the exercise.

- **OH 6.1.1 Information needs for ICZM**

- Dorcey (1986) draws a distinction between two types of knowledge; descriptive knowledge and functional knowledge. These two types of knowledge have different contributions to planning and decision making.

Descriptive knowledge is information on the state of the system (be it biophysical, cultural, socioeconomic or managerial). It includes such things as the abundance and distribution of species, the types of institutional arrangements in place for management of an area and the value of marine products harvested from an area. It is essentially information that describes the elements of the system under consideration.

Functional knowledge relates to the processes that are taking place within the system. Functional knowledge includes such things as how changes in water quality affect coral growth and survival, the effect of changing technology on the tourism industry or the impact of particular institutional arrangements on decision making processes.

Dorcey (1986) argues that descriptive knowledge and functional knowledge have different contributions to make to planning and decision making. Functional knowledge is necessary to be able to analyse the consequences of adopting particular policies or courses of action. Concentration on collection of descriptive knowledge and a lack of attention to weaknesses in functional knowledge can frustrate planning and problem solving. An emphasis on functional knowledge may be particularly important in developing integrated, multi-purpose management systems.

- **OH 6.1.2 Types of information important for coastal managers, in rank order for importance and availability**

OH 6.1.2 presents the results of a survey of Australian coastal zone managers examining their opinions on the importance and availability of information. It is worth noting that the top five priorities include elements from biophysical, social, economic and management spheres. It is also interesting to note that the importance of information and its availability do not necessarily correspond.

Availability of informaton

- Outline and discuss the problems relating to availability of information.

Information has not been collected
The required information may not have been collected. Where this information is of critical importance to managers, they need to respond by making arrangements for the data to be obtained. There are a number of ways in which

This can be done (establish agency-based data collection programs, fund others to collect priority information, communicate information priorities to relevant bodies who may be able to collect data as part of existing research or monitoring programs, etc). Universities, other government departments, community groups, NGO's and industry groups are all possible bodies that may be able to contribute to information collection.

Almost all coastal planning efforts require new data and information. In many cases basic resource inventory work will be required. While this may be undertaken by external experts (either national or international) and may be funded by international agencies, attempts should be made to involve local staff in the work. For these staff, the research phase provides an invaluable opportunity for training, while the researchers can benefit from the local knowledge of the managers. Most importantly, managers are more likely to value and use information when they have had some involvement in its collection.

Substantial amounts of data are required to operate the complex models that are used to describe or predict the function of coastal systems. For example, in order to describe accurately the long-term and short-term fluctuations of coastal systems, data must be collected periodically over the duration of the fluctuation period. Several years of rainfall and runoff data are needed to identify areas that are likely to be inundated during floods. Obtaining data for impact assessments is particularly difficult in developing countries where the existing databases may be incomplete, scattered, or of questionable validity, and often do not include basic topographic maps or resource inventories such as soil surveys.

Whatever approach is taken, it is critical that managers recognise and accept that ultimately the responsibility for ensuring that critical information is available lies with them even if they are not directly involved int he actual collection of the data. Wherever possible, managers should be consulted during the planning phase of any research programs to ensure that the data collected will meet their needs and will be in a form that they can understand and apply in their planning and decision making.

The information is available but is not used

The data may have been collected but be unavailable to the manager either because they are unaware of its existence or because they are unable to access or correctly interpret the data. This is a communication problem and will be addressed later in the session.

- At this point in the Training Session refer to Session Activities 6.1 and conduct Exercise 2. Allow about 30 minutes for this activity.

Collection and collation of information

Actual methods of data collection are strongly dependent on the nature of the data being collected. In many cases there will be well established methodologies that should be followed if reliable and useful information is to be obtained (eg. water quality data that has derived from incorrectly collected samples may be

misleading and useless).

Managers need to understand that absolute precision of data is often not required for decision making. Insistence on such standards may mean that little or no information is actually available because data collection programs at the specified level of precision have not been undertaken. Less rigorous, less technical and therefore less expensive methods will often provide data at a sufficient level of precision to guide decision making. It is however important that the level of precision of the data is known - this allows the level of confidence that can be placed on the decision to be established.

Information collected about the study area will facilitate an analysis of present conditions and identification of undeveloped resource potential. During collection of baseline data every effort should be made to incorporate information on activities of local and indigenous populations. All data should be spatially referenced if not actually mapped.

Components of Coastal Zone and Associated Ecosystems
The main components of the coastal zone and major ecosystems should be identified and mapped. These can include surface water areas, soils, vegetation, fauna and existing human activities within the coastal system. Major processes that influence health and productivity of the coastal system should also be identified. These include seasonal variations in the quality and quantity of water entering the coastal system, nutrient cycling, and forms and levels of extraction of materials from the coastal system.

Linkages
Linkages between and among ecosystem components require mapping. A common form of mapping is the hydrological net used in topographic maps. If possible, data should be gathered on linkages between the coastal system and surrounding areas. Hydrologic linkages are extremely important in the coastal zone as they represent the primary mechanisms for transferring material and energy. Surface and subsurface terrestrial hydrology are important, as are linkages between the terrestrial and marine systems exemplified by waves and nearshore currents. Weather events such as storms are an important linkage between the atmosphere and the earth surface.

Where locations of reefs, seagrass beds and mud banks at sea are known to constitute the breeding habitats of economically important species, they should be included in maps. Where available, tidal fluctuations, currents, aquifers, recharge zones and historic hurricane, cyclone, storm surge paths should be mapped.

Ecosystem functions and uses
The relationships between ecosystem functions and existing and potential uses requires comprehensive and detailed description. These relationships constitute the foundation for multiple use planning and management and therefore, comprehensiveness of coverage is essential. An important aspect of this analysis is to reveal the relationships between multiple uses dependent upon a single

ecosystem function as well as multiple ecosystem functions that support a single use.

Hazards

Coastal and lowland ecosystems are dynamic natural systems imbedded in equally dynamic socio-economic systems. These dynamic conditions are often associated with the risk of natural or man-induced hazards that can adversely influence the success of coastal system development initiatives. Risk is the probability of a natural or man-induced hazard causing harm to people and property. Inappropriate planning and resource management can trigger natural hazards, such as landslides, and can make people and their property more vulnerable to the effects of natural hazards. For example, locating settlements in active flood plains makes people more vulnerable to the risk of losing their crops, property and even their lives as a result of periodic flooding. Such development can also be made more prone to a catastrophic loss of life if poor standards of planning and management are practised in the watershed upstream from the settlement.

Risk is often high for any proposed development project, and the risks of a project failing to meet its production goals as well as causing irreversible damage to coastal system functions are often underestimated or even overlooked. Environmental hazards, such as flooding, and consequent risks to crops can be dealt with by adopting management strategies where risk is incorporated into the design of the planned activities. An example would be in a flood plain to plant crops that can withstand periodic inundation.

Perceptions of risk differ among people, and they are conditioned by socioeconomic conditions. People with little choice are often forced to accept high levels of risk. Planners and managers must take notice of the dangers associated with disturbance of natural processes and functions of coastal systems. Examples include the increased incidence and severity of flooding, reduction of rates of ground water recharge, increased incidence of water and insect borne disease vectors can pose a severe hazard to human health, and loss of food production from fisheries.

Social, Cultural and Economic Factors

Baseline socio-economic data should be gathered from available sources. Critical data information needs are for social, cultural or economic factors that could influence the sustainable utilisation of different coastal systems or their resources. Factors such as traditional rights of access to resources, historical beliefs, existing patterns of resource use and economic dependence on the part of local people as well as the skills and knowledge of people associated with new forms of coastal system use are important. Details of economic, social and cultural data requirements are discussed in Session 6.4 and Module 4.

Conservation Value

The conservation value of coastal systems should also be evaluated. Conservation value is a bio-physical and social issue. A particular task of importance will be identification of critical areas for official designation,

including endangered species habitat, critical wildlife and fisheries habitat, and areas of aesthetic, scientific and educational value.

Guidelines have been developed and applied to the definition of conservation values in the tropics, (for example see MacKinnon and MacKinnon, 1986).

Methods of information stoarge and management
As the volume of information on the coastal zone grows, questions of information management are becoming more important. Databases and geographic information systems provide sophisticated and powerful mechanisms for data storage and analysis. Combined with the advent of personal computers, computer workstations and related technology, these systems have revolutionised information management since the early 1980's. But there is a danger that the sophistication of such programs may isolate them from managers who may lack the necessary skills to use the systems or who may simply be too busy to seek out information that is not readily available. Managers have a responsibility to base their decisions on the best available information and Information Systems staff have a responsibility to make relevant information easily available to line managers.

Computerised information storage and retrieval systems and increasing access to remote data sources via the Internet should also make it easier for data to be shared amongst sectoral interests. Access to common data sources is likely to be a key requirement in promoting integrated management of the coastal zone. Establishing and promoting the use of such data sharing systems is an important challenge for coastal zone managers.

Sharing information across sectors is recognised as an important factor in promoting integrated coastal zone management. However, Brown (1995), in a study of coastal zone managers in Australia identified "the existence of closed communication circles within and between policy sectors. Coastal managers, both government and non-government, and at national, state and local levels, report that they communicate strongly only within their own organisations and interests... This means that all policy sectors are recycling the same information, with little new information entering from other sectors, education or research."

There must also be a mechanism for horizontal information links between government sectors/planning authorities. Vertical information links are also needed between central, regional (state) and local governments. At each level of government there is also a need for sectoral linkage between the various sectoral & planning authorities functioning at each specific level.

- Refer to Session Activities 6.1 activities 5 & 6 and conduct Group Exercise 3, allow about 45 minutes for this exercise.

Integration of information
Managers need to integrate biophysical, social, economic, cultural and managerial information in solving problems relating to coastal zone management.

Brown (1995) has outlined the requirements for such integrated management. "There are four dimensions of integrated local area management (policy, practice, problem-solving and place) which contribute to vertical and horizontal integrated decision making based on an holistic understanding of the real issues at the local scale".

- **OH 6.1.4 Four dimensions of integrated local area management**

Working definitions of the four dimensions of integrated local area management are provided by Brown (1995).

Policy integration - *forming policy communities*
(vertical integration)
All the stakeholders, including both government (federal, state and local) and community interests (economic, environmental and social) develop a common policy direction, through negotiations between all the stakeholders. The natural policy communities on most long-standing issues collaborate on a continuing basis, rather than the present ad hoc approach.

Practical integration - *developing multi-skilled teams*
(horizontal integration)
There is a range of different occupations and skills needed on any one local issue. Issues range from approving development applications to regenerating sand dunes, holding regular team meetings. Decisions are made in concert, using mediation and facilitation rather than sequentially or in opposition.

Problem-solving integration - *synthesising all the evidence*
(holistic thinking)
The social, economic, environmental and management aspects of an issue are interconnected; and recognised as of equal importance in decision making on any issue. Modern management education includes multidisciplinary problem-solving; and information technology can provide access to the full range of specialised knowledge.

Integration by scale and place - *working towards community goals*
(the local vision)
Policy, practice and problem-solving only exert an influence on the coastal zone when they are applied to specific localities. This is the reality check for the integration process because it is only at a given place and time that policies, work practices and problem-solving can be evaluated for their effectiveness.
Scenarios, community needs analyses, projections and guided imagery all help communities articulate and share their visions.

Coastal Atlas or Data Bank
A coastal atlas or data bank is a systematic compilation, interpretation, and display of information linked to a specific set of coastal issues, organised for an entire state or nation. The premise of coastal atlases is described in a document prepared by the State of Texas:
Through inventory and evaluation of coastal zone resources, environments, and land and water uses, programs can be established that will permit use of natural

resources and maintenance of environmental quality by adjusting use to resource capacity (Brown *et al.*, 1980).

Although simple data or mapping for one site or several sites can assist the policy making process such an effort is not regarded as an atlas or comprehensive data base. Rather, several features must be present to qualify an information system as an atlas or data base.

- information collected should be issue oriented, designed to lay the foundation for policy making;
- information should be collected consistently for the same parameters, and preferably at the same scale - on a coast-wide basis;
- information should be compiled and synthesised in meaningful ways, using consistent weighting and scaling techniques; and
- information should be easily retrievable.

A coastal atlas meets the criteria outlined above and, in addition, includes a reproducible set of maps prepared on a common scale. In some cases, the map may represent the final output of the data base. In other cases, preparation of a series of descriptive and interpretive maps may be part of the analytic effort. For example, an initial round of maps might be prepared to delineate biological, geographical and land use features on a stretch of coast. Next, a second round of maps may be prepared. At this stage, a map of slope stability could be prepared using maps of geological units, slope, and historical landslides. At the third stage, a composite map of all geologic hazards could be compiled, indicating levels of risk for new development and indicating areas to be avoided.

The same approach could be used to combine maps of shellfish beds, wetlands, and endangered species habitats into a single map of sensitive biological resources. The resulting maps would give planners and policy makers tools to guide the type and intensity of new development, or to choose priority areas for protection or acquisition.

For coastal management purposes, a data base refers to a set of information systematically organised around consistent geographic units. For example, a data base could be keyed to parcels or townships of land, an offshore tract, or a particular linear kilometre of coastline. Often the data base is conceptually organised as a table with information on a set of natural resource parameters (geologic material, soil type, vegetation cover, prevailing land use, agricultural suitability) keyed to each geographic unit. Alternatively, a coastal pollution data base might be organised as a network of points reflecting the location of monitoring stations for water quality. With the event of reliable, low-cost computer automation, there is a pronounced trend towards computer storage of data bases. This, in turn, allows easy updating of information and completion of a variety of computations.

Several US states have prepared state wide atlases of their coasts as the information foundation for their coastal management programme. Florida launched a mapping effort in the early 1970s and Texas followed a few years later. One of the more ambitious efforts was completed by the state of Washington, in

collaboration with the University of Washington's Geography Department. Over thirty parameters are mapped for each coastal county, each keyed to policies regulating shoreline development.

The European Commission recognised the need for consistent reliable mapped data and in 1973, as a method for "classifying the territory of the community on the basis of environmental characteristics" (Briggs and Hansom, 1982). The role of "Ecological Mapping" in the coastal zone was reiterated in the European Coastal Charter (Briggs and Hansom, 1982). Although a case study was carried out for the Basilicata area of Italy, the proposed method does not evaluate the coastal zone as a separate entity. Four specific applications of data base and coastal stages have been suggested for the European Community: flood hazard mapping, erosion hazard mapping, coastal pollution, and landscape and habitat evaluation (Briggs and Hansom, 1982).

The Philippines' Coastal Zone Programme has undertaken a programme of data collection for selected areas via analysis of LANDSAT images (Zamora, 1979). A national survey of coastal resource use is under way and a four volume report has been prepared. Approximately ten years ago, the Japanese government collected 24 natural and social factors pertaining to the coastal zone (Shapiro, forthcoming). The data was computer mapped for a band extending one kilometre on either side of the shoreline. Presently a coastal atlas is being prepared for Osaka Bay at a scale of 1:25,000 (Shapiro, forthcoming). The Osaka atlas is being prepared by university students, faculty, and citizens groups to influence the government's coastal development policy making process.

Sri Lanka is preparing maps of the coastal zone with technical assistance funded by USAID. Much of the work is being completed by students and faculty of the Geography Department, Peridynia University (Kinsey and Sondheimer, 1984). New Zealand has compiled an Atlas of Coastal Resources. The announcement for the Atlas proclaims:
"It will be of interest to all those who use the coast to work and play, and of particular value to students and teachers, engineers, planners, scientists, fishermen, boat owners, divers, marine farmers, and many others," (Tortell, 1981).

The Eastern Caribbean Natural Areas Management Program (ECNAMP), a non-governmental organisation, has assisted in the preparation of a series of island areas in the Eastern Caribbean. That effort drew heavily on the skills and capabilities of island residents and included in integral training component. (See Island Ecosystems Case Study).

Coastal zone atlases and data bases can play a central role in facilitating a more integrated and better informed approach to coastal resource management. These strategies promote sound organisation of the often fragmented information existing for the coast. By drawing together data from different aspects of the environment - for example on mangrove location, shrimp production, and land use designations - data bases emphasise the interaction of specific components of the environment. Often a coastal atlas or data bank is first used as a tool for

problem identification, perhaps directing attention to sites that need immediate attention.

Coastal atlas and data bank preparation has direct connections to the Regional Seas Programme for those nations that border on constricted ocean areas. If the coastal zone issues are transboundary in nature, data banks and atlas programs may have to be applied. Regional preparation of an atlas or data bank should also realise savings to be achieved by economies of scale to be effective as a management tool. As distinct from a problem identification technique, coastal atlases and data bases must be linked to a prescriptive set of policies and actions based on the assembled technical information.

Like the strategies of impact assessment and acquisition programs, a coastal atlas can yield valuable educational benefits. The educational benefits are derived not only from the product but also the compilation process - particularly if it is an open process involving all relevant government agencies and non-governmental organisations. If the product is presented in a clear, attractive format, maps of the coastal zone can also help convey the need for regulation, acquisition, or capital investment. This in turn can help generate support for coastal management policies among citizens, interest groups, agency personnel and elected officials.

Since atlases and data bases record the condition of the coast at a given moment in time they provide a valuable benchmark to be used as the basis for future comparisons. In this way, rates and patterns of natural changes can be measured, and the effectiveness of a particular regulatory programme can be evaluated. Computerised data banks are especially suited to periodic updating for tracking progress. A second technology that advances the case of atlases and data banks is LANDSAT imagery, which is ideal at a gross scale for preparing base maps and identifying resources, and generates new data at frequent intervals. Since academicians can often make valuable contributions to data bases, a nation adopting this approach is likely to benefit from collaboration between universities and environmental agencies.

The utility of coastal zone atlases and data banks is governed by several constraints. First, these strategies are fundamentally tools for compilation and synthesis of information. They must be linked to a process of interpretation of findings, policy setting and intervention in the form of regulation acquisition or capital investment and construction to be considered a management strategy. Many initial attempts to build atlases and data bases are not linked to a specific policy making process which spell out how the findings are to be applied. Without setting clear goals for the relationship between data collection and implementation, nations that prepare atlases and data bases may be disappointed with the result. It is common for the information assembled to have only marginal application to the policy making questions asked. By contrast, the environmental impact statement strategy is tied to the analytic process by formal institutional procedures for report preparation or project revision.

Second, it is clear that the value of a coastal data base or atlas is critically dependent on the quality and quantity of raw information. In developing

countries, the available data is often uneven with regard to accuracy and consistency of coverage. Third, the methods by which data is compiled, scaled and aggregated has an equal impact on the utility of the data base or atlas. This is especially evident in considering the map scales at which data are obtained and reproduced. For instance, maps compiled 1:250,000 or 1:125,000 are useful for large scale regional planning, but much finer grain is needed (perhaps 1:24,000) for preparation of land use plans. Even more detailed maps are needed for site plans of particular projects. Fourth, atlases and data bases can quickly become obsolete, so there must be a commitment to their timely use and continual updating. Finally, building an atlas or data abase is costly in dollar and staff terms. It should not be undertaken without a clear realisation of both start up and maintenance costs. Since the methods, contents and results derived from coastal zone atlases and data banks vary so widely, systematic evaluation of these techniques should be undertaken.

SESSION ACTIVITIES 6.1

GROUP EXERCISE 1

- Have participants list their major information requirements and sort these into biophysical, cultural, social, economic, and management categories. Then have them list the information that they think people working in other sectors would require. Compare the two lists. What common information requirements exist?

- Compare your lists with that developed by Scura et al. (1992)

GROUP EXERCISE 2

- Ask participants to assess the availability of information relating to the needs that they identified above in the previous group exercise.

- Ask them to suggest ways in which priority information needs which are currently poorly served could be better addressed and consider the roles that the international community and international and bilateral funding agencies should play in obtaining this information.

GROUP EXERCISE 3

- Ask participants to identify the frequency with which they communicate with people in their own organisation, their own sectoral area and other sectors (local, state and federal government, industry, research/education, NGO) using the rating scale developed by Brown (1995). Compile results into a table similar to OH 6.1.3 and discuss these in relation to the following questions. Do the results show the same pattern reported by the study of coastal zone

managers in Australia? How could these communication barriers be reduced and sharing of information promoted? Are the problems principally technical in nature (ie. lack of a national database system available to all sectors, lack of skill amongst managers to use existing systems) or are there social or managerial barriers that also need to be addressed?

SESSION MATERIALS 6.1

OH 6.1.1 Information needs for ICZM
OH 6.1.2 Types of information important to coastal zone managers
OH 6.1.3 Frequency of receiving information among coastal zone managers
OH 6.1.4 Four dimensions of integrated local area management

REFERENCES 6.1

Brown, V. A. 1995, *Turning the Tide, Integrated Local Area Management for Australia's Coastal Zone*, Department of the Environment, Sport and Territories, Canberra.

Brown, V. A. & Burke G. 1993, *Between the Devil and the Deep Blue Sea: The Information and Research Need of Australian Coastal Managers*, AGPS Canberra.

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Gore, A. 1993, *Earth in the Balance*, Plume, New York.

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Scura, L. F., Chua T. E., Pido M. D. & Paw J. N. 1992, 'Lessons for integrated coastal zone management: the ASEAN experience', in *Integrative framework and methods for coastal area management* , eds T. E. Chua & L. F. Scura, ICLARM Conference Proceedings 37, pp. 1-70.

Information Needs for ICZM

Biophysical and Environmental Aspects
- Resources inventories
- Determination of environmental linkages and processes
- Identification, monitoring and evaluation of environmental change
- Physical quantification of environmental impacts

Social and Economical Aspects
- Social, cultural and economic characterisation of coastal communities
- Estimation of demand and supply of coastal resources, and projection of future demand and supply
- Identification of current and potential future resource conflicts
- Identification of market and policy failures
- Economic valuation of coastal resources including non-market valuation
- Evaluation of alternative policy options and management strategies

Institutional and Organisational Aspects
- Rights and obligations with regard to coastal resource use
- Organisational jurisdiction, responsibilities, structure and coordination

Opportunities for Management Interventions
- Evaluation of opportunities for and efficacy of interventions to influence behaviour
- Evaluation of opportunities for and efficacy of direct public involvement or investment

Source: Adapted from Scura *et al*, 1992

Types of information important to the work of Coastal Managers, in rank order for importance and availability

Information for managing coastal areas:	Rank order of: IMPORTANCE	AVAILABILITY
Ecosystems, habitats and species	1	14
Environmental impact assessments	2	12
Condition of rivers, oceans	3	25
Recreation and tourism	4	6
Community priorities for coastal areas	5	24
Strategic plans	6	17
Condition of soils and beaches	7	16
Integrated resource management	8	26
Public participation	9	15
Coastal hazards e.g. oil spills	10	13
Pollution indicators	11	20
Waste management	12	9
Regulations and by-laws	13	3
Development benefits and losses	14	27
Land ownership and tenure	15	1
Water management	16	8
Visual/aesthetic values	17	18
Community service needs	18	19
Heritage values	19	10
Infrastructure costs e.g. roads, water	20	5
Dollar values of the natural environment	21	28
Aboriginal and Torres St Islanders	22	22
Business opportunities and risks	23	21
Economic instruments	24	23
Industry performance	25	7
International obligations	26	2
Social data e.g. age, income	27	4
Employment statistics	28	11

N=1099

Source: Brown & Burke, 1993

Frequency of Receiving Information Among Coastal Zone Managers

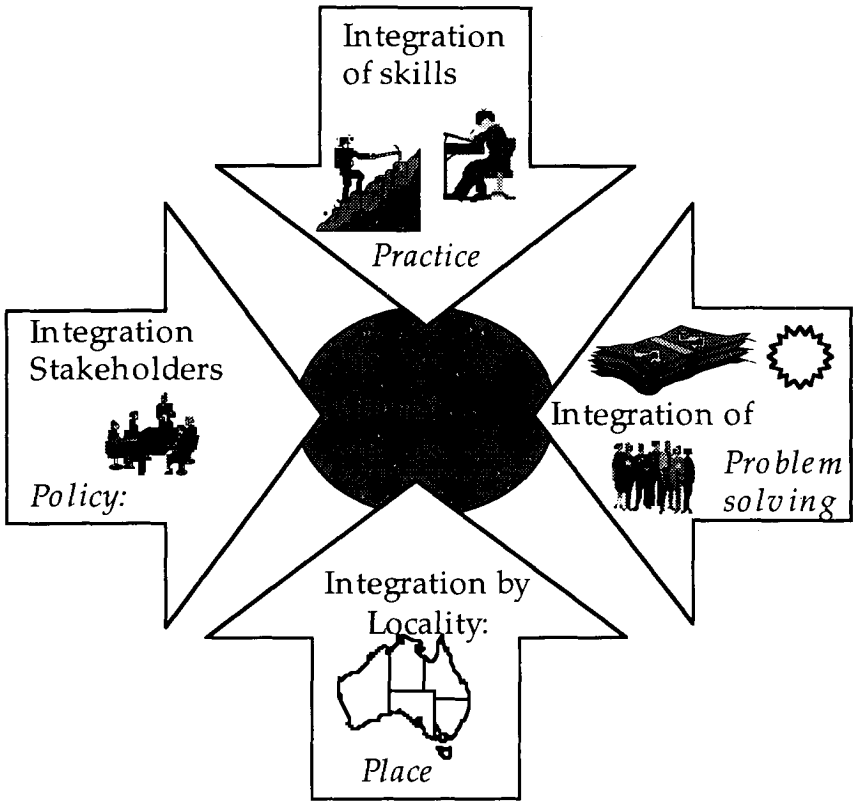
Channels	Policy Sectors					
	Local Govt (n= 444)	State Govt (N=242)	Federal Govt (n= 42)	Education (n = 80)	Conservation (n = 131)	Industry (n = 84)
Colleagues in own organisation	64.4	60.9	67.1	56.2	64.5	58.2
Local govt	50.5	31.9	19.6	19.4	21.3	24.3
State govt	41.3	54.7	48.0	41.1	38.9	38.6
Federal govt	21.1	31.8	59.9	34.5	35.4	31.1
Workshops	28.7	30.5	35.4	44.3	29.9	31.8
Conservation	28.0	30.7	29.0	35.5	48.4	27.6
Industry	18.2	29.7	27.7	17.1	14.4	34.2

Scale 0 = almost never, 25 = sometimes, 50 = regularly, 75 = very often, 100 = all the time
** n refers to number of responses.*

Frequency of receiving information among coastal zone managers in six main policy sectors (n = 1-15)*

Source: Brown, 1985

Four Dimensions of Integrated Local Area Management



Dimensions of integrated local area management
Source: James: Brown, 1995

MODULE	**6.** **What do Managers Need to Know?**
TRAINING SESSION	**6.2** **Communications**
OBJECTIVE	To emphasise the importance of communications in ICZM management and outline a strategy for planning a communications programme.
SIGNIFICANCE	Communication is an essential component of ICZM as it informs all the stakeholders and makes them aware of their role in the management strategy. Managers must be aware of the power of communication and its role in gaining support for their programs.
PRESENTATION	Combined lecture and workshop
TIME	Half day
EQUIPMENT	OH projector, large sheets of paper and marker pens.

TRAINING SESSION 6.2

COMMUNICATIONS

Author: Deborah Cavanagh

INTRODUCTION

The success of an ICZM plan depends on the cooperation of coastal zone users. Public education works towards a cooperative climate because it provides people with the information they need to:

- Support the concept of ICZM;
- Comply with ICZM regulations; and
- Understand why those regulations were instituted.

Communication strategy targets a variety of stakeholders including decision makers, politicians, scientists, managers, and various user groups. This session will examine the role of public contact in ICZM, look at the ways in which public contact can market ICZM messages and outline methods of planning a public contact programme.

SESSION CONTENT

Long term support for ICZM by stakeholders is most successfully achieved when the resource users understand the reasons for management plans as well as the long term benefits of complying with those plans. Increased awareness of management issues has resulted, in some cases, in communities working with the management agency to ensure management decisions are carried out in their region.

- List successful communications programs in your region which have resulted in greater community support for and involvement in local resource management.

Communication and education are the most cost effective means of achieving cooperation and long term compliance with the ICZM plan. Communications work usually falls under the following terms of:

Interpretation: is a term used by nature conservation agencies and may be defined as "the process of developing a visitor's interest in, and enjoyment and understanding of an area, or part of an area, by describing and explaining its

characteristics and their inter-relationships" (Countryside Recreation Glossary, 1970).

Extension: is often used to refer to communication directed towards particular stakeholders and to address specific management issues (for this session the term "communication" will be used to cover both these aspects of education). Enforcement is often a necessary component of management plans but the subsequent behaviour changes are often short term. Unlike enforcement, communication can affect long-term behaviour changes because it can motivate the community to support management decisions as well as change attitudes and behaviours (Alder, 1995).

- Ask participants for examples demonstrating the effectiveness of communications versus enforcement programs in their regions.

In many countries the relationship between government bureaucrats, resource "experts" and resource users is changing. Rapid advances in communications technology is enabling groups to access information from a variety of sources around the world. Governments can use these innovations to better inform stakeholders in the coastal zone.

Local area management is made possible by effective communications programs. By actively involving the community in ICZM planning from the outset managers can promote a sense of community ownership of the management plan. This often results in community motivation to undertake further training and become more deeply involved in local management activities.

Awareness of the decision making process enables stakeholders to decide their level of involvement in planning and decision making. If stakeholders are empowered to make decisions, and agree to do so, they are ultimately responsible for those decisions and will therefore commit themselves to implement the decisions, regulate use and enforce the rules (Alder, 1995). ICZM managers and planners must be fully aware of the long term objectives of their communication programme as the results may range from merely informing stakeholders of ICZM decisions to empowering a community to manage their own region in cooperation with government agencies.

In order to encourage stakeholder commitment to an ICZM programme, a communications programme should:

- Aim for genuine community participation by involving stakeholders in the ICZM from the early planning stages;
- Ensure that mechanisms for making decisions are concrete, understood and accepted by stakeholders;
- Focus on management issues and the concept of sustainable use;
- Encourage problem solving that cultivates the preservation of complexity rather than emulating single use solutions;
- Clearly identify your audience and target it with up to date and culturally appropriate public awareness programs;
- Continually retrain your managers and communication staff to ensure their messages and the delivery are up to date and fit the current climate.

Community participation: in an ICZM project can range from awareness of management decisions to facilitating active community involvement in the planning process. In the early stages of any communication programme the targeted stakeholders must be made aware of the ecology of the area, resource exploitation and its impact on the community as well as the consequences of sustainable and unsustainable management decisions.

Decision making mechanisms: The programme can then build on the core environmental information by explaining how decisions are made and the role stakeholders may take in this process (Alder 1995). The Great Barrier Reef Marine Park Authority is working with Marine Resource Advisory Committees with the aim of these becoming decision making representatives of communities and stakeholders.

It is crucial that management agencies be very clear about the decision making process and the degree of responsibility they expect from the stakeholders. Stakeholders will be disillusioned and sometimes disgruntled if they are led to believe they will have considerable influence in decision making and they find their input is not given due regard. If their role is clearly defined from the outset, and the stakeholders accept that role, then they will assign what they feel is the appropriate amount of effort to their cooperative endeavours.

Focus on management: Stakeholders and other community members are usually motivated when they are addressing a specific, immediate issue and when they know their participation will have tangible results. ICZM communications programs must be clearly focused on management issues addressing sustainable use of resources.

Preserve complexity: by maintaining a holistic view of issues and problems. Stakeholders often pressure managers to reach a simple, single use solution which frequently ignores the flow-on effect so typical of resource exploitation in marine environments. Communication programs must encourage broad based problem solving by providing holistic overviews of ecosystems and issues.

Clearly identify and target your audience: Fishermen, politicians, developers, government agencies, farmers, shipping companies and children are just a few of the stakeholders with vested interest in the future sustainability of the coastal zone. Once the overall goal of the ICZM programme is established the communications programme must:

- identify the stakeholders to be addressed,
- determine their degree of understanding of the issues,
- decide what information these stakeholders must have,
- decide the degree of participation you are expecting from the particular group, and
- tailor your message to that particular audience.

Communications training: and upgrading is particularly important as communication technology rapidly advances and information is made available from almost anywhere in the world. Communicators must constantly keep

abreast of the trends and innovations in communications technology, while at the same time refining the communications techniques which work best for particular audiences. Communicating the same message repeatedly can become stale and the information can become out of date. By taking advantage of the communications technology available to them, communicators can talk to each other about the effective techniques and information in their ICZM programs.

Effective communication is the key ingredient to any ICZM programme. Stakeholders from all levels of government and private enterprise must talk to each other, discuss issues, problems and reach consensus. Everyone working on an ICZM programme is an active participant in the communications programme and managers can take advantage of the ongoing communication between stakeholders to promote their management and sustainable use messages.

Marketing ICZM

- Explain that marketing concepts can be applied to ICZM communications strategy. Exercises in Session Activities 6.2 ask participants to adapt a marketing strategy to communications programs in their regions.

Because ICZM communication programs are aimed at changing peoples' attitudes and behaviour, private enterprise marketing principles, which also aim at changing attitudes and behaviour, can be applied when planning a programme. Marketing communication techniques such as research, segmentation analysis, measurable objectives and effective media to influence and manage client groups and audiences can be applied to ICZM programs.

- **OH 6.2.1 Marketing an ICZM programme**

- Discuss each point outlined in OH 6.2.1 and use examples from your region as examples of how to apply this strategy to local areas.

Planning a communications programme

On going developments in communications technology enables information about ICZM to be disseminated in a variety of forms to specifically targeted audiences. Information specialists must therefore, be able to clearly identify:

- their message
- their audience
- the most effective medium for delivering that message.

Identifying the message

Goals: The clearly articulated purpose or mission for your organisation is the basis for establishing your programme goals.

Management issues and user needs: these are established through discussion, workshops, interviews etc with stakeholders, managers, decision makers etc.

What are the values of the coastal zone? By consulting stakeholders, managers and decision makers establish the aesthetic, scientific, historical, environmental, cultural and other values of the area.

Establish desired outcomes and objectives: with the information gained from considering the management issues, user needs and broad goals for public contact you can establish the desired outcomes and objectives. Decide on the:

- goals for the public contact programme;
- desired outcome (e.g. what you would like to achieve in 5 years); and
- specific objectives. For public contact programs the objectives are usually a change in understanding, attitude or behaviour, or the result of such change.

Establish themes

Public education programs are often more clearly delivered and received if they are based on a particular theme. For example, a theme of "Mangroves - an ecological and economic resource", might highlight some of the major biological components of the mangrove forests, outline major ecological processes and then illustrate how these areas are essential for the economic well being of the local community.

Understand your audience

As you consult with various stakeholders you will develop an understanding of the needs and interests of the different groups. Your messages must be tailored to each group in order to make the most impact.

Develop strategies to achieve your objectives

Consider a broad range of techniques to reach your audience, such as newsletters, local theatre, video, libraries, newspapers, and one-on-one contact. Analyse the benefits and disadvantages of using these strategies for the various stakeholders. Match the technique to the audience.

Develop detailed project proposals for the strategies selected. Calculate the resource requirements for the project including staff, equipment, budget and maintenance.

Prioritise the tasks

This may be done according to:

- Contribution to achievement of objectives: The projects which are likely to contribute the most are given the highest priority.
- Logical sequence: Consideration of the needs of the stakeholders may place the more mundane aspects of the project before the more exciting ones (such as making videos).
- Synergy and opportunity: Some projects logically go together and benefit from joint development.
- Resource constraints: Expensive projects may be lower or higher on the priority list. Staffing limitations may also influence the priority allocation.

Monitoring and Evaluation

The art of evaluation is in selecting appropriate indicators that will provide a good estimate of whether the goals have been achieved. The science of evaluation lies in obtaining valid and reliable measures of the selected indicators. Evaluation can feed back into the revision of the plan to change strategies or reconsider and modify the original goals and outcomes.

SESSION ACTIVITIES 6.2

- In this session participants are asked to describe public contact programs in their region, determine the programs' objectives and whether it is targeted at the correct audience. Then plan ICZM public contact programs for their region.
- Divide participants into groups of 3 to 5 and ask them to develop a communications programme for ICZM in their regions following the steps outlined above and using the concepts discussed in this lecture. The plan should be developed to an outline stage.
- Ask participants to suggest appropriate goals for public participation in their regions.
- Develop a list of management issues and stakeholder requirements for the region.
- Develop a plan with prioritised tasks as outlined in the planning section above.
- Ask each group to present their plan.

SESSION MATERIALS 6.2

OH 6.2.1 Marketing an ICZM Programme

REFERENCES 6.2

Alder, J. 1995, *A management analysis of tropical marine protected areas: Indonesia and the Great Barrier Reef Marine Park - two case studies*, Department of Environmental Studies and Geography, James Cook University of North Queensland, Townsville.

Countryside Recreation Glossary, 1970, Countryside Commission, London.

Kenchington, R. A. &Hudson, B. E. T. 1984, *Coral Reef Management Handbook*, UNESCO Regional Office for Science and Technology for South-East Asia, Jakarta.

Marketing an ICZM Programme

Activity	Description	Application in MPA education programs
Market Planning	Setting of targets and markets based on corporate objectives and formulation of action plans.	Establishing what changes are required in user behaviour and awareness to meet management objectives (e.g. reduce blast fishing by 50%)
Product Development and Planning	Developing new ideas and concepts, and testing the products to ensure they meet customer needs	Developing new education material and ensuring that it will work with intended audience before distribution
Sales Planning	Defining field or sales outlets	Defining the groups which will receive the programme (e.g. coastal communities dependent on reef fishing for subsistence)
Marketing Research	Collating information on actual and potential markets and users of goods and services	Determine the information wants and needs of the target audiences (e.g. what are the cheap alternatives to blast fishing?)
Sales Forecasting	Assessment of potential sales and market trends	Assessment of the potential short long term impacts of the education programme on the target audience (e.g. how long will it take to see a measurable reduction in blast fishing activities?)
Analysis	Analysis of the product life-cycle	How long will the programme be effective for? (e.g. how long will the blast fishing have an impact on coastal fishers who watch it?)
Target Marketing	Formulating a more detailed definition of different groups that make up the market (segmentation) and determining where efforts should be targeted	A more detailed definition of the target audiences (e.g. blast fishers, cyanide fishers or murami fishers)
Developing the Market Mix	Setting the blend of product, price, place and promotion to generate the responses the organisation wants in the target market	Balancing the available funding (price) for the programme, with the intended messages (product), the most appropriate media (promotion), and target audiences (place) (e.g. balancing the cost of a video production for blast fishers within a limited budget)
Marketing and Sales Operations	Implementation of the marketing plan	Implementation of the education programme.
Marketing and Sales Control	Monitoring performance to ensure targets are achieved within the budget	Monitoring and evaluating the effectiveness of the education programme

Source Alder, J. 1995 *A management analysis of tropical marine protected areas: Indonesia and the Great Barrier Reef Marine Park - Two case studies.* Department of Environmental Studies and Geography, James Cook University, Townsville.

MODULE	**6** **What do Managers Need to Know?**
TRAINING SESSION	**6.3** **Economic Analysis & Valuing Environmental Resources**
OBJECTIVE	To provide an introduction to economic analysis for project evaluation and techniques for valuing environmental resources.
SIGNIFICANCE	Project evaluation is often undertaken for developments in the Coastal Zone, but will only lead to sustainable resource use where all values of environmental resources are included.
PRESENTATION	Lectures & workshop
TIME	Two 1 hour lectures, half day workshop
EQUIPMENT	OH, writing materials, copies of the original papers of case studies cited would be useful.

TRAINING SESSION 6.3

ECONOMIC ANALYSIS & VALUING ENVIRONMENTAL RESOURCES

Author: Sally Driml

INTRODUCTION

Welcome participants to the session and explain that the following will be an introduction to economic analysis for project evaluation and techniques for valuing environmental resources.

Participants will be asked to apply economic analysis techniques to a familiar scenario from their regions.

SESSION CONTENT

Project evaluation

One of the main tasks for planners and decision makers in the coastal zone is to assess proposals for changes that may affect the environment. These proposals may be for public or private sector developments, for planning schemes or even management policies. The proposals are generally made because someone considers that economic benefits will accrue, but relevant questions are: are the projected benefits likely to eventuate (is the basis on which projections are made as sound as possible?); who will benefit and will anyone lose?; and what are the projected impacts on natural environments?

The economic technique of Benefit Cost Analysis (BCA) is often used either by itself or incorporated into various forms of Environmental Impact Assessment to assist assessment of proposals. Benefit Cost Analysis can be very narrow in scope and just measure those aspects of the proposal easily measured in money terms. For example with a proposal to build a new dam, it is relatively straightforward to measure the costs of compensating landowners in the area to be flooded plus the costs of building the dam and comparing these with the projected benefits of increased agricultural production with regular water supplies. This type of analysis can however be extended to cover other important issues. One way of extending the analysis is to include an 'equity' analysis by identifying who in the community will gain benefits and who will face costs.

Another way of extending BCA is to include environmental impacts not easily measured in money terms. The simplest way of doing this is just to make sure a description of potential impacts, identified as costs or benefits, is included with

the economic information going to decision makers. The most thorough approach is to measure non-market values in monetary terms using methods from the range described below. **OH 6.3.1** lists the range of ways environmental values can be incorporated into decisions using BCA (or other approaches).

- **OH 6.3.1 Ways of integrating environmental values into decisions**

VALUING ENVIRONMENTAL RESOURCES

There are a number of techniques that have been developed to value environmental resources. The choice of method for analysis depends on the circumstances of the question to be analysed. **OH 6.3.2** lists different circumstances and the valuation approaches that are available for each. The actual methodologies available for each circumstance are listed in **OH 6.3.3** to **OH 6.3.5.**

There is not sufficient space here to discuss all the techniques described above. The most widely used techniques are the ones based on **observable market approaches** (**OH 6.3.3**) plus the **Travel cost method** (**OH 6.3.4**) and **Contingent valuation** (**OH 6.3.5**). The following boxes summarise case studies where some of these methods have been used. In the study reported in Case Study 1, the market based method of **Change of productivity** is used to value the impacts of harvesting mangroves for export woodchips. This is an example of a project evaluation using a **Benefit Cost Analysis** framework. In Case Study 2, a similar approach is taken to economic assessment of regional development plan.

In developing countries access to viewing wildlife is often free of charge so this privilege is not valued in a market. This may undervalue the benefits that flow from often unique opportunities for tourists and local people. Two methods of placing monetary value on viewing wildlife, the **Travel cost method** and **Contingent valuation**, are described in Case Study 3.

TRAINING SESSION 6.3

CASE STUDY 1

Modelling economy-ecology linkages in mangroves, Bintuni Bay

A study by Ruitenbeek (1994) gives a good example of how ecological economics can be applied to decisions on resource use policy for a multiple-use coastal area. The area studied is the Bintuni Bay area of Irian Jaya, Indonesia. The bay has a 300 000 ha mangrove ecosystem. Proposals exist to harvest mangrove wood for commercial woodchip exports. The economic study employs **Benefit Cost Analysis** to compare the economic values of different options for harvesting mangroves for woodchip production. Within the BCA, the value of environmental impacts of mangrove harvesting is measured using the **Change in productivity** technique by modelling the expected change in the value of fish catch with changes in the area of mangroves. The study adopts a sensitivity analysis to account for uncertainty in our knowledge about the biological links between mangrove harvesting and fish catch.

At the time of the study the area supported a shrimp export industry and 3000 households who live in the coastal area. Traditional non-commercial uses of mangroves were estimated at worth Rp 20 billion per year (US$10 million/yr). This estimated value was based on a survey of households to identify the value of mangrove derived goods used for trade and to substitute for goods which would otherwise have to be purchased. Commercial fisheries were worth Rp70 billion/yr (US$35 million/yr) and selective commercial mangrove cutting had a value of Rp40 billion/yr (US$20 million/yr).

Several scenarios for mangrove harvesting were proposed, ranging from clearfelling to selective harvesting of different percentages of the harvestable area on a rotational basis. The likely net income from these scenarios was modelled using world market prices for woodchips minus costs of harvesting.

Mangrove areas provide breeding, nursery and habitat support for fish and shrimp. It has been established by research that there is a relationship between the area of mangrove and the volume of fish catch. Ruitenbeek reports that for Java, the relationship is typically that a 50% reduction in mangrove area would result in a 50% reduction in fishery production. No research had been done for Bintuni Bay, so the precise nature of the relationship, and time delays, between clearing and reductions in fish catch were unknown. To address this problem, a number of 'linkage scenarios' were developed. These ranged from 'no links' to 'strong links' as described for Java. Different time delays, from immediate impact to ten years delay of effects, were included in the linkage scenarios.

The use of all these scenarios resulted in a number of different possible future states of resources use. For each, the Net Present Value (NPV) was calculated

using Benefit Cost Analysis. The NPV equals the sum over a number of years of the net income from harvesting for woodchip plus the net income from fish catch and traditional use based on remaining intact mangrove areas. The **OHP 6.3.6** shows the results when a discount rate of 7.5% is used.

The results show that *if linkages are ignored,* the optimal strategy is to clear cut the mangroves for export woodchip. This is the action that a narrow economic analysis, that did not take into account wider environmental implications would recommend. However, where even weak linkages are assumed, the optimal strategy is to be more conservative. Under the *strong linkages scenario,* the recommendation is for selective harvesting over only 25% of the area (and the clear cut strategy is the worst option). See **OH 6.3.6**

Source: Ruitenbeek (1994)

TRAINING SESSION 6.3

CASE STUDY 2

Economic analysis of the Palawan Regional Development Plan

The integration of economic analysis of environmental values in regional planning is not yet widely practised. This case study shows the potential for gaining useful information by subjecting planning options to economic analysis. Goldrick and James (1994) report on the use of economic analysis in studies that occurred during the development of a regional development plan for the island of Palawan in the Philippines. At the time of planning, in the mid 1980s, the island had a low population density relative to the rest of the Philippines but high growth rates, including from immigration. The island's forest cover was 92% in 1968, reduced to 68-70% by the early 1980s due to shifting cultivation and damaging logging practices. The island economy is highly dependent on natural resources including forestry, agriculture, fishing and a potential tourism industry.

As part of the development plan, a strategy for environmental protection (SEP) was developed. The economic analysis attempted to measure the value of protection delivered due to the SEP. The value of the SEP is environmental damage avoided minus the costs of implementing the SEP. The analysis used a partial **Benefit Cost Analysis** framework and **Change of productivity** and **Replacement cost** techniques to value environmental protection.

The value of the SEP is the difference between environmental values with the plan and without the plan. The plan broadly aims to maintain the ecosystem at the time of planning but in addition includes revegetation in the upper reaches of water catchments to reduce erosion and sedimentation. The likely scenario without the plan was calculated by extrapolating existing trends, for example destruction of mangroves through clearing.

Protection measures to be undertaken on land, in mangrove areas and inshore marine areas were listed along with predicted benefits. The benefits were divided into those able to be separately attributed to action in one area and those common to all actions. It is important to note that other benefits much more difficult to quantify such as conservation of biodiversity were not included.

The analysis sought first to measure the value of the separable benefits, with and without the SEP, over a 100 year period. These were measured using market prices, with the **change of productivity** technique. For example, the net benefits to agriculture were the increased returns from irrigated rice minus losses in returns from the shifting cultivation eliminated. The net benefits of changes to sustainable forestry and mangrove harvesting were calculated as the difference between returns from current practices and those from more careful logging with

planned rotations. The annual net benefits in these cases were negative in the first two decades but switched to positive returns in the longer term. The common benefits to fishery production and tourism were added. Lastly, the costs of implementing the plan including administrative cost and **replacement costs** for reforestation were subtracted from the benefits.

Overall, the Net Present Value of the SEP was calculated for a 100 year period using discount rates of 0% and 5%. In both cases, the NPV was positive indicating the SEP provides economic benefits. As the benefits of the SEP were calculated using purely market prices, the total benefits including non-market prices are likely to be even higher. The results indicate to planners that the implementation of a SEP within the regional development plan for Palawan will mean greater economic development over the long term than if there were no environmental protection plan.

It is worth noting that the time period of 100 years and the low discount rates used in this analysis mean this study looks at a longer time period than is typical of economic analyses. Most analyses adopt market discount rates of around 7% to 15% and this favours benefits to be earned in the near future and limits projections to as little as 20 years. There is much criticism that sustainable use patterns are discriminated against by the conventions of economic analysis. One option is to do 'sensitivity analyses' comparing results using a range of discount rates and time periods. See **OH 6.3.7.**

Source: Goldrick & James (1994).

TRAINING SESSION 6.3

CASE STUDY 3

The recreational value of viewing wildlife, Kenya

The total economic value of an environmental resource, such as Lake Nakuru National Park in Kenya discussed in this case study, is composed of the benefits to people who visit for recreation plus the values that accrue to people who may not visit the park but value the continued existence of the environment (existence and bequest values) and perhaps the option to visit in the future (option value). This study seeks to estimate a minimum value for the park by calculating the value placed on viewing wildlife by people who visit the park for ecotourism.

The main attraction to visitors in Lake Nakuru National Park is the large concentration of lesser flamingoes. As is the case with many National Parks, entry fees are low and do not represent the real value visitors place on visiting the park. It is necessary to calculate this value by economic analysis. Two methods of valuation, **Travel cost analysis** and **Contingent valuation** were used in this study.

Both valuation methods rely on surveying a sample of visitors to collect information for analysis. In the travel cost analysis, the aim is to create a surrogate market for entry by using market information on the cost of travel to the area as an indication of what visitors would be willing to pay in entry fees if required. The methodology has been in use for over twenty years, in the USA in particular. The authors of the case study explain its strengths and weaknesses and illustrate how it was applied in this instance.

The Contingent valuation method relies on setting up a hypothetical market and then asking people what they would be either willing to pay (WTP) or willing to accept in compensation (WTA) for a change in that market. Whichever of these questions is relevant differs from case to case depending on people's actual or perceived property rights. Researchers often ask both questions to compare the answers. There is a threat of water pollution reducing flamingo numbers in Lake Nakuru National Park. In the case study, the visitors were asked what they were willing to accept in dollar reductions in their trip costs if the environmental quality was less than it is currently. Visitors were also asked what they would be willing to pay into a fund to ensure the survival of the flamingoes. The authors explain various aspects of the Contingent valuation method and how results are calculated.

The results of the travel cost study were that the recreational value of visiting Lake Nakuru National Park in 1991 was $US13.7 to 15.1 million. The authors chose to use the willingness to pay results of the Contingent valuation study

which indicated a value for visiting the park and maintaining flamingo populations of $US7.5 million. It is usual for economic valuation studies of the environment to give approximate values. The authors suggest these be used to bound the value at between $US7.5 and 15 million. This indicates a significant value is attributed to the opportunity of viewing wildlife.

The information can be used in developing environmental management policy. At the time of the study, revenue from entry fees was only $US0.8 million. In the study, it was calculated that Kenyan residents would react to a price increase by reducing the number of visits but that non Kenyans would be prepared to pay higher entry fees. This suggests that entry fees tc non Kenyans could be increased and funds used to address the pollution threats and other park management costs. The authors report that, after their study, entry fees to non Kenyans were increased by 310% to $US13 per visit.

Source: Mungatana & Navrud (1994)

SESSION ACTIVITIES 6.3

Think of a hypothetical coastal development proposal or use a recent example familiar to you. Describe the elements of the project and the links to the natural environment and to the community and economy of the region.

What are the possible benefits and costs of the project? Which benefits and costs are likely to be measured in market values and which are likely to be left out? How might you approach measuring the non-market benefits and costs?

Think about the (intragenerational) equity implications of the project. Who is likely to benefit from the project and who will bear the costs? How might losers be compensated? What are the intergenerational equity effects of the project (that is how are the benefits and costs distributed between people now and in the future)?

SESSION MATERIALS 6.3

OH 6.3.1 Ways Of Integrating Environmental Values Into Decisions
OH 6.3.2 Techniques for Valuing Environmental Resources
OH 6.3.3 Market Value Approaches
OH 6.3.4 Surrogate Market Approaches
OH 6.3.5 Simulated Market Approaches
OH 6.3.6 Scenarios Of Links Between Mangroves And Fish Catches
OH 6.3.7 Benefits of Environmental Protection

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Pearce, D. W. & Nash C. A. 1981, *The Social Appraisal of Projects*, Macmillian Press, London.

Ruitenbeek, H. J. 1994, 'Modelling economy-ecology linkages in mangroves: Economic evidence for promoting conservation in Bintuni Bay, Indonesia', *Ecological Economics*, vol. 10, pp. 233-47.

Integrating Environmental Values

Omit them	Consider only monetary values and risk making decisions that disadvantage society
Recognise them	Make no attempt to value or integrate them into decisions
Describe them	Present a descriptive list alongside the list of monetary values
Make a qualitative comparison	Describe the non-monetary effects and compare them with the monetary and non-monetary effects. For example: Are the monetary benefits of a decision worth the non-monetary costs? Are the monetary costs less than the non-monetary benefits of the decision?
Make a quantitative, non-monetary assessment	Assess and record effects in non-monetary units
Make a quantitative monetary assessment	Evaluate in money terms as many effects as possible and integrate them in the decision. Describe and record the remaining effects.

Ways of integrating environmental values into decisions
Source: DEST et al (1995).

Techniques for Valuing Environmental Resources

Market Situation	*Data Used*	*Kind of Technique*	*OH*
Observable market data for prices or costs	Price or cost of environmental resources	Market value approaches (derive value from comparisons of costs and revenues)	OH 6.3.3
	Price of costs of surrogate goods or services	Surrogate market approaches (derive value from costs and revenues in related markets)	OH 6.3.4
No observable market data for prices or costs	Responses to questions in a survey that simulates a market	Simulated market approaches (derive value form hypothetical questions)	OH 6.3.5

Source: DEST et al (1995).

Market Value Approaches

Effect of change	*Valuation technique*	*Example*
Change in availability, quality or quantity of an output	**Change in productivity**	Change in productivity of a commercial fishery due to clearing of mangroves.
Change in availability, quality or quantity of an input	**Change in income**	Loss of income in a community due to health effects of pollution
Individuals, groups or society replace an entire asset, part of an asset or quality of an asset	**Replacement cost**	Cost of importing fish for consumption if local stocks depleted by overfishing
Individuals, groups or society spend money to defend their environment	**Preventative expenditure**	Cost of installing board walks to minimise impacts of tourism in parks
Individuals, groups or society relocate an activity	**Relocation cost**	Cost of relocating communities away from polluted sites

Source: DEST et al (1995).

Surrogate Market Approaches

Surrogate	*Description*	*Technique*	*Australian applications*
Travel cost	Cost of travel is a proxy for price paid to use the environmental resource	**Travel cost analysis**	Recreation
Market price of a good with an environmental characteristic	Change in price of good is value of change in the characteristics	**Property value**	Air pollution, noise, soil conservation,
Wages to labour	Change in wages is value of change in environment	**Wage differential**	Urban decline
Value of a close substitute	Value of a close substitute is value of effect of interest	**Proxy good**	Research, native forests

Source: DEST et al (1995).

Simulated Market Approaches

Nature of questions	*Nature of simulation*	*Technique*	*Examples*
Direct questions about willingness to pay/accept	Purchase of environmental good, service or asset	**valuation**	Choice between allowing an area to be mined or not
	Choice between alternatives each with a different level of the environmental effect	**Trade-off game**	Choice between different sizes of conservation reserve
Direct questions about preferences	Rank or rate environmental and other goods and services	**Contingent ranking** and **Contingent rating**	Choice between public expenditure on conservation or for example education
Direct questions about quantities to purchase	Choices of quantities to purchase in a market setting	**Priority evaluator**	Choices of private expenditure between market and non-market goods

Source: DEST et al (1995).

Scenarios Of Links Between Mangroves and Fish Catches

	Very strong links	*Strong links*	*Moderate links*	*Weak links*	*No links*
*Impact parameter	1	1	0.5	0.5	0
Time delay (years)	0	5	5	10	-
Optimal cutting strategy	Ban cutting	Selective cut on 25% of harvestable area, 30 year rotation	Selective cut on 80% of harvestable area, 30 year rotation	Selective cut on 80% of harvestable area, 30 year rotation	Clear cut harvestable area over 30 years
NPV Billions of Rp	2230	2240	2480	2590	2820

*Percentage reduction in fish catch with percentage mangrove area cleared.

Benefits of Environmental Protection

Environment protected	*Protection techniques*	*Separable benefits*	*Common benefits*
Land based protection	Protect catchments by eliminating shifting cultivation	improved agricultural returns of irrigated rice on lowlands	fisheries production tourism benefits
	Change to sustainable forestry production	longer term returns from harvesting	
		reduction in loss of infrastructure due to floods	
Mangrove protection	Stop clearing, harvest products on sustainable basis	longer term returns from harvesting	fisheries production tourism benefits
Inshore marine protection	Control illegal fishing		fisheries production tourism benefits

Source: Identification of benefits of environmental protection, Palawan

MODULE	**6** **What do Managers Need to Know?**
TRAINING SESSION	**6.4** **Management through Regulation & Economic Instruments**
OBJECTIVE	To provide an introduction to the range of economic instruments of potential use in ICZM.
SIGNIFICANCE	Economic instruments may be used in conjunction with regulations to adjust the workings of economic systems towards more sustainable resource use.
PRESENTATION	Lectures & workshop
TIME	1 hour lectures, 2 hr workshop
EQUIPMENT	OH, writing materials

TRAINING SESSION 6.4

Management Through Regulation & Economic Instruments

Author: Sally Driml

INTRODUCTION

This module addresses ways to adjust economic systems to direct them towards sustainable resource use. The methods available to achieve adjustment include regulations such as prohibitions, limits, standards and also 'economic instruments'. These instruments, such as taxes, tradeable use rights and performance bonds, are usually used in conjunction with regulations to make efficient adjustments to the rate and type of resource use.

Intelligent use of economic analysis allows us to understand the processes at work in an economy and to use adjustments to these processes (through the use of regulations and 'economic instruments') to get a better outcome. If the aim of a community is ecologically sustainable development, it is important to modify the workings of economies to direct them towards that outcome.

SESSION CONTENT

Management through regulation and economic instruments

Because many environmental resources are not valued in monetary terms, the normal workings of markets tend to overuse these resources. The results may be depletion and degradation. Regulations and economic instruments are used to adjust the way markets work to get a better outcome. If sustainable development is the goal of a community, the regulations and economic instruments can be set to that aim.

The use of regulations and economic instruments compliments the economic analysis methods discussed above. It is generally only practical to conduct a major analysis for new project or policy proposals or reviews of regional plans. Regulations and economic instruments are used to adjust the workings of markets everyday. (It is not unusual for proposals for new regulations or economic instruments to be subject to an economic analysis before being introduced).

Regulations are legal limits on how resources can be used. These include zoning plans, fish catch limits, pollution discharge standards. Economic activity has to operate within these limits. Regulations are often the most appropriate way to control resource use. They are the only option if we wish to prohibit actions entirely such as discharge of toxic wastes or logging in National Parks.

Economic instruments include taxes, subsidies, tradeable permits and others listed in the table below. These are almost always used in conjunction with regulations. Economic instruments are so named because they link into market processes to adjust the way markets operate. For example, pollution taxes work to put a price on the discharge of pollution. The use of the natural environment as a waste receptacle is no longer free, it has a price. Economic instruments are often preferred to further regulation because they allow the market to adjust to the most efficient means of operation. For example, instead of specifying by regulation what type of pollution abatement processes a factory must adopt, charging a pollution tax (often in association with regulations on maximum discharge allowed) gives an incentive for the owners of the factory to find the least cost method of abatement and to minimise discharge.

One particular type of instrument, tradeable rights, creates a market where previously there was none. An example is tradeable fish catch quotas, often called individual transferable catch quotas (ITCQs). Many of the world's fisheries have been overfished because access to them was free and uncontrolled. Governments have stepped in to manage fisheries using a variety of means. To implement ITCQs, first a total limit on catch from the whole fishery (termed the 'global quota') has to be set, preferably based on scientific data on the sustainable harvest level. This global quota is then divided into smaller units and often allocated evenly to all the people who can prove they fished there in the past. These individual quotas are able to be bought and sold. Some people may chose to sell their quota and retire from the fishery; others may buy a quota and enter. The most efficient fishers may buy quotas from the less efficient. The value of the quotas become linked to the expected value of earnings from the fishery and therefore gives access to this resource a monetary value.

The Organisation for Economic Cooperation and Development (OECD) has produced a series of reports on the use of economic instruments for environmental management. The range of instruments identified by the OECD is listed in OH 6.4.1

- **OH 6.4.1. Types of Economic Instruments**

The design of an effective economic instrument is quite complex. If not well designed, the effect can even be counter-productive. The OECD recommends that the following criteria be used to evaluate the design of instruments and whether they will be useful in a situation.

- **OH 6.4.2 Criteria to evaluate effectiveness of economic instruments.**

A better understanding of the use of economic instruments may be gained by looking at the use of instruments in one country. OH 6.4.3a and OH 6.4.3b are drawn from a recent review of the use of economic instruments for environmental management in Australia. Some of the applications are directly and indirectly related to coastal zone management.

- **OH 6.4.3a and b Use of economic instruments for environmental management in Australia.**

A recent review of the use of regulations and economic instruments in East Asian countries found that regulations are the most widely used method of managing processes that effect the environment. This is to be expected because regulations are the traditional means of controlling environmental impacts. A variety of economic instruments are in use in some East Asian countries, but in all cases the number of examples are few. The potential for greater use of economic instruments, often in combination with regulations, was proposed (O'Connor 1994).

SESSION ACTIVITIES 6.4

Think about the approaches taken to environmental regulation in the coastal zone areas you are familiar with. Are there any examples of uses of economic instruments? How do these work?

Are there any opportunities for using any of the economic instruments discussed in this module?

Use any examples you know, or think about the hypothetical examples of:

(i) using individual tradeable catch quotas in a fishery
(ii) using pollution taxes

What outcomes would you be looking for in applying the economic instruments? What combination of regulations and economic instruments would be needed to meet that outcome? What would you need to do to introduce the system? What level of monitoring and/or policing would be needed? How would the use of a combination of regulations and economic instruments differ from just using regulations? Is there any advantage in using economic instruments in these examples?

SESSION MATERIALS 6.4

OH 6.4.1 Types of Economic Instruments
OH 6.4.2 Criteria to evaluate effectiveness of economic instruments
OH 6.4.3a Use of Economic Instruments for Environmental Management in Australia
OH 6.4.3b Use of Economic Instruments for Environmental Management in Australia

REFERENCES 6.4

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Organisation for Economic Cooperation and Development, 1989, *Economic Instruments for Environmental Protection*, OECD, Paris.

Types of Economic Instruments

CHARGES Effluent charges User charges Product charges Administrative charges Tax differentiation	**MARKET CREATION** Emissions trading Market intervention Liability insurance
SUBSIDIES Grants Soft loans Tax allowances	(Financial) **ENFORCEMENT INCENTIVES** Non-compliance fees Performance bonds
DEPOSIT-REFUND SYSTEMS	

Types of economic instrument identified by the OECD
Source: OECD (1989)

Criteria to Evaluate the Effectiveness of Economic Instruments

Past and present applications	How well similar instruments are working in the country or similar countries?
Environmental effectiveness	Will the environmental management goal be met?
Economic efficiency	Is this the least cost of meeting the goal?
Administrative efficiency and practicability	Is it practical to administer, and in particular to collect the information required?
Concordance with institutional framework of the country	Will it fit in with other policy approaches or be so unusual as to not be effective?

Source: OECD (1989)

Use of Economic Instruments for Environmental Management in Australia

Instrument	*When used*	*Examples*
Emission and effluent charges	Per unit charges on discharge of waste directly to air or water	In South Australia, charges related to environmental impact of discharge of wastes into waterways. Introduced for marine environment protection.
User charges for the treatment/ disposal of wastes	Charges on households and industry for government run waste treatment systems (sewage system, rubbish collection)	Charges on industry by volume of waste discharged into municipal sewage systems
Environment taxes	Levies to finance environmental improvement	Levy on households in Sydney to repair past environmental damage and provide better treatment of sewage being released into the ocean
Product charges	Charge on the use of products known to damage environment	Charge on the use of ozone depleting products
Deposit refunds	Refunds on return of articles to encourage recycling.	Deposit refunds on glass bottles
Tradeable pollution rights	Tradeable rights to a quota to discharge waste to water or air	Not yet widely used due to complexity but under consideration, only existing application is tradeable rights to discharge saline water into inland rivers

Source: James (1993).

Use of Economic Instruments for Environmental Instruments in Australia

Instrument	*When used*	*Examples*
Tradeable resource user rights	Tradeable rights to harvest (forestry, fisheries) or access (tourism) a natural resource	ITCQs used in a number of commercial fisheries
User charges for natural resources and environmental amenity	Charges for costs of providing visitor facilities to prevent damage and repair of damage caused by visiting natural environments	Entry fees to national and marine parks
Performance bonds	Bonds posted by developers of mines, tourist attractions etc. to pay for clean up of environment in the case of accidents or the developer going out of business	Performance bonds posted by private developers of tourist infrastructure in the Great Barrier Reef Marine Park

Source: James (1993).

MODULE 7

MAKING INTEGRATED COASTAL ZONE MANAGEMENT WORK

Authors: Marc Hockings, Kim Looi Ch'ng, Dr Peter Burbridge and Jim Davie

OBJECTIVES

In essence, planning is the process of defining a desired future state and then devising strategies and actions for achieving that state. Plans can be as simple as deciding what to have for breakfast and how you will get it, to designing a sustainable development plan for the nation's coastal zone. Training Session 7.1 will examine the principles of planning in all its stages from the inception of an idea through to the implementation of the scheme and final evaluation.

Planning processes are as varied as the agencies involved in development in the coastal zone. Training Session 7.2 examines the different forms of planning and emphasises the need for an integrated approach in coastal management planning.

Training Session 7.3 outlines a multiple use planning model that may be adapted to local circumstances. Participants are asked to examine this system to determine whether it could meet the planning needs in their regions. This exercise is designed to alert participants to the planning requirements in their areas and discuss how they may be met in the future.

Planning is an essential management skill which, to be effective, must be honed and improved with experience. By monitoring a planning activity managers can improve their own performance as well as the outcome of the project. Training Session 7.4 examines the role of evaluation in the planning process and the variety of monitoring strategies which may be used to determine the effectiveness of a programme. Training Session 7.5 is an exercise in planning monitoring and evaluation programs.

All planning programs work within a framework of legal and institutional mechanisms which may enhance or constrain the planning process. Training Session 7.6 outlines the legal and institutional arrangements of which managers must be aware. The session activities encourage participants to examine the arrangements that affect ICZM in their regions.

TRAINING SESSIONS

MODULE	**7.** **Making Integrated Coastal Zone Management Work**
TRAINING SESSION	**7.1** **Principles of Planning**
OBJECTIVE	At the end of the session participants will have an understanding of the general planning process, the characteristics of effective planning and how planning can be applied at a variety of levels and scales.
SIGNIFICANCE	Planning is one of the most important components of management. This session introduces some basic planning concepts that will be developed within a coastal zone context in subsequent sessions.
PRESENTATION	Lecture
TIME	1 hour
EQUIPMENT	OH projector, materials for documentation and presentation of discussion outcomes

TRAINING SESSION 7.1

PRINCIPLES OF PLANNING

Author: Marc Hockings

INTRODUCTION

State objectives of session.
Introduce the idea that planning is an activity that everyone does in their daily lives. In order for participants to realise that they are already "planners", ask them to suggest some of the things that they plan for outside of a work context. Then ask them to list some of the planning that they undertake within their work environment.

SESSION CONTENT

Discuss the concept of planning as a process. Begin by giving different definitions of planning.

DEFINITIONS OF PLANNING

In essence, planning is the process of defining a desired future state and then devising strategies and actions for achieving that state. There are many definitions of planning, a selection of which are presented below. The particular emphasis given by different authors often relates to the particular context or type of planning under consideration.

- "planning is a process of preparing a set of decisions for action in the future, directed at achieving goals by preferable means," (Dror 1963, in Faludi 1973, p330)

"Major features of general planning include a sequence of actions which are designed to solve problems in the future... which can be conceptualised into a number of stages, such as:

- identification of the problem;
- formulation of general goals and objectives relating to the problem;
- identification of possible constraints;
- projection of the future situation;
- production of a preferred plan." (Glasson 1978, p 19).

- "Planning is the deliberate social or organisational activity of developing an optimal strategy of future action to achieve a desired set of goals, for solving novel problems in complex contexts, and attended by the power and intention to commit resources and to act as necessary to implement the chosen strategy," (Alexander 1992, p73)

- **OH 7.1.1 Definitions of Planning**

- Briefly outline the three models of decision making detailed below and discuss their application to planning approaches. Ask participants if they can identify the type of approach that was used in planning exercises with which they are familiar.

THEORIES OF DECISION MAKING

•***Note to trainers:*** *This section of the lecture relating to theories of decision making can be omitted if the trainer feels that it may confuse rather than enlighten the participants. It is not necessary to go through this section before introducing the general planning model. If participants have had little or no experience with planning in theory or practice it may be best to leave the section out. It is most suited to inclusion when training individuals who have had some experience with planning in practice but may have not had an introduction to planning theory.*

The following is a brief outline of three theories of decision making that could underlie an approach to planning. These are: the rational-comprehensive model, disjointed incrementalism and mixed scanning.

Rational-comprehensive model: This model is based on the systematic consideration of all possible means of achieving established goals. Taken to its extreme this requires a complete understanding of the system under consideration and a full enumeration and consideration of all alternative courses of action. The rational-comprehensive model of planning therefore emphasises the collection of extensive data on the system under consideration as a starting point for the planning process. This process of rational problem solving has been criticised by many authors on the basis that no real decision-making process can meet the demands of rationality: complete information and consideration of all alternatives.

Disjointed incrementalism is very different from the rational model. Where the latter requires the decision maker to develop all possible alternatives (or at least a substantial range) the incrementalist decision maker develops only a few possible strategies, none of them differing radically from the status quo. The rationale for this approach is twofold. Firstly, decision makers in reality find it impossible to deal with the mass of information the rational approach would demand. Secondly, they do not conceive as feasible courses of action radically different from the status quo.

Research has shown that disjointed incrementalism is a better description of actual decision-making behaviour than the rational comprehensive model but it does not apply to all cases.

Mixed scanning: this approach recognises that decisions are made at differing levels. Decision making at the lower, more operational levels can be undertaken in the incremental mode where choices are conceived to be constrained to alternatives not too different from the status quo. In addition to these "tactical" levels, however, there are higher levels where decision makers have to be aware of the broader strategic picture where consideration can be given to a wider range of options, some radically different from the current situation. Decision makers can and should "scan" their environment over a continuum of different levels.

A strategic planning model

- Develop the model of the planning process by explaining each step one at a time. Make sure that participants understand the meaning of each step in the process before moving on to the next stage.

- **OH 7.1.2 A General Planning Model**

The essential elements of the planning model are:

- The clear formulation of the goals that planning seeks to achieve (the purposes and broad outcomes desired from management). Note that the goals are largely derived from consideration of three factors:
  - the purpose for which the organisation was established (organisational mission);
  - the values of the resource being managed (resource values); and
  - the particular management beliefs and approach adopted by the organisation (management values);
- Identification of the current situation (including environmental scan of both internal organisational factors and external considerations). This is often termed a SWOT analysis (Strengths, Weaknesses, Opportunities, Threats). Opportunities and threats can be evaluated in terms of the priority that they should be accorded by considering the likely impact on the organisation and the likelihood of the opportunity or threat actually occurring.

- **OH 7.1.3 Threat and Opportunity Matrix**

- Determination of objectives (clear statements of the outcomes to be achieved). Note that good objectives should be specific, time-bound and measurable;
- Analysis of the difference between the current and desired situations (gap analysis). This will allow a decision to be made as to whether current strategies will achieve the objectives that have been established or if new strategies and action will be required;
- Definition of strategies to bridge the gap. These are the policies, guidelines and actions that specify what will be done;

- Implementation of strategies;
- Monitoring, evaluation and review. The results of evaluation may feedback to different stages in the planning process. This depends on whether the problem is perceived to be in the definition of goals and objectives, the strategies that have been selected to achieve these outcomes, or in the actual implementation of the plan. This stage of planning is often handled poorly, or omitted entirely, but it is an essential part of the process.

- **OH 7.1.4** Management Cycle

These stages of the planning process and the place of planning in the management cycle are represented diagrammatically in OH 7.1.2, 7.1.3 and 7.1.4.

Characteristics of effective planning

- Discuss the characteristics of effective planning that are outlined below. Ask participants to nominate other characteristics that they feel are important in making plans and planning effective.

A number of characteristics of effective planning can be recognised:

Participation: planning should be a participatory exercise involving the organisation's clients and other outside individuals or groups who will be affected by the plan together with those people who will be responsible for implementing the plan. A plan which seeks to dictate programs without this consultation and involvement is likely to be far less effective.

Bias towards action: many factors affect how useful any planning exercise will be but none is more important than the presence or absence of a "bias towards action". There needs to be a real commitment from the organisation to implement the plan. This is sometimes lacking if planning is undertaken just to meet statutory and bureaucratic obligations or because it is "the thing to do".

Decision-making framework: circumstances relevant to a plan will change. Plans that propose a series of actions to be undertaken in response to current circumstances without clearly linking these to broader objectives can quickly become outdated. Effective plans establish clear outcomes and objectives, and establish a framework which can be used to guide future decisions and help formulate strategies to cope with new problems or opportunities.

- Discuss the concept of scale in planning and how it is usual for planning to occur either simultaneously or sequentially at a variety of scales. This means that any one area may be affected by two or three plans developed at various levels. Have participants discuss the hierarchy of plans relevant to the management of the coastal zone that apply in their particular country of origin. Note that the same planning methodology can be applied at all levels although the detail of planning varies greatly.

At the broadest scale whole areas of national development may be covered by a single long-term plan while at the smallest scale a plan may be developed for a single project or site. Common types of broad scale plans are strategic plans, corporate plans, regional plans. At a narrower scale there are zoning plans and area management plans while at a still narrower scale plans might be developed for a particular site or project.

An example of a planning hierarchy for the Great Barrier Reef Region in Australia is given in **OH 7.1.5.**

- **OH 7.1.5 Planning Hierarchy for the Great Barrier Reef**

Planning for the coastal zone

- The significant changes in planning systems that are required to implement integrated coastal zone management relate not so much to planning methodology but to the focus, scope and processes of planning.

The planning process outlined in **OH 7.1.2** can be applied within a traditional, framework or within a regional, multi-sectoral approach.

The concentration of pressures for use of the coastal zone have highlighted the importance of planning as a mechanism for determining the optimal allocation of limited resources. Planning systems that are based around sectoral or disciplinary concerns, that involve only one level of government or that exclude meaningful participation from the local community and other stakeholders, cannot achieve this aim.

Conflicts of interest will inevitably exist between these various players and decisions on resource allocation must be made through a process of bargaining, negotiation and conflict resolution. In most cases this will involve planning on at least a regional scale.

- Reinforce the idea that planning is something that everyone should be involved in and that essentially the same planning process can be applied at all levels. Review the characteristics of effective planning that were identified in the lecture and from participant responses.

SESSION MATERIALS 7.1

- **OH 7.1.1** Definitions of Planning
- **OH 7.1.2** A Strategic Planning Process
- **OH 7.1.3** Threat and Opportunity Matrix
- **OH 7.1.4** Management Cycle
- **OH 7.1.5** Planning Hierarchy for the Great Barrier Reef

Definitions Of Planning

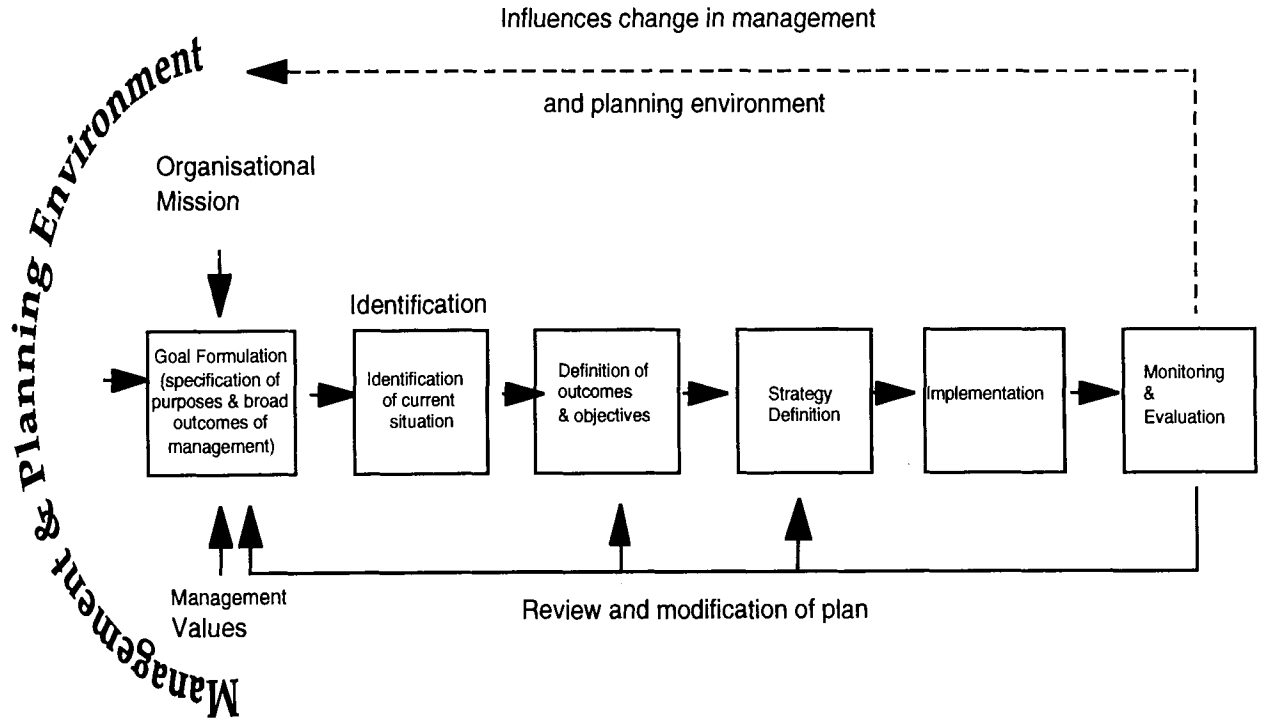
Dror (1963) in Faludi (1973), p 330
"planning is a process of preparing a set of decisions for action in the future, directed at achieving goals by preferable means."

Glasson (1978), p 19
"Major features of general planning include a sequence of actions which are designed to solve problems in the future .... which can be conceptualised into a number of stages, such as:

- the identification of the problem;
- the formulation of general goals and ... objectives relating to the problem;
- the identification of possible constraints;
- the projection of the future situation;
- the production of a preferred plan."

Alexander (1992), p 73
"Planning is the deliberate social or organisational activity of developing an optimal strategy of future action to achieve a desired set of goals, for solving novel problems in complex contexts, and attended by the power and intention to commit resources and to act as necessary to implement the chosen strategy".

A Strategic Planning Process



Threat Matrix

Severity		
High	High Priority	Moderate Priority (watching brief)
Low	Moderate Priority (plan action if resources available)	Low Priority
	High	Low

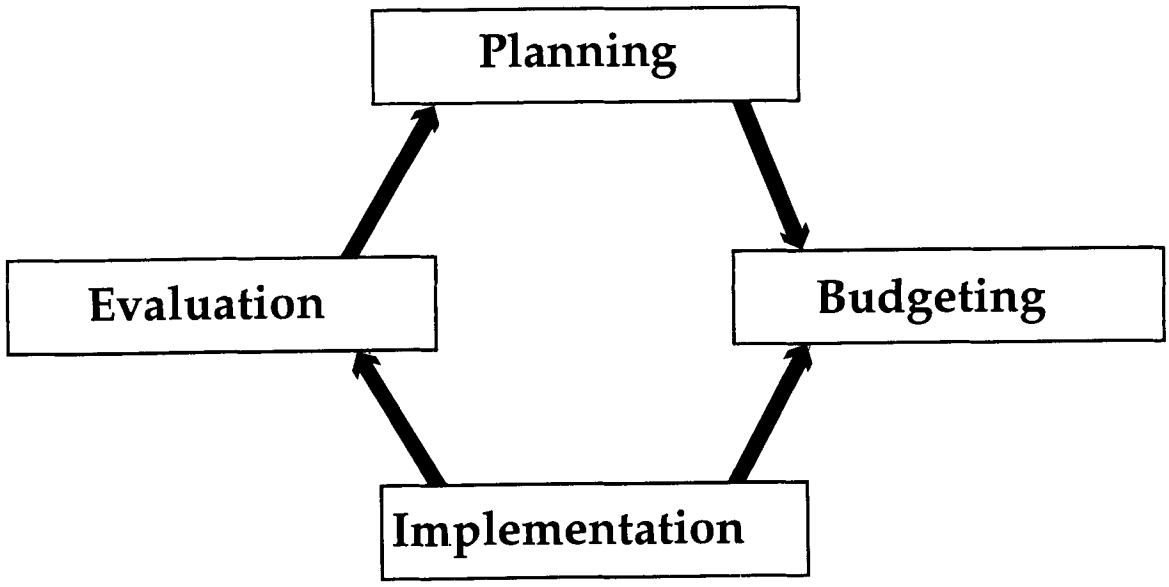
Likelihood of occurrence

Opportunity Matrix

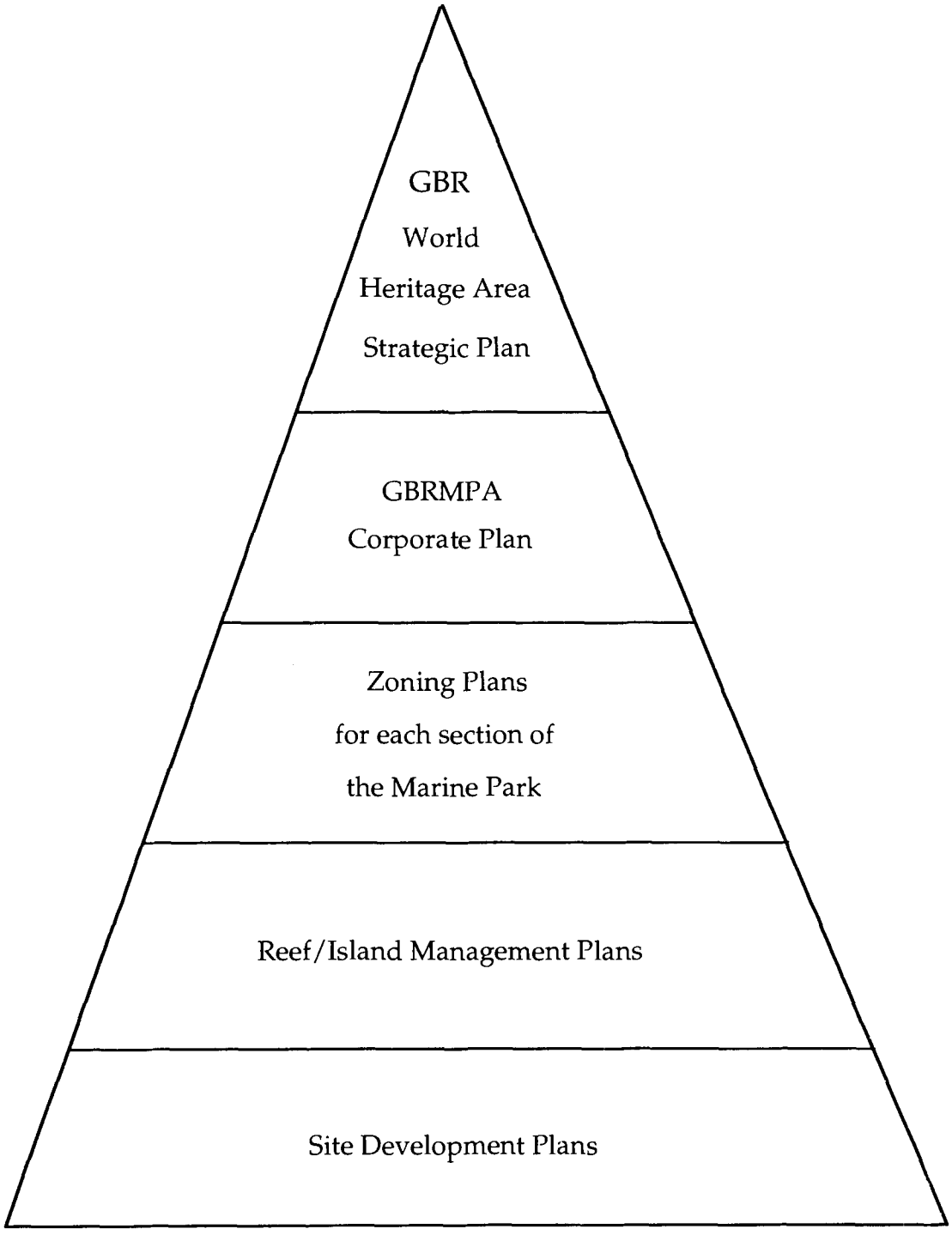
Benefit		
High	High Priority	Moderate Priority (watching brief)
Low	Moderate Priority (plan action if resources available)	Low Priority
	High	Low

Likelihood of occurrence

Management Cycle



Planning hierarchy for the Great Barrier Reef



Source: Kenchington, R. A. and Ch'ng, K. L. (eds) 1994, Staff Training Materials for the Management of Marine Areas, UNEP RCU/EAS Technical Report Series No. 4, p.389.

MODULE	7. **Making Integrated Coastal Zone Management Work**
TRAINING SESSION	7.2 **Approaches to Management Planning**
OBJECTIVE	At the end of the session participants will have an understanding of the need for an integrated approach to coastal management in order to overcome problems of communication and conflict across resource sectors, levels of government and between government and the community.
SIGNIFICANCE	Coastal management involves a high degree of cooperation among stakeholders. This level of cooperation in not easy to achieve under the most common forms of organisation for decision making. The material presented here considers alternative organisational models to assist in achieving required levels of cooperation.
PRESENTATION	Workshops and Lecture
TIME	1 hour for each workshop and 1 hour for the lecture.
EQUIPMENT	OH projector, materials for documentation and presentation of workshop findings

TRAINING SESSION 7.2

APPROACHES TO MANAGEMENT PLANNING

Author: Kim Looi Ch'ng

INTRODUCTION

Because of the wide array of stakeholders involved in decision making in coastal management issues a number of significant organisational issues must be overcome to achieve ICZM. Successful management planning requires:

- A mechanism for coordinating and integrating sectors.
- An integrated, multidisciplinary, strategic, holistic approach which aims at balancing the need to maintain desired levels of maximum sustainable yield as well as the desired quality of coastal resources and associated environments.
- A mechanism for coordinating and integrating different levels of government.
- A mechanism which allows the participation of all stakeholders, particularly the local community.
- A mechanism to optimise the use of scarce resources among competing (and often conflicting) users for the benefit of society as a whole, in the short term and long term.

This Training Session explores the mechanisms and arrangements which are essential to support decision making in government.

SESSION CONTENT

Coastal zone planning needs to be proactive

Tremendous pressure on the limited space in the coastal zone makes it essential that planning authorities establish a strategy whereby decision making on development projects is driven by a spatial plan. The spatial plan may initially be quite poor in information but should seek, through on-going surveys, research and monitoring to build up an information base identifying both the optimum allocation of resources among sectoral interests and the basis for negotiation among competing interests. Thus there needs to be interacting and simultaneous streams of information gathering and spatial planning and management in order to put the decision makers "ahead of the game". Tools such as GIS and remote sensed data are essential to this process.

A potentially valuable organisational system has been adopted in Indonesia through their Spatial Planning Act of 1993. This is being implemented through national, provincial and local government authorities. Care is being taken in the implementation structure to allow for vertical integration of planning activities across the various levels of government and to ensure that community participation is emphasised. However, the system is still very young and remains hampered by an inadequate information base, a lack of appropriately trained staff and variable degrees of authority by the planning boards allowing them to impose integrated planning solutions on sectoral agencies within their jurisdiction.

Coastal zone planning requires a high degree of cooperation and coordination
Effective coordination helps to ensure that decisions integrate the objectives of sectoral groups, levels of government and local community needs.

Most government organisations throughout the world have inherited bureaucratic structures which reflect single sector objectives. Ministries of mines, agriculture, forestry and fisheries seek to maximise economic production. The objectives of sustainable development refined and reinforced at the Rio Conference on Environment and Development in 1992 make such bureaucratic structures obsolete. In order to be sustainable, exploitation of resources on diminishing areas of available land and sea must be managed on a multiple use basis.

It is unrealistic to expect a change in this form of bureaucratic organisation in the short or even medium term. Other approaches are therefore necessary to broaden the objectives of single agencies holding dominant economic or political influence.

To be persuasive and effective, resource allocation and conservation management policies, strategies and programmes need to be implemented within the national legal and administrative framework. Government involvement and commitment are therefore essential for the establishment and implementation of ICZM. Because of the existence of various traditional sectoral line agencies and quasi government authorities with sweeping powers, as well as several tiers of government with jurisdiction over overlapping resources, it is imperative to have a mechanism for effective coordination between these agencies/authorities/governments.

This coordinating mechanism would have to establish and maintain a system of communication among these agencies/authorities/governments. It would also need the ability to settle disagreements and oversee and monitor the implementation of an ICZM plan. Overall common goals and objectives are a prerequisite to effective collaboration among these agencies/authorities/governments.

ICZM, therefore, calls for significant changes in approach and operation of government bureaucracies. In the long term there would be a need to reorganise and establish a new authority to oversee ICZM and to provide the impetus and the leadership towards integrated management and development of coastal and

marine resources. Such a major step may be counterproductive in the short term as bureaucracies are often sensitive to encroachment of their power and responsibilities.

An effective, interim step would be to assign the task of coordination and integration to an agency already responsible for national planning and development. This agency could be backed up by a high level committee or board with memberships from the various levels of governments, stakeholder and agencies/authorities. The board would have overall authority with respect to the implementation of the ICZM plan. In addition to enhancing the process of integration, the ICZM plan would have to be integrated into the national development plan.

A step towards such an approach is being adopted in Malaysia. The Economic Planning Unit (EPU) of the Prime Ministers Office has overall authority over planning and development in the country. The EPU is undertaking the task of establishing a national integrated coastal resources policy and plan. It is developing a mechanism for coordinating the various sectoral agencies and the three levels of federal, state and local government. It is anticipated that the EPU will consider establishing a high level council/board or allocating such a function to an existing board responsible for sustainable development.

The Australian Government Coastal Zone Inquiry recommended that there should be no new bureaucracies established. The coastal zone should not be marginalised as a sector of its own. Rather coordination and cooperation among agencies should be achieved through national agreement of a "coastal action programme". This would be implemented through a part time *National Coastal Management Agency* . The agency would be a board consisting of representatives of Commonwealth, State and local government and the indigenous community. It would be supported by a full time secretariat and a *National Coastal Consultative Council* of part time advisers chosen for their ability to contribute to the treatment of technical and professional interests. The *National Coastal Zone Management Agency* would be responsible to and report to the existing Council of Australian Governments who would approve *inter alia* objectives and principles for the management of the coastal zone.

Change towards sustainable use of the coastal zone will only occur if the economic power base in the society can be motivated to assume long-term development goals

There is a need to continually review environmental assessment and impact analysis procedures so that they support integrated environmental planning and management.

Planning systems

In ICZM, the goals and objectives should be clearly stated and understood by all parties concerned. The goals should state the broad, ultimate purpose of the plan, while objectives should outline its measurable and attainable ends in a defined area within a given time frame. Objectives need to be clearly defined and prioritised.

The objectives of the ICZM are centred on three areas:

- Strengthening multisectoral planning and management;
- Promoting rational utilisation of coastal resources and minimising resource-use conflicts; and
- Maintaining biological diversity, productivity of coastal species and habitats, and the proper functioning of the coastal environment.

ICZM is viewed by Scura *el al* as three mutually supporting dimensions **(OH 7.2.1)**. These dimensions are:

- Management processes of plan formulation and implementation and monitoring and evaluation;
- Identified management issues such as pollution, loss of habitat and overfishing; and
- Management actions taken to address each issue.

Management actions are normally of three general types:

- Institutional and organisational arrangements needed to facilitate the accomplishment of the management activities;
- Public intervention directed at the modification of human behaviour, including policy instruments such as regulations and market-based incentives; and
- Direct government involvement or investment.

All these require effective monitoring, evaluation and enforcement capacities of the institutions responsible for the management of the resource use in the coastal and marine areas. The institutional capacities for these three functions of the sectoral organisations involved would have to be upgraded and their authority/jurisdiction and responsibilities over the resource use made explicit by:

- Establishing legislations and developing explicit and specific regulations,
- Providing for adequate and competent administrative arrangements, and
- Ensuring adequate funding, and trained staff.

It is often the lack of common goals and objectives, and appropriate management arrangements and unclear line of jurisdiction among line agencies which lead to sectoral rather than integrated approaches. To a large extent these are responsible for the mismanagement/misuse and degradation of the many coastal resources and their associated environments.

Appropriate institutional and organisational arrangements for coordination and implementation, including the apportioning of rights and obligations and the legalisation of these jurisdictions, are therefore crucial and essential components of an ICZM plan.

The management process is iterative, with feedback loops to information and plan revision. The process aims at identifying and finding solutions to the management issues. The management issues are often classified into groups and

addressed by specific management action plans, such as erosion control, mangrove management, water quality maintenance and protected area management.

One of the most important steps in the preparation of an ICZM plan is the identification and prioritisation of what are considered to be the significant issues (both problems and potential activities). Four types of issues can be identified:

- Public demands for the goods and services produced in the coastal zone;
- Competing, and often conflicting, use of coastal resources;
- Impacts of natural hazards on the state of the natural system eg. coastal hazards caused by natural processes (shore erosion, river flooding, landslides) may impact on human settlement and developed areas; and
- Potential activities: development/investment opportunities for private sectors in aquaculture, tourist facilities, ports etc.

The identification and prioritisation of issues can be used to:

- identify specific objectives and criteria that can be used in the monitoring and evaluation of the ICZM programme;
- establish long term goals and framework for the ICZM plan;
- identify information requirements in order to establish priorities for targeted research and monitoring programmes;
- make social impact assessments, and identify and establish linkages with the various stakeholders including the public and private sectors and individuals involved in the resolution of each specific issue. These people should be involved in the process of plan formulation:
- formulate the framework/mechanism for governance and the organisational framework for integration and coordination between sectors and between governments during the planning and implementation stages; and
- demarcate coastal zone boundaries, both landward and seaward.

The identified issues can also be used in social impact assessments. It can be used to identify all individuals and groups with significant interests in the resolution of each issue for the public participation strategy where they can be invited to participate in the planning process.

SESSION MATERIALS 7.2

- **OH 7.2.1** Coastal Management System
- **OH 7.2.2** The process of ICZM Plan development

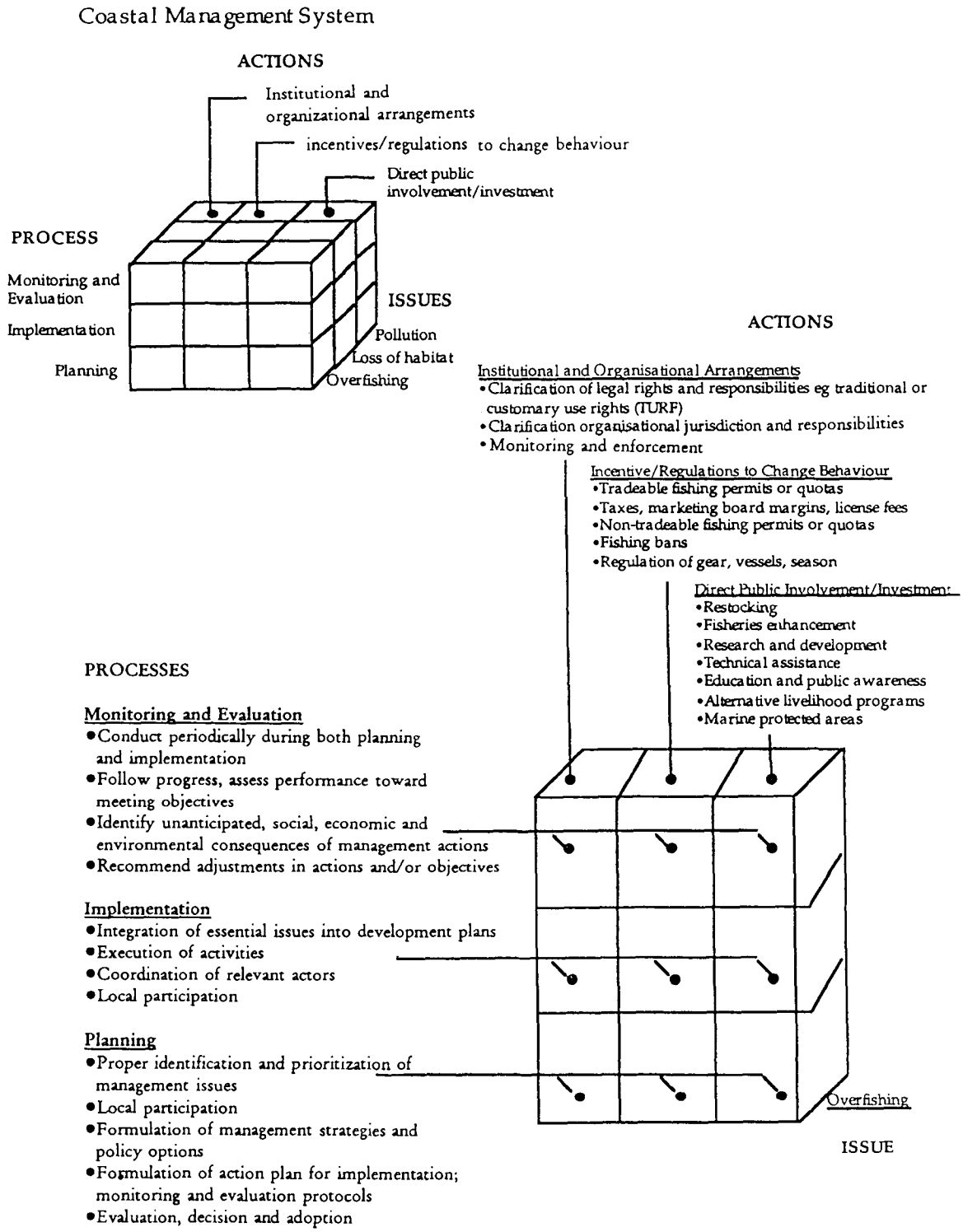
REFERENCES 7.2

Chua T. E. & Scura, L.F. (eds) 1992, *Integrative Frameworks and Methods for Coastal Area Management*, Proceedings of the Regional Workshop on Coastal Zone Planning and Management in ASEAN: Lessons Learned, Bandar Seri Begawan, Brunei Darussalam, 28-30 April, 1992, ICLARM Conference Proceedings 37, ICLARM, Manila.

Jones, V., ed. 1993. *Management Arrangements for the Development and Implementation of Coastal Zone Management Programmes*, International Conference on Coastal Zone Management, 1-5 November 1993, the Netherlands, WCC '93 Organising Committee, Ministry of Transport, Public Works and Water Management, the Netherlands.

The Malaysian Coastal Resources Study Team, 1992, *The Coastal Management Plan for South Johore, Malaysia*, ASEAN/US Coastal Resources Management Project, ICLARM Technical Report 33, 291pp.

Coastal Management System



Source: Scura et al 1992

The process of ICZM plan development

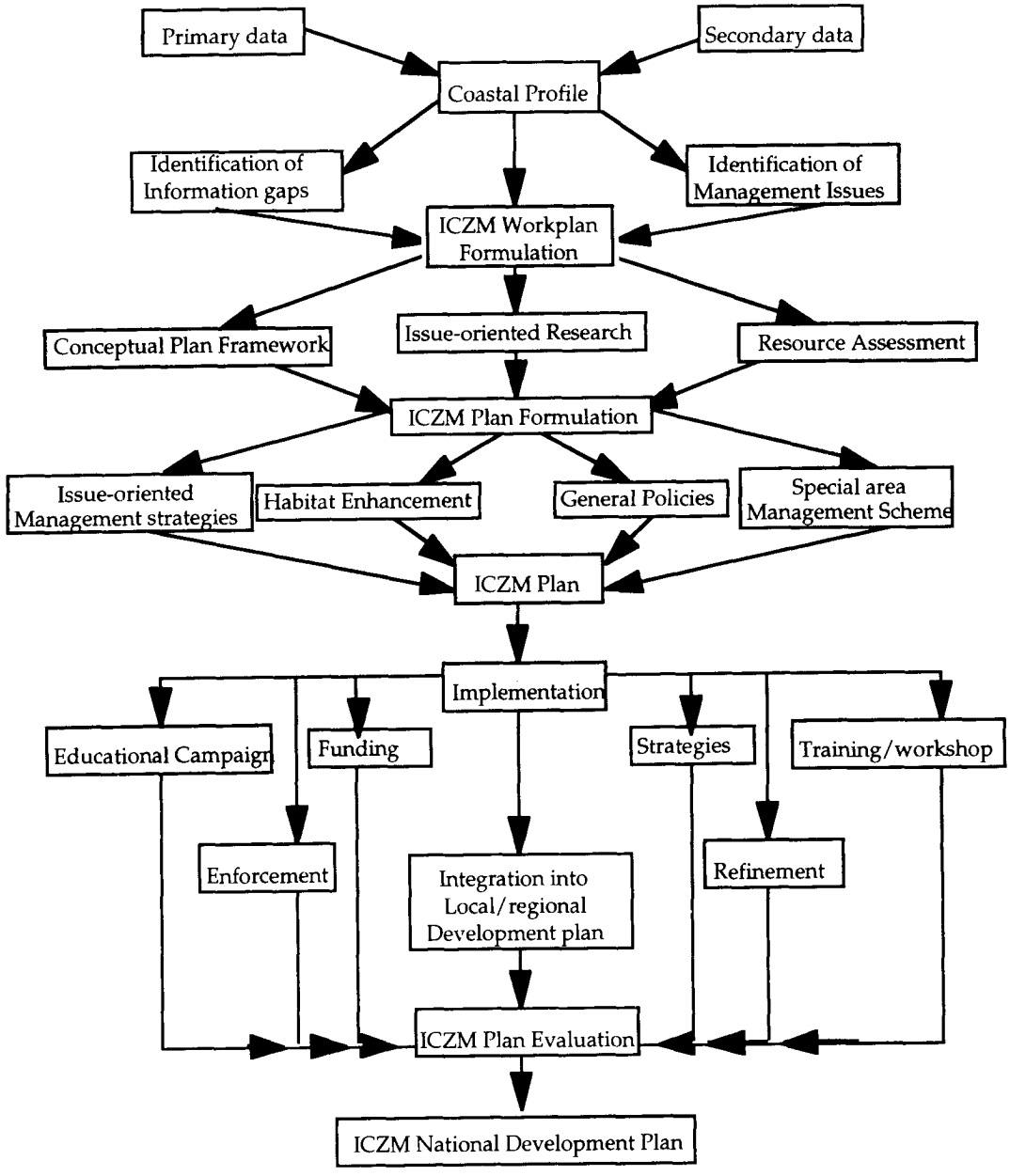


Fig 3. The Process of ICZM Plan Development

Source: Adapted from: Scura et al. 1992

*Note that the process outlined by Scura et al. (1992) doesn't explicitly show the role of various stakeholders and communities in the preparation of the plans. As discussed in the introduction to this session such involvement is critical for successful planning.

MODULE	**7.** **Making Integrated Coastal Zone Management Work**
TRAINING SESSION	**7.3** **A Multiple Use Model for Coastal Zone Management**
OBJECTIVE	To outline a possible model of planning for multiple use management of the coastal zone.
SIGNIFICANCE	Establishing a methodology for multiple use planning and management is critical to the success of ICZM programs.
PRESENTATION	Lecture
TIME	2 hours
EQUIPMENT	OH, Whiteboard

TRAINING SESSION 7.3

A MULTIPLE USE MODEL FOR COASTAL ZONE MANAGEMENT

Author: Dr Peter Burbridge

INTRODUCTION

Welcome participants to the session and explain that the lecture will describe a system for integrated multiple use planning and management of coastal systems.

Participants will form discussion groups to analyse the system and suggest ways it may or may not be adapted to local circumstances.

SESSION CONTENT

Management of coastal systems as the bases for sustainable resources development

Where human activities are directly or indirectly supported by coastal ecosystems, the basic starting point for planning for and managing sustainable development must be the systems - not the final use of the resources generated by those systems.

Multiple Use Management of Coastal Systems

Multiple use is an organising principle where the choice of management boundaries for coastal systems is based on functions and critical linkages with other systems similar to criteria adopted in watershed management. The management of processes is more important than management of uses. While uses have to be managed in terms of areal extent and intensity of use, it is more important to base the management of uses on criteria such as:

- Complementarity of use in respect to activities (eg. forest harvesting versus nutrient flows to support fisheries in mangroves),
- Non-consumptive forms of complementary use (eg. conservation of mangrove for sustainable capture fisheries development supporting the maintenance of coastal erosion control of benefit to navigation).

This provides a strong base upon which to develop complementary techniques to promote beneficial multiple use strategies such as integration of activities and coordination of policies and investment strategies. Once the concept of multiple use has helped achieve improvements in national thinking concerning the broad management objectives for coastal resource systems, regional and local

investment strategies and strategies for investment in infrastructure, and resource allocation, objectives for land and water use can be developed.

The concept of multiple use can be applied to the management of coastal areas and renewable coastal resources. However, the coastal zones of the world are ecologically, economically and socially far more complex than most watersheds and we need to invest in strengthening human resources and institutional arrangements to allow multiple-use management concepts, principles and techniques to be integrated into the thinking and actions of the myriad of agencies and resources uses with interests in promoting wise and sustainable coastal development.

A system for integrated multiple-use planning and management

A multiple-use planning and management process has been proposed for coastal wetlands by Burbridge, Stanturf and Samarakoon (Draft manuscript, 1994) that is designed to guide people in the sustainable use of wetlands resources, help to reduce risk and uncertainty, and optimise social and economic benefits. This planning framework represents a synthesis of generalised planning and decision processes (eg. Alexander, 1986; Roberts, 1979); development planning as set forth by the Organisation of American States (OAS, 1984) and by the OECD (1986); and applications to land use (Davis et al. 1985) and the coastal zone (Clark 1988; Chua and Scura, 1992). The system is outlined below with modifications to make it suitable for more forms of coastal systems. A full explanation of the system proposed by Burbridge, Stanturf and Samarakoon will be forthcoming in Volume One - Concepts and Principles for Sustainable Tropical Coastal Wetland Development to be published by IUCN in 1994.

The process is divided into two phases. The first deals with Resource Analysis; the second with Management Planning.

The Resource Analysis phase is concerned with the objective appraisal of the resources generated by coastal systems, and the way they can be used in a wise manner to help meet development objectives. It involves four steps, providing information that:

- will identify the potential for utilising coastal systems in a sustainable manner, and
- will assist in making decisions about how to allocate coastal system resources and where different activities would be appropriate.

The Management Planning phase, involving a further seven steps, deals with planning for, and managing the use of coastal systems to meet economic and social development objectives.

Although these phases should be understood conceptually as a continuum, in practice they usually occur at different times. Resource analysis, the identification of opportunities for new forms of development and the allocation of resources, is done infrequently and is strategic by nature. Management planning is a continuous process of organising and controlling day to day uses and activities such as environmental protection.

Assessment of environmental factors that condition the use of coastal systems is integral to all stages of the planning process; and, if properly conducted, will provide information to help planners and managers avoid adverse impacts. Where it is not feasible to avoid creating an adverse impact, EIA procedures can be used to predict potential impacts, and to determine appropriate actions to ameliorate or compensate for that impact.

A significant practical advantage of multiple-use planning is that it gives recognition to interconnections among uses and these are taken into account during the analyses of potential constraints, environmental impacts and risks. A professional team will be needed to implement the process. It should be multidisciplinary and represent the interests of all sectors. One method of developing such a team is to form a "coastal systems working group" with members from the main agencies and private bodies which have an interest in coastal systems development. The planning team may or may not have a GIS available, and they may or may not have jurisdictional control over the land area. In any case, data must be spatially referenced to be of value in the process of planning for the use of resources. The importance of maps is high, whether produced manually or electronically by GIS.

A major feature of the process is that environmental, economic and socio-cultural information is used in both phases to determine the most effective use of resources and to illustrate the relative merits of different development alternatives. The process is iterative, each step helps to strengthen successive steps. Plans and management measures are constantly monitored to assess their effectiveness and to provide information with which to improve plans and management strategies.

The continuum of activities that provide continuing support to the planning and management process are described in more detail below:

Resource analysis

1. Definition of boundaries

Many of the key bio-geophysical processes that maintain the health and productivity processes of coastal systems, (eg. hydrologic processes that bring materials and nutrients to the coast), originate outside the boundary of the coastal system. It is important, therefore, to adopt appropriate boundaries for the study of how coastal systems function and how to approach the appraisal of their resources before detailed investigations are attempted.

The choice of boundaries appropriate to the study of coastal systems and for their subsequent planning and management requires the integration of three sets of factors. These are:

- Key environmental processes,
- Administrative units, and
- Activities which affect or are dependent on coastal system resources.

To optimise the use of the flow of economic and environmental goods and services from a coastal system, a comprehensive management boundary needs to be adopted that encompasses the activities:

- Upstream which could influence the environmental processes that maintain the functions, health and productivity of the coastal system ecosystem, and
- Downstream that depend upon the flow of coastal system resources.

The study area should be divided into broad survey units based on landform (physiography) and hydrology. This is the first step in developing a classification of the study area based upon biogeophysical features, which will be the basis for subsequent analysis and interpretation of the resources generated by the coastal system. Examples of coastal area classifications include Hayden et al. (1984) and Salm (1984). A coastal system classifications has been proposed by Cowardin et al. (1979).

These survey units may be further stratified into ecological units which can be treated for suitability for different types and mixes of resource use. The approach relies heavily on the integration of information on physical factors derived from remote sensing and expert opinion.

2. Resource evaluation

The different resources (economic and environmental goods and services) should be evaluated in respect to their ability to support social and economic development objectives. This information needs to be complemented by an appraisal of how they are being used, their existing market value, their non-marketed economic and environmental value, and what scope there may be for creating more intensive or more diversified forms of use. Any problems which hinder the potential use of the resources should also be taken into consideration.

The objectives of resource evaluation are to:

- analyse the present condition of the natural goods and services including supply and demand,
- identify key management parameters that influence existing uses,
- develop a comprehensive list of possible uses and identify key management measures, such as controls over the intensity of use of a resources, required to sustain them, and
- identify risks associated with increased resource use.

Data gained from the resource analyses should be incorporated into resource maps which can be overlayed to yield information that will facilitate decision making (McHarg, 1969). Three subjects that should be illustrated by resource maps of coastal system areas are those:

- with potential for new or enhanced forms of resource use,
- where human activities should be kept to a minimum, and
- where rehabilitation is recommended to compensate for coastal systems that may be degraded through their allocation to activities that are not dependent on coastal systems, or to increase the overall supply of coastal system resources.

3. Assessment of development opportunities

Collecting and collating information and resource evaluation provide for the appraisal of the resources that may potentially be available. Development of this potential depends on factors such as the skills, private capital or public investment required to make effective and sustainable use of these opportunities. Analysis of these factors will determine the feasibility of instituting the way coastal systems are used and managed, and what is required from different government departments and the community to facilitate their sustainable development.

Issues that ought to be examined routinely include:

- Existing and potential domestic and international markets for the products derived from coastal systems.
- The availability of technological and managerial expertise.
- The level of public investment and institutional support, such as extension services, required for sustainable development of existing or new resources.
- Measures that may need to be applied to redress coastal system management problems. For example, relocation of people or cessation of activities that exceed sustainable levels of resource use.
- Existing skills and experience in the local area that may contribute to the implementation of management.

4. Appraisal of compatibility

The purpose of appraising compatibility is to determine which resource uses are compatible and which are likely to be in conflict. Multiple-use management may be either *area-oriented* or *resource-oriented*. In either case multiple-use involves complementary, supplementary or competitive relationships among existing and potential uses.

Two or more resource uses are complementary if they can take place in the same area or use the same resource at different times. For example, charcoal production and tan bark collection can both make use of different parts of the same mangrove tree. Medicinal plant collection and cutting of fish trap poles can make use of different resources in the same area. As long as the planned activities do not damage the basic functions of the coastal system ecosystem, they are complementary.

Supplementary relationships mean there is essentially no adverse influence between uses. An example would be use of the natural coastal systems function as flood plains to protect settlements downstream and designation of sites within the coastal system as nature conservation areas.

Competitive relationships where conflicts among activities can arise if controls over the form and intensity of resource use are not applied are the most common pressures for development to intensify. If one use increases, causing a decline of another, their relationship is competitive. The nature of the relationship between two uses can change. If the level of one use exceeds some threshold value, the other use will decline. For example, if mangrove is

managed primarily for the production of timber, the value of the coastal system as a feeding ground, spawning and nursery area for fish may decline.

The outcome of compatibility appraisal is a list of activities and environmental goods and services that may be integrated into a management plan for a coastal system. The list should be accompanied by an assessment of the optimal mix of activities for local communities, regional development priorities and national development objectives.

Measures required to facilitate the harmonious and integrated use of the coastal system by these activities should also be clearly spelt out. Such measures might include:

- maximum permitted harvests of specific resources,
- seasonal limits on use to or harvesting of resources,
- performance standards for disposal of waste materials,
- common use of specified forms of access, and
- restocking of areas following extraction of plants, animals or other items.

Non-compatible uses that are dependent on the coastal system's resources should also be identified. These activities can be integrated into a management plan by spatially segregating them from other activities within the coastal system (zoning), or in the timing of their use of an area or specific resource. For example, the protection of a coastal system habitat for a rare or endangered species of bird would normally be incompatible with timber production. By restricting harvesting operations to areas outside a buffer zone surrounding critical habitat and timing cutting to the non-breeding and nesting season, the two activities can be managed as compatible uses.

Guidelines are currently being developed to promote compatibility among otherwise incompatible activities, and these can be adapted to meet conditions in different countries. For example, the IUCN and the "E&P Forum", (a consortium representing major oil companies) have developed a set of industry wide guidelines for oil and gas exploration and production in mangrove ecosystems (IUCN and E&P Forum, 1993). These guidelines are designed to minimise the impact of oil and gas operations, avoid disturbance to other activities, and to facilitate the rehabilitation of any degraded areas once operations have ceased.

Management planning

The remaining steps deal with the selection of the most appropriate mix of resource uses and the planning and management arrangements for optimising the sustainable use of the coastal system. Plans should be designed in a manner that provides positive guidance for public and private investment which will benefit the region but also the local community.

1. Identification of the optimal mix of activities
The Resource Analysis phase provides the basic information needed to assess what coastal system resources are available and the degree to which different forms of resource use are compatible. The question that now has to be addressed is concerned with the most appropriate, ecologically sustainable mix of resource uses for national, regional or local development objectives.

The solution to this question will involve:

- selection of suites of compatible use options from the lists determined in the "Appraisal of Compatibility";
- assessment of the development opportunities presented by these options for local regional or national needs;
- determination of the management regimes necessary for sustainable production; and
- assessment of the community motivation and skills base for implementing and managing the coastal system.

Close cooperation will be required between those personnel who may have been involved in "Resource Analysis" activities and those involved in determining management plans.

2. Prediction of the ecological, social and economic impacts
The process which has been outlined above involves a series of analyses which together constitute a strategic application of *"Environmental Impact Assessment"* (EIA) to the planning and management process (Wood 1988). Adverse ecological, social or economic impacts should have been picked up and solutions incorporated into the evolving management plan. Nevertheless circumstances may occur where further, carefully focused EIA will be required. Wathern (1988) provides a useful review of contemporary international approaches to EIA.

3. Formulation of Strategies for Coastal system Utilisation
Formulation of a regional or more local strategy is the synthesis phase of the integrated planning and management process and the beginning of the design stage. The strategy should encompass the entire area of the coastal system and include controls over activities in the surrounding area that could adversely influence the coastal system ecosystem or planned activities. The basis of a regional strategy is the allocation of coastal system areas or resources among different activities. The allocation should be based upon the recommendations of the Coastal systems Working Group and be adapted over time as experience is gained in the management of the planned activities since a common measure does not exist for determining the best combination of coastal system uses.

The strategy should embody the following elements to assist in implementation:

- Policies to guide public and private sector use of the coastal system and its resources.
- Detailed plans for activity sites and use of resources to obtain the planned outputs of economic and environmental goods and services

- Management measures such as guidelines, performance standards, and controls to ensure compliance with the plan by individual activities.
- Incentives and technical support to facilitate the efficient implementation of the strategy.
- Measures should be taken to ensure the conservation of key environmental processes and functions, including rehabilitation of degraded coastal system areas to compensate for unavoidable loss of functions or resources.
- Institutional and legal arrangements/mechanisms for coordination among resource sectors, governments, private sectors and stakeholders.

4. Formulation of Spatial Plans for the location of resource based activities
Once a decision has been made for the allocation and use of coastal system resources, steps can be taken to plan for the allocation and use of coastal system areas or individual resources. The plan should be formulated in manner which clearly designates where and how different activities should be implemented. The plan should be organised into a logical sequence of actions that will provide the infrastructure, investment and technical support required to assist the resource users to undertake their activities in a sustainable manner.

5. Formulation of Management Plans to implement the planned development
Management plans provide the means of implementing the planned development and ensuring that it is sustainable. Specific tasks that need to be addressed in a management plan include:

- Setting out a schedule of actions to facilitate the coordination and integration of activities by agencies with specific responsibilities for supporting the planned coastal system development activities.

- Supervising the provision of services and infrastructure required to facilitate the planned development.

- Ensuring that the intended activities are located in the designated areas or are using the allocated resources in the manner intended in the spatial plan.

- Ensuring that activities adhere to planned levels of resource use and environmental management conditions, such as safe disposal of wastes, stipulated to protect the functional integrity of the coastal system ecosystem.

6. Monitoring of Spatial Plans and Management Arrangements
Monitoring of key environmental, social or economic factors should be undertaken to determine the effectiveness of spatial and management plans and to identify unforeseen adverse impacts on environmental processes and ecosystem functions so that they can be rectified before irreversible environmental, social or economic damage occurs. Monitoring should be an integral part of the planning and management process. It is a powerful tool for

gathering information on changing demands for resources, or previously unidentified or underestimated opportunities for enhanced resource use.

7. Adaptive management

The planning and management of tropical resource systems are very complex tasks and it is seldom possible to remove the uncertainty from predictions about how these systems will respond to planned development. Monitoring is a very important tool for updating and improving the strategic approaches, spatial plans and management arrangements.

A commitment to adaptive management will promote "best practice", in the implementation of a development project. New information on poor performance or impacts, derived from post implementation monitoring, should be corrected as they become known rather than after irreversible changes occur in the functions of ecosystems. Adaptive approaches also permit the use of the experience gained to strengthen future planning and management of coastal systems.

Adaptive planning and management can be used in:

- Short term control of day to day activities, and
- Longer term adjustments in the planned mix and intensities of resource uses and the overall strategy.

Basic principles for planning and manaaging the sustainable use of coastal resources

Wherever feasible, the primary planning and management objective should be to optimise opportunities for human economic and social development that can be supported by coastal system ecosystems. This can only be achieved where the functional integrity of the coastal system is maintained and the flows of resources required to support development objectives are sustained.

The following basic principles will assist planners and managers in promoting new and innovative means of supporting sustainable development of coastal systems:

- The first and most fundamental principle for development of new forms of sustainable coastal system use is the formulation and ongoing maintenance of resource use and tenure systems that are directed to multiple use rather than single purpose and exclusive use by one form of economic activity.

- Avoid the conversion of natural coastal systems in order to develop human activities that can be successfully developed in non-coastal environments. This helps to avoid:
  - foreclosure of future development options;
  - reduction in the flows of economic and environmental goods and services sustained by the coastal system;
  - loss of economic and social benefits by people dependent on coastal system generated resources;

  - increased vulnerability of the new activity in the former coastal system to flooding and other hazards posed by the environmental processes that cause coastal systems to develop; and
  - increased hazards to activities downstream or otherwise linked to the coastal system by hydrologic and other natural processes.

- Base economic development upon the non-destructive use of the coastal ecosystem and sustainable use of renewable flows of goods and services.

- Seek to optimise the social and economic benefits derived from coastal system resources through applying multiple objective and multiple-use planning and management to the allocation of coastal system areas and exploitation of coastal system resources. An example would be the integration of maintenance of coastal system functions. For example, flood water retention, ground water recharge and maintenance of base water flows in river systems with controlled timber harvesting, fuelwood production, secondary forest product collection and conservation of breeding habitats for migratory wildfowl. Careful planning and timing of these activities will avoid conflicts. For example, prohibiting logging during monsoonal wet seasons and within 2 km of nesting sites of bird species being protected.

- Protect essential environmental processes that maintain the health and productivity of coastal ecosystems. The single most important group of processes to consider are those affecting coastal system hydrology, such as the flow of freshwater or tidal inundation. These processes govern material, energy and nutrient flows and other essential processes as well as linkages with other terrestrial and marine ecosystems, the migration of commercial fish species from the sea to mangrove to breed being one important ecological and economic linkage. (Adapted from Burbridge and Davie, 1994)

These basic principles will assist planners, managers and users of natural resources in promoting coastal system developments that meet the needs of individual societies while helping to protect coastal system functions that are important at the international level. Better communication and cooperation in the dialogue among all interested parties are the essential skills to foster in resolving conflict and achieving consensus on wise use.

Human Resources Development for Sustainable Coastal System Development

Integrated coastal system planning and management represents a potentially very cost-effective means of reducing conflicts, improving the efficiency of resource allocation and use and minimising risks to investment and lives and property. The ecological, economic and social benefits from integrated coastal system planning and management have been illustrated in this volume and the manuals designed to help foresters and others implement the concepts and practical techniques will help promote wise and sustainable coastal system use. However, before the full potential and wide application of these materials can be achieved, major efforts will have to be made by international bodies, with the collaboration and strong commitment of governments concerned to:

- expand the social, cultural and economic knowledge available to policy makers, planners and managers to compliment existing bio-geophysical knowledge of coastal system ecosystems;
- train planners and resources managers to focus on the coastal system ecosystem as the basis for planning and managing coastal system dependent activities;
- create economic and fiscal incentives to optimise the utilisation of coastal resources in meeting social and economic development needs; and
- improve the efficiency of coastal system resource use.

In all the above efforts, the most crucial element to the whole mix of efforts to achieve ICZM is the political will of the governments concerned. This can only be achieved if the politicians and decision-makers are made aware of and are convinced of the long-term economic and social benefits of ICZM.

SESSION ACTIVITIES 7.3

- Divide participants into discussion groups. Ask them to examine the system, discuss its benefits and constraints and how it might be applied to their local circumstances. Ask each group to record the outcomes of their discussion and present their findings to the group.

MODULE	**7.** **Making Integrated Coastal Zone Management Work**
TRAINING SESSION	**7.4** **Monitoring and Evaluation**
OBJECTIVE	At the end of the session participants will have an understanding of the importance of evaluating the outcomes of management and the role of monitoring programs in providing the data for such evaluations.
SIGNIFICANCE	Monitoring and evaluation are critical steps in the process of management. They provide managers with information on achievement of objectives and provide a basis for review of plans.
PRESENTATION	Lecture
TIME	1.5 hours
EQUIPMENT	OH, Whiteboard

TRAINING SESSION 7.4

MONITORING AND EVALUATION

Author: Marc Hockings and Jim Davie

INTRODUCTION

Introduce the topic of the lecture by having individuals write down their own definitions of *monitoring* and *evaluation*. Write these up on the whiteboard and compare and discuss the concepts that have emerged. It is likely that there will be some common elements of definitions and some differences that reflect the different purposes or methodologies that underlie particular approaches. There are no single definitions of monitoring and evaluation that are correct.

Rogers (1991) has provided simple and general definitions for the terms that capture the essence of these activities:

Monitoring: routine collection of data on chosen parameters and correlating such data so as to predict future change.
Evaluation: appraisal of management efforts (including ecological appraisal, economic appraisal and environmental assessment techniques).

SESSION CONTENT

Monitoring and evaluation as part of a Management System

- Discuss the relationship between monitoring and evaluation and the importance of establishing a clear purpose for monitoring programs before they are commenced.

Monitoring can be used to provide the data on which evaluations of management effectiveness can be based. However, to be able to fulfil this function, the monitoring programme must be designed with a clear understanding of the way in which the data will be used. Too often, monitoring programs are established without adequate planning, and with no specific objectives in mind. If such programs become entrenched in the management system, a large amount of effort can be wasted on collecting irrelevant or poorly structured data. More commonly, such monitoring programs will be abandoned after a few years when it is recognised that no useful purpose is being served by collecting the data. Unfortunately, monitoring as an element of management can be discredited by such ventures.

- Discuss the importance of monitoring and evaluation in providing the feedback loop in a management cycle of planning, budgeting, implementation and review.

- Evaluation can be undertaken for a number of reasons and can be directed towards particular stakeholders involved in the programme or management issue. Have participants list the possible reasons for conducting evaluation projects and the groups who would use the data from such studies. List these reasons on the whiteboard and then seek to group them on the basis of the categories listed below.

Reason for evaluation	**Major users of evaluation results**
Improve initial programme planning	Policy makers, Managers
Accountability (to clients and government)	Clients, Ministers, Parliament Managers
Improve efficiency of programme delivery	Managers, Clients
Improve effectiveness of programme outcomes	Managers, Clients
Maximise chance of political/Treasury support	Ministers, Senior managers
Symbolic/administrative reasons (legal requirement or public expectation)	Clients, Central government agencies

- The question of who should conduct evaluations can be problematic. Owen (1993) has discussed the options in terms of the key players in evaluation, i.e. those for whom the evaluation findings are intended (the audience) and those who conduct the evaluation (the evaluators).

Both the audience and the evaluators may be characterised as being internal (directly associated with the conduct of the programme) or external (people not directly associated with the conduct of the programme). Based on this classification, four configurations of evaluator and audience are possible (Owen, 1993).

- **OH 7.4.1 Options for design of evaluation projects.**

Internal evaluators have the advantage of knowing the organisation and its programs intimately and of being known by programme staff. They may have greater opportunity to promote the use of evaluation findings and to build monitoring and evaluation into the management cycle. While internal evaluations are generally less expensive than external evaluations they may lack credibility, especially with an external audience. The potentially greater objectivity, experience and credibility of external evaluators must be weighed against factors such as cost and lack of follow through of evaluation findings. Programme staff may also view an external evaluator as a possible threat and therefore not co-operate fully in the exercise. Use of external evaluators may be particularly important when the study is being undertaken for accountability reasons.

- A common distinction amongst types of evaluation is the separation of measures according to what component of management activity or what stage of project implementation they target.

This has been discussed by various others with distinctions based on input, process and outcome evaluation (Wilcox, 1992) or *ex ante* (before programme is commenced), process and impact evaluation (Department of Finance, 1989). Bourn (1992) distinguishes types of evaluation in terms of whether they address questions of economy (minimising the cost of inputs), efficiency (maximising outputs for a given input through effective management processes) or effectiveness (extent to which outcomes achieve objectives) while Corbett (1992) refers to output, efficiency and effectiveness indicators. The Department of Finance (1989) in its guide to programme evaluation refers to the notions of appropriateness, efficiency and effectiveness as key issues to be addressed in evaluating programs. These various distinctions can be conceptualised as a parallel sequences of management activities and types of evaluation.

- **OH 7.4.2 Types of evaluation and their relationship to management activities**

Ex ante evaluations are undertaken as part of the process of programme design. They can provide information on the likely extent to which the proposed programme will meet established objectives (i.e. its appropriateness). Needs assessment, cost-benefit analysis and social and environmental impact assessment are examples of approaches that can be taken to *ex ante* evaluation Such evaluations provide a basis for policy formulation.

Monitoring the level of resources devoted to a programme (input evaluation) provides a measure of commitment to a programme but in the absence of any data on the results of this activity, few useful conclusions can be drawn from such an assessment. For example, the number of staff or the size of the budget devoted to regional planning does not provide a measure of the effectiveness of the planning system. Nevertheless significant declines or increases in inputs to a programme can be useful information when considered in concert with other information on programme performance. Input measures are often used by politicians as measures of commitment (or lack of it) to an issue of public concern.

Process and outcome evaluations can be more useful in detecting areas where the conduct or delivery of programs could be improved. They are especially relevant early in the life of a programme when participants are learning the best methods for implementation and delivery of the programme elements. In a coastal zone management context such evaluations could focus on such issues as methods of public participation in planning or permit approval assessment systems.

Impact evaluations examine the extent to which a programme is achieving its established objectives. The focus is on the intended (and unintended) outcomes of the programme. Attempts to assess the effects of complex programs through selection of one or two simple indicators are usually unsuccessful. A

combination of quantitative and qualitative measures of performance is now accepted as more valid.

There has been a trend to direct attention and effort towards the first and last of these types of evaluation (*ex ante* and impact evaluations) as these provide the most directly applicable information to senior managers. But it has to be recognised that they are also more difficult evaluations to undertake. It is often not clear what data collection or monitoring programs should be adopted to provide the basis for such reviews. Relevant data may be difficult or expensive to collect. Choosing the right measures of programme performance (i.e. establishing the right things to monitor) is a difficult task.

- Translating a desire to evaluate a programme into a set of monitoring projects is a difficult and intellectually challenging exercise. It involves a combination of scientific and managerial decisions.

Establishing clear objectives for any monitoring programme is a critical first step and failure to do this is often the causes failure for monitoring programs (Bernstein et al., 1993). However, the derivation of clear objectives is not always straightforward because of factors such as the conflicting nature of multiple monitoring objectives, the different perspective that players such as scientists and managers bring to the process, and difficulties in ensuring that objectives are viable *a priori* (Centre for Coastal Management, 1993). As Bernstein et al. (1993) point out, if monitoring programs are to play a useful role in environmental management, they must be focused on objectives that are both scientifically valid and managerially useful.

Kenchington (1994) has discussed some of the issues associated with developing viable monitoring programs for coastal environments. Traditional environmental monitoring programs (eg. levels of various pollutants in the environment) may be expensive to maintain and the ecological or management significance of results difficult to interpret. On the other hand biological indicators usually require a level of ecological understanding and field expertise that is often lacking. Development of such field expertise and baseline data will require a greater level of commitment to natural resource management than has generally been shown by natural resource management agencies (Hockings and McDonald, 1994).

The precision expected of a monitoring programme has to be balanced against the costs of the programme and the significance of the issue under examination (Noble and Norton, 1991). In many cases it may be sufficient for a monitoring programme to act as a "trigger" indicating that significant change is occurring in the system being investigated without being able to determine the precise extent of the change. Managers and scientists can then decide if the change warrants further research. There is little point in designing a monitoring programme which is scientifically rigorous but too expensive to be implemented on a continuing basis by managers.

Allied to this notion of a "trigger" indicating environmental change is the concept of indicators that represent in some way the state of the system. The selection of valid indicators is not straightforward, although the desirable attributes of "useful" indicators can be specified (Centre for Coastal Management, 1993;)

- **OH 7.4.3 Criteria for selection of environmental indicators.**

- Statistical validity is an important (but not the only) consideration in selecting a monitoring strategy. Colman et al. (1991, pp. 45-52) provide a useful discussion of the issues involved. A summary of the key points is presented below.

Where quantitative data are to be collected in a monitoring programme, the decision as to whether there has been a change in the state of the system will be based on statistical analysis. Firstly the notion of error in statistics needs to be considered (**OH 7.3.3**). Type I error rates (rejecting the null hypothesis when it is true) are usually set at a low level (α = 0.01-0.05). Type II error rates (accepting the null hypothesis when it is false), to the extent that they are considered at all, are more commonly set at 20% (β= 0.2). These significance levels reflect the fact that scientists normally pay more attention to reducing Type I as opposed to Type II errors. However, for monitoring purposes, Type II errors (failure to detect a change when it has occurred) may be more important than Type I errors (mistakenly claiming that a change has occurred).

- **OH 7.4.4 Statistical tests and monitoring design - Type I and Type II errors**

The power of the test (1-β) represents the level of confidence that the statistical test is non-significant because there really is no change. With a knowledge of the level of variability in the data, the sample size and the desired power of the test it is possible to calculate the minimum extent of change that could be detected by the monitoring programme. Conversely, it is possible to determine the sample size necessary to detect a given level of change in the variables being studied. (see Colman et al., 1991 or most statistical textbooks for details of these calculations).

Of critical importance is their observation that the power of a monitoring programme to detect change increases dramatically as the duration of monitoring increases. A commitment from managers to maintain monitoring programs is therefore necessary if the benefits of the programme are to be realised.

- This session has introduced some of the concepts of monitoring and evaluation and discussed some of the considerations that need to be addressed in designing such programs. The next session will consider these in the context of coastal zone management.

SESSION MATERIALS 7.4

- **OH 7.4.1** Options for design of evaluation projects
- **OH 7.4.2** Types of evaluation and their relationship to management activities
- **OH 7.4.3** Criteria for selection of environmental indicators.
- **OH 7.4.4** Statistical tests and monitoring design - Type I and Type II errors

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Options for design of evaluation projects

		Audience	
		Internal	**External**
Evaluator	**Internal**	Insiders for Insiders	Insiders for outsiders
	External	Outsiders for insiders	Outsiders for outsiders

Source: Adapted from Owen, 1993, p.34

Evaluation and the management cycle

Project/Management Activity				
Project planning	Project resources - staff - funds	Project operations - management systems - management systems	Project outputs - services and facilities - various results of management action	Project impacts - effects of project outputs in terms of project objectives
↓	↓	↓	↓	↓
ex-ante	Input	Process	Outcome	Impact
Types of evaluation				
Appropriateness	Economy	Efficiency	Effectiveness	Effectiveness
Focus of evaluation				Appropriateness

Types of evaluation and their relationship to management activities
Source: Hockings, M. (in press), A framework for the evaluation of conservation management.

Criteria for Selection of Environmental Indicators

Characteristic	Criteria
Critical	Measure must correlate strongly with changes in ecological processes or other unmeasured components
	Measure must apply to a broad range of regional ecosystems
	Measure integrates environmental effects over time and space
	Measure can be quantified at low cost
	Measure is functionally important
Desirable	Indicates response to resource use in a measurable way
	Provides an indication of widespread change
	Has a standard measurement technique
	Exhibits low measurement error
	Has an historical database
	Is cost-effective (low cost for high information value)
	Is used in existing policy models

Source: Centre for Coastal Management (1993)

Statistical Tests and Monitoring Design - Type I and Type II Errors

	Statistical	Conclusion
Actual condition of attribute being monitored	Reject H_0 (change has occurred)	Accept H_0 (no change has occurred)
Change	**Correct decision** Change detected	**Type II error** Failure to detect change
No change	**Type I error** False alarm	**Correct decision** No change detected; none exists

Source: Modified from Colman et al. (1991), p46.

MODULE	7. **Making Integrated Coastal Zone Management Work**
TRAINING SESSION	7.5 **Planning a Monitoring and Evaluation Programme**
OBJECTIVE	At the end of the session participants will have an understanding of the key issues relating to monitoring and evaluation of coastal zone management.
SIGNIFICANCE	Monitoring and evaluation will be important in the management and review of ICZM projects.
PRESENTATION	Lecture and workshop
TIME	2 hours
EQUIPMENT	OH, Whiteboard

MODULE 7.5

PLANNING A MONITORING AND EVALUATION PROGRAMME

Authors: Marc Hockings and Jim Davie

INTRODUCTION

Briefly review the material presented in Session 7.4 in relation to the purposes of monitoring and evaluation

SESSION CONTENT

- Discuss the importance of linking the planning of a monitoring programme to a set of overall goals for integrated coastal zone management.

The specification of monitoring and evaluation programs should follow the development of goals for coastal zone management. Monitoring and evaluation programs can then aim to assess the extent to which the outcomes specified by these goals have been achieved. These should include aspects related to the biophysical, cultural, social, economic and management spheres. Typically, though, monitoring programs for coastal zone environments have not been devised within such a co-ordinated framework but have grown from a series of individual monitoring exercises addressing specific areas, issues or projects. Typically these monitoring programs have concentrated on aspects of the biophysical environment. For example, a report on monitoring in the Great Barrier Reef Region listed sixteen monitoring programs, eleven of which related exclusively or predominantly to the biophysical environment (Lassig et al. 1988). Similarly, thirteen of the fourteen programs that were developed as part of a monitoring programme for the Channel Islands National Park and National Marine Sanctuary were biophysically oriented.

- Discuss how the nature of integrated coastal zone management affects the design of monitoring and evaluation projects.

As monitoring and evaluation programs should derive from a consideration of the goals of integrated coastal zone management, it follows that the design of the monitoring and evaluation programs should reflect the attributes of an integrated approach to management. One element of this is the multi-sectoral nature of management. This is reflected in a requirement for programs to consider more than just the state of the biophysical environment.

A second, and equally important, consideration is the scale at which monitoring occurs. Site or project specific monitoring that has typified many coastal zone programs (especially programs associated with environmental impact assessment and development control) will fail to identify changes that are occurring at a regional scale. Project specific monitoring is also usually conducted over a restricted time frame and will therefore not provide the continuity of data required for management in the long term.

A change in scale of monitoring may be associated with a change in the level of precision or resolution required and hence in methodologies that are appropriate (Lassig et al., 1988). The focus may shift from a reductionist to holistic view of the environment with an emphasis on information about processes rather than state of individual species or system components (refer to Session 6.3 for a discussion of the relative importance of descriptive and functional knowledge in integrated, multi-purpose management systems). Both holistic and reductionist approaches are required to provide the information base necessary for effective management (Kelleher and Lassig, 1994).

TRAINING SESSION 7.5

CASE STUDY 1

Indicators for Victoria's marine and coastal environments

In 1991 the Victorian Institute of Marine Science was asked prepare a report on monitoring techniques and approaches for coastal environments which could form a basis for the Commissioner for the Environment to provide an overview of current conditions and trends in coastal and marine environments. The geographic scope of the study was the natural environments from the 3 nautical mile boundary of State waters to a less precisely defined inland boundary but including at least the extent of inland penetration of marine saline waters.

The approach taken in the study was to define a set of "Valued Environmental Attributes" of coastal and marine environments and then to examine techniques for detecting long-term change in the state of those attributes. These attributes were grouped in categories of Water Quality, Marine Biota, Seabed Sediment Quality, Coastal Morphologies, Aesthetic and Cultural.

The report found that the concept of key indicators of environmental change was well suited to monitoring attributes such as marine biota and water quality but was of limited use in relation to attributes such as aesthetics and cultural resources (see Session 7.4 for a discussion of desirable attributes of indicators).

Both State and Process indicators are proposed in the report and for each indicator, methods of data acquisition, frequency and location of monitoring are specified in broad outline where possible. A total of 52 indicators are proposed for monitoring. For attributes such as water quality, existing standards and a long history of research provide a basis for a relatively straightforward design of a monitoring programme. Indeed they found that there were adequate existing data sets for five of the six indicators proposed. Identification of indicators for other attributes was more problematical and fewer existing data sets were available (none for aesthetic attributes). In many cases monitoring methodologies for the proposed indicators remain to be determined.

Both environmental and human activity process indicators were proposed. Examples of environmental variables are things such as salinity, temperature, sea level and wave climate. Proposed indicators for human activity include such measures as volumes of commercial shipping, extent of dredging work, area of land used for coastal facilities. Because these latter measures relate to quantity of activity rather than impact or quality, it is difficult to see how such data could be interpreted or what constitutes significant or unacceptable change.

The focus of the study is on providing a basis for reporting on the condition of coastal resources. Significantly it has taken a basically sectoral approach,

recommending for example that aesthetic and cultural resources be dealt with as a separate exercise linked to terrestrial environments and that anthropocentric and natural environmental concerns be separated.

TRAINING SESSION 7.5

CASE STUDY 2

Great Barrier Reef World Heritage Area 25 Year Strategic Plan

The Great Barrier Reef Region is well known as the site of one of the great marine parks of the world. Its maze of reefs and islands stretch over 2000 km along the Queensland coast. The region and adjacent coastal areas include a spectrum of uses and levels of development from remote and pristine sites with very low levels of use through to intensive commercial, tourist and urban areas with high levels of disturbance to the area's natural condition. The Great Barrier Reef Marine Park covers 344 000 sq km. It forms the major part of the Great Barrier Reef World Heritage Area which also includes adjacent Queensland waters and islands. While the Marine Park has provided for multiple use management within a framework ecological sustainability over most of the area, it was recognised that further co-operation and integration between the many stakeholders in the region was desirable. Three levels of government (national, state and local) incorporating dozens of different departments, agencies and local government councils have responsibilities in the area. Added to this are the many user and interest groups involved with the Great Barrier Reef.

The aim of the project to prepare a 25 year strategic plan was to develop a shared vision for the future of the region that would facilitate closer co-operation and consultation between the groups involved in the area. Over 60 user and interest groups, agencies and Aboriginal and Torres Strait Islander communities participated in a series of workshops to develop the plan. The plan specifically sought to integrate issues across regions and sectors. Unlike many planning exercises, the process was participative rather than consultative; the planning team consisted of representatives of all of the stakeholder organisations or sectors. The plan was not created solely for the Great Barrier Reef Marine Park Authority or the other government agencies but to act as a guide for all users of the area. It is hoped that organisations and groups will use the plan as a guide in the own planning and decision making. The 25 year vision is:

A healthy environment: an Area which maintains its diversity of species and habitats, and its ecological integrity and resilience, parts of which are in pristine condition.

Sustainable multiple use: non-destructive activities which can continue forever, that is in such a way that minimises the loss of future opportunities for use, and does not adversely affect the ecological integrity of its natural systems.

Maintenance and enhancement of values: the continuation and enhancement of diverse aesthetic, ecological, economic and social values, providing for the

aspirations of residents, users, Aboriginal and Torres Strait Islander people and the global community.

Integrated management: management of activities which takes into account the ecological relationship between the area and other adjacent areas, particularly the mainland.

Knowledge-based but cautious management in the absence of information: decisions based on a commitment to research, monitoring and review using data and experience from all sources and erring on the side of caution in the absence of information.

An informed, involved, committed community: within this broad vision a set of objectives were developed at two levels
(25 years and 5 years). The plan recognised the importance of review and evaluation as part of the planning cycle (**OH 7.5.1**) and a number of initiatives have been developed to facilitate this process.

For each objective and strategy identified in the plan, the group or groups responsible for carrying out the action and a method of assessing achievement of the objective (a performance indicator) have been specified (**OH 7.5.2**). All participants are being asked to comment annually on their progress in implementing the plan.

OH 7.5.2 is a sample of the objectives, strategies and performance indicators from the plan.

The performance indicators specified in the plan cover a spectrum of biophysical, cultural, social, economic and managerial information types. They deal with processes of management and outputs and outcomes from management processes (see discussion of these issues in session 7.4). Many of the indicators will require complex and extensive monitoring programs to be developed in order to obtain the specified information. Others will be able to be estimated from the annual reports on implementation or other readily accessible data sources. The implementation of the monitoring and evaluation components of the plan will test the commitment of the various agencies and groups to the evaluation process. This component of the strategic plan illustrates, in many ways, the difficulties involved in developing methods of assessing performance that are valid, meaningful and practical.

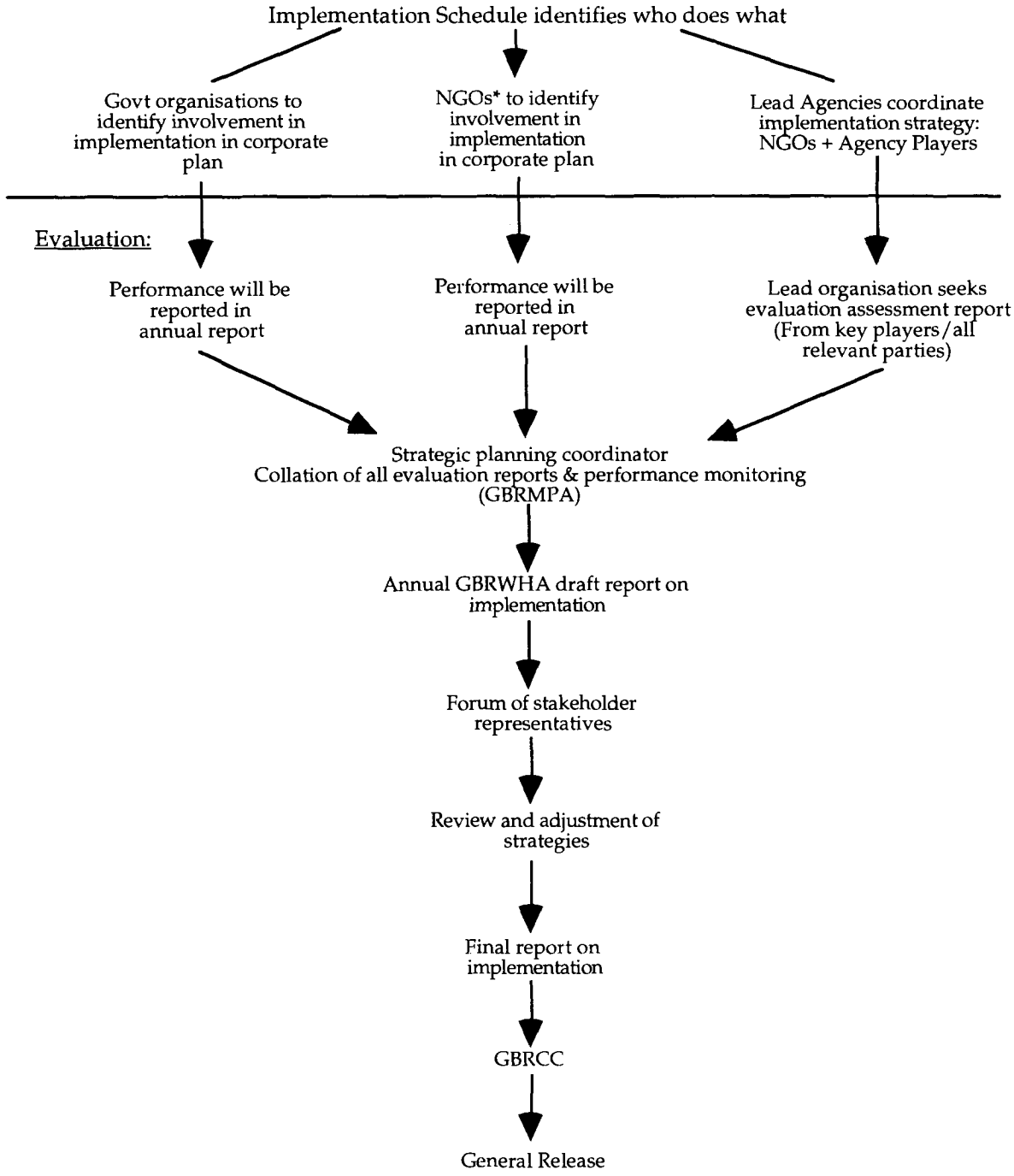
SESSION ACTIVITIES 7.5

- Divide participants into groups of 4-6 people. Each group should spend about 40 minutes addressing the questions listed below and then report back on their discussions.

- Question 1. What systems of monitoring and evaluation are being used in relation to coastal zone management in your country? What is the scale and nature of these evaluations:
    - project based
    - sectorally based
    - multi-sectoral and regional?

- Question 2. Given the context of the coastal zone in your country, what measures should be used as indicators of successful coastal zone management? How could this information be collected and who should be responsible for this data collection?

Annual Evaluation Cycle



*NGOs - Non-government organisations

Source: *The Great Barrier Reef, Keeping it Great: a 25 Year Strategic Plan for the Great Barrier Reef World Heritage Area, 1994 - 2019*, Great Barrier Reef Marine Park Authority, Townsville, p. 53.

Performance Indicators

1 - CONSERVATION

25 YEAR OBJECTIVE

To ensure the persistence of the Great Barrier Reef World Heritage Area as a diverse, resilient, and productive ecological system, while retaining opportunity for a diverse range of experiences and uses consistent with Australia's obligations under the World Heritage Convention.

5 YEAR OBJECTIVES	STRATEGIES	PERFORMANCE INDICATORS	LEAD AGENCY	KEY PLAYERS
1.1 To have in place integrated management strategies for the *conservation of the* Great Barrier Reef World Heritage Area.	1.1.1 Develop, in consultation with *stakeholders,* integrated planning for *conservation* of the Area consistent with Australia's obligations under the World Heritage Convention, and, where applicable, the *Inter-Governmental Agreement on the Environment.*	Conservation objectives dealt with in plans. Complementarity of management plans.	GBRMPA QDEH	All stake-holders
	1.1.2 Document existing *biological communities*, as appropriate, and causes of degradation to enable impacts and their cumulative effects to be assessed and accounted for in regional planning and *resource* management plans.	Degree of documentation of biological communities and causes of degradation. Plans addressing impacts.	GBRMPA QDEH QDPI	All stake-holders
1.2 To have in place clear policies for the *conservation* of major *biological communities* in the Area.	1.2.1 Develop, in consultation with *stakeholders,* policies for the *conservation* of the following *biological communities*: coral reefs, mangroves, island vegetation, seagrass, *Halimeda beds*, cays, inter-reefal areas, and the *Great Barrier Reef lagoon.*	Amount of unnatural loss of mangroves, seagrasses, live coral cover and island vegetation at both regional and local levels.	GBRMPA QDEH	QDEH QDPI QFMA Conser-vation Science

Source: *Draft Performance Indicators: The Great Barrier Reef, Keeping it Great: a 25 year Strategic Plan for the Great Barrier Reef World Heritage Area, 1994 - 2019,* Great Barrier Reef Marine Park Authority, Townsville

MODULE	**7.** **Making Integrated Coastal Zone Management Work**
TRAINING SESSION	**7.6** **Legal and Institutional Issues and Mechanisms that can be Used to Support Sustainable Use of Coastal Marine Resources**
OBJECTIVE	To understand the legal and institutional issues and mechanisms that affect the implementation of ICZM and to examine the changes that will be necessary if ICZM is to be effective.
SIGNIFICANCE	The nature of ICZM requires that managers take a holistic approach to management issues. Awareness of the legal and institutional impediments to ICZM will assist managers in devising and implementing mechanism to minimise the negative influence of traditional, sectoral approaches to traditional land and sea management.
PRESENTATION	Lecture and workshop
TIME	2 hours
EQUIPMENT	OH, Whiteboard

TRAINING SESSION 7.6

LEGAL AND INSTITUTIONAL ISSUES AND MECHANISMS THAT CAN BE USED TO SUPPORT SUSTAINABLE USE OF COASTAL MARINE RESOURCES

Author: Kim Looi Ch'ng

INTRODUCTION

Welcome participants and explain that this session will examine the the legal and institutional issues and mechanisms that affect the implementation of ICZM. You will also examine the legal and institutional changes necessary if ICZM is to be effective. The nature of ICZM requires that managers take an holistic approach to management issues. Awareness of the legal and institutional impediments to ICZM will assist mangers in devising and implementing mechanisms to minimise the negative influence of traditional, sectoral approaches to land and sea management.

SESSION CONTENT

Legal and institutional issues in ICZM

To understand the legal and institutional issues and recommend the required mechanisms that can be used to support sustainable use of coastal and marine resources within an integrated coastal zone framework, several factors have to be considered:

- It is important to understand the intrinsic characteristics of ICZM and the prevalent legal and institutional framework.

Coastal and the associated marine resources are most appropriately managed in an holistic context in which all parts are presumed to be interdependent. Sustainable use of coastal and marine resources is intrinsically holistic. ICZM examines and takes into account the multitudinous ecological relationships that exist between and within the terrestrial, the atmospheric and water components of the coastal zone. ICZM is therefore more complex and challenging than just managing water or air pollution per se. These attributes have significant overtones with respect to how government institutions addresses coastal zone problems and opportunities.

ICZM is a new approach with which most policy makers, decision makers and resource managers are unfamiliar. Currently, most governments address

environmental issues on a sectoral basis. Legal and administrative jurisdictions are often essentially exclusive and bureaucracies zealously guard their "turf". More often than not these bureaucracies are parochial in their responses when responsibilities/authority should be shared.

A holistic perspective, essentially broad-based, requiring widely applicable responsibilities, addressing myriad ecological interrelationships and permitting encroachment into traditionally exclusive jurisdiction conflicts with the principles that underlie the approach taken in sectoral management of coastal resources. Changing the philosophy to one calling for shared jurisdictional responsibilities is often fraught with difficulties and is opposed by traditionally entrenched authorities. Failure in the implementation of ICZM plans and policies can often be attributed to such traditional behaviour in organisations which are responsible for the management of the coastal zone.

- Effective collaboration and coordination among government organisations requires agreement about common overall goals. This agreement is difficult to achieve and does not necessarily ensure effective collaboration.

An essential component of ICZM is a mechanism (or a forum) which will establish and enforce the norms of communication and decision making between the organisations responsible for the management of coastal resources. There is also a need for a focal point for coordinating the planning, implementation and monitoring of ICZM plans. This also provides the oversight needed at the different levels of national, regional and local government.

- Another constraint towards the acceptance of sustainable ICZM is that the stakeholders in most cases favour the traditionally preferred benefits of employment and economic growth rather than the implicit but not obvious benefits (at least in the short term) of sustainable management of coastal resources.

Changes of organisational framework, behaviour and approaches towards the management of coastal and marine resources can only be implemented by government with the competent authority to enforce such changes. The government must have the authority to introduce change through incentives and compliance control, through direct (by regulations) and/or indirect means (by economic sanctions or incentives).

An appropriately conceived legal framework and organisational structure in government would have to be in place to provide the required support for the implementation of the ICZM policies. The nature of the relevant legal framework and organisational structures would be influenced largely by the policies established and also the resources available to ensure successful implementation of the ICZM policies.

These legal and institutional frameworks and the associated laws and organisational operations would have to be structured in such a manner as to

address the goals of ICZM. ICZM obviously requires significant changes in the framework, behaviour and prevalent norms of use and exploitation of coastal and marine resources.

Environmental laws: constraints faced in its enforcement

The measures imposed under laws and regulations with regards to the environment are often viewed by the public (stakeholders) as autocratic and arbitrary. The benefits are often not obvious because the costs imposed are in anticipation of benefits in the distant future. For example, by retaining mangroves, managers can prevent erosion of the coastline. The cost of retaining mangroves is often high and the direct benefit of keeping mangroves as well as advantages in the future may be obscured from the stakeholder's point of view. It is necessary, therefore, to implement an intensive awareness programme with regards to the long-term benefits of sustainable coastal resources management. This should be an important component of the relevant legal and institutional policies.

The legal milieu and its relevance to ICZM

In planning for ICZM, the relevant environmental laws must be considered. They establish the framework in which organisations function and they grant the rights and authority in which the organisations operate and dictate their mission. In a similar manner, societal norms become customary law once they are codified in the legal framework.

Laws are used to achieve desired objectives or goals. Examples of such objectives are: the prevention of coastal erosion through sustainable use of mangroves, optimising the exploitation of the marine resources on a sustainable basis, enhancing the quality of life through the Clean Air and Water Act etc.

Laws alone cannot be relied on to achieve compliance. It is necessary to obtain the general community and the stake holders support for the goals of sustainable use of coastal and marine resources.

Laws and the appropriate organisational structures are crucial to the success of any ICZM plan. The dynamic nature of the coastal and marine areas and its particular vulnerability to environmental degradation necessitates a legal and institutional regime which is specific to ICZM.

ICZM presents a very demanding task for governments. It requires the development of a totally new, visionary legal framework and accompanying mechanisms in which the ICZM philosophy and goals can be achieved. Arbitrary boundaries imposed by sectoral management (without reference to the dynamic nature of the coastal ecosystem) undermines ICZM. Effective ICZM requires the adoption of a comprehensive holistic framework (and philosophy) when drafting the legal and institutional frameworks and when arranging the planning, implementation, monitoring and enforcement of the activities in the coastal zone.

The major constraints facing the implementation of ICZM are the ingrained and well established sectoral institutional and legal systems. In order to achieve

successful implementation of ICZM, it is often necessary to change the way existing institutions function and to establish new institutional frameworks or management arrangements and structures which will set the norms and guide the activities in the coastal zone. This requires the amendment of existing legislation and/or the establishment of new legislation.

To be effective, therefore, ICZM must be a governmental operation with a legal and institutional framework. It must have the support of the community at large to ensure that the management and development of the coastal and marine areas is directed towards the goals of sustainable use of coastal and marine resources. The ultimate aim of ICZM is to minimise the conflicts of use and the resulting adverse environmental and economic impacts and to optimise both the environmental and economic benefits.

Legislation is necessary to ensure a management regime which will regulate and guide social conduct to achieve the goals of ICZM. The long term result will be the integrated management of coastal areas.

Boelart-Suominen explained that the legal system needs to reflect the process of policy integration involving:

- A comprehensive framework of action which would consider the geographical scope and the incorporation of the interests of all stakeholders and relevant issues and opportunities.

- Analysis of several policy options from a holistic point of view as opposed to a sectoral angle.

- Developing policy decisions which are consistent with the goals of sustainable use of the coastal and marine resources (Boelart-Suominen et al, 1994).

- Relevant environmental laws must also be reviewed to ensure that they meet the criteria of comprehensiveness, holism and consistency (Boelart-Suominen et al, 1994). The relevant legislation should have the following characteristics:
  - Be comprehensive enough to incorporate:
    - the geographical areas relevant to the scope of the ICZM plan;
    - the institutions with authority over the activities in the relevant coastal areas;
    - the issues at hand; and
    - the environmental and socio-economic benefits and costs.

- Take a holistic approach with all substantive laws pertaining to the rights and duties consistent with the overall objectives of sustainable use of the coastal and marine resources; the decisions made in the implementation

of these laws will take into account all material information from various sectors.

- Establish mechanisms and procedures to ensure that at all times the legal regulations and guidelines applied by the various sectoral institutions (whether federal, regional or local) and by the different levels of government will be consistent with the overall policies and objectives of ICZM. As enforcement and application of the laws and subsidiary legislation and guidelines are at various levels of government there is a need for very explicit written guidelines. There should be a mechanism for monitoring and reporting to a national/regional focal point which has the authority to coordinate the implementation of national/regional ICZM plans.

Legal issues involved in the establishment of ICZM

ICZM is new subject matter in the management of coastal resources and is of intense interests and analysis. Chapter 17 of Agenda 21 of the United Nations Conference on Environment and Development (UNCED) focuses on the ICZM for follow-up action on a global basis. The United Nations Regional Seas Programme undertakes its programmes within the broad context of Integrated Coastal and Marine Area Management. The theory and practice of ICZM is therefore very actively analysed and undertaken.

Expressing into legal language policies and management objectives which need to be both consistent with the specific goals of ICZM and flexible and dynamic, is fraught with difficulties. The systems that are adopted also vary from country to country. Invariably, any legal system adopted has to take into account the prevalent legal system and social norms within the country concerned. Besides being tailored for integrated management of the coastal zone, the system has to take into account the practicality of enforcing the new system, bearing in mind the capacity and competency of the management staff and facilities. The systems may be established in phases, thereby building up the competency and capacity of the organisations responsible for the management of the coastal area over a period of time.

Definition of the coastal zone

In the development of the legal system, it is important to decide how to define the coastal zone and how to establish appropriate organisational structures and standard operational procedures (SOPs). This will direct all actions towards the achievement of the ICZM plan, objectives and goals, while at the same time ensuring that decision making is integrated and consistent with resolving user conflicts in the coastal zone.

The coastal zone is dynamic and the various elements present are interacting and changing constantly. Any specific or fixed temporal or spatial demarcation of boundaries is not consistent with the characteristics of the coastal zone. It is necessary to both reflect the dynamic nature of the area and to establish an acceptable degree of legal confidence. It must be remembered that the more

precise the definition, the less it will capture the inherent dynamic nature of the coastal zone.

The most common legal approach is to establish the landward and seaward boundaries, without any explicit definition of the area. This is based on the condition that activities which impact on the coastal and marine areas will be taken into account.

The coastal areas under the USA Coastal Zone Management Act (CZMA) includes the "coastal waters (including the lands therein and thereunder) and the adjacent shorelines (including the waters therein and thereunder) strongly influenced by each other and in proximity to the shorelines of several coastal states (which) includes islands, transitional and intertidal areas, salt marshes, wetlands and beaches". The CZMA provides a broad legal framework and the detailed definition of the coastal zones is left to each individual state.

New Zealand on the other hand, adopts a well defined core area called the "coastal marine area". This is part of a larger "coastal environment" which is not defined and over which the Act has authority. This allows a high degree of flexibility for policy and management purposes and still defines the area to which the law is applicable. Unless specific permission is given in a regional coastal plan, permits are required for a whole range of activities within the coastal marine area. One of the main objectives of the Act is to promote sustainable development.

It is not, therefore, of primary importance to define a precise area. It is sufficient to have a broad conceptual framework or no legal definition at all (Boelart-Suominen et al, 1994). The goals and objectives must be very clear, however, and policies, action plans and programmes must be integrated and consistently reflect the goals and objectives. Where important prerogatives and legal requirements are being effected precision is necessary regarding the area concerned. Such areas include conservation areas, buffer zones and watershed areas where strict preservation of the natural habitats is important for sustainable management.

The outer limits of the coastal zone

Several ICZM national legislations define the outer limit of the territorial waters as the outermost limit of the management zone while some define the exclusive economic zone (EEZ) as the outermost limit. The former definition coincides with the rights of full sovereignty as provided under international law over the area. Most of the coastal activities occur within territorial waters. The latter definition enables nations to manage the rights and obligations as detailed in the United Nations Convention on Law of the Sea (UNCLOS). The goal of UNCLOS is sustainable exploitation of the marine resources in the seabeds and the adjacent waters of the continental shelf and the EEZ.

The landward boundary of the coastal zone

For management purposes, the landward boundary of the coastal zone should extend as far as necessary inland to include areas which have ecological influence or are ecologically influenced by the coastal area and marine waters. The landward boundary need not be defined precisely. However, the legal

framework over which the ICZM plan applies should cover activities as far inland as possible to include areas which have influence over the coastal and marine areas. Policies directed towards the conservation of watersheds are examples of ICZM jurisdiction reaching inland in order to achieve a high level of water quality. On the other hand, areas close to the shoreline need to be defined in very precise terms. In these core areas permits may be required and laws should be strictly enforced to regulate a wide range of activities. Permits should be required for activities such as construction, aquaculture/mariculture, industries, ports, jetties, fishing etc.

Jurisdiction and responsibilities of line agencies

To ensure that the policies and programmes of the line agencies are consistent with the overall goals of sustainable use of coastal resources and to reduce institutional conflicts, the institutional arrangements and measures of ICZM legislation needs to be clearly and precisely defined. This will ensure the required coordination between line agencies and the different levels of governments in the implementation of programmes and activities established in the ICZM plan.

ICZM legislation is necessary to clarify and define the functions, powers, responsibilities and obligations of the government bodies which have sway over the coastal areas. The rights and responsibilities of the different levels of government (federal, regional and local) also need to be clarified. The necessary amendments should be made to existing laws to ensure that goals are consistent.

Institutional jurisdiction is a sensitive matter. Line agencies and governments at different levels often zealously hold on to their prerogatives. It is unrealistic to expect that by establishing ICZM the jurisdictional divides will break down immediately. The most immediate and urgent action for ICZM legislation is to eliminate as far as possible the existing administrative inefficiencies and duplications and to ensure that all relevant agencies/governments are involved in the decision-making processes with respect to activities that occur in the coastal zone and those activities that will impact on the coastal and marine areas.

If jurisdictional conflict is a major constraint to the successful implementation of an ICZM plan it may be necessary for the ICZM legislation to establish a high level policy making body. Representation on this body would come from all relevant agencies/ministries, different levels of governments and all stakeholders. The role of this body would be to formulate and monitor the implementation of national policies and plans with respect to the coastal and marine areas. This policy making body would ensure a common and agreed purpose and would encourage relevant agencies to conform to its policies and plans. Different levels of government may also need to establish coordinating/ authoritative bodies which would coordinate and monitor the implementation of the policies and plans at the various levels of jurisdiction.

The most successful attempts at establishing a legislative basis for ICZM are those where the government has undertaken a comprehensive review of all relevant

legislation from a holistic integrated perspective and/or established a new government body with a broad mandate to develop policy, legislate and enforce the legislation.

Institutional aspects of the implementation and enforcement of ICZM plans
ICZM plans are generally established, implemented and enforced through:

- A newly established, independent authority, with powers to coordinate, the functions and tasks of the ICZM plan through formal mechanisms. The functions and tasks are allocated to organisations with jurisdiction over the coastal and marine areas; or
- An existing agency with jurisdictional powers over the marine areas or an agency responsible for coordination of the formulation and implementation of national development plan. This latter agency takes the lead role in coordinating the formulation, implementation and monitoring of the ICZM plan.

Where the sectoral functions of line agencies/ministries become major impediments to the successful implementation of ICZM, a totally new institutional structure integrating the various sectoral line functions in the coastal and marine areas may have to be created.

In practice, coordination of functions and jurisdiction in the coastal and marine areas is the norm in the formulation and integration of ICZM plan. A lead agency undertakes the responsibilities of coordination and monitoring. This is often the case in countries where a very organised system of government already exists and where sectoral line agencies are strongly geared to handle each particular sectoral responsibilities.

In countries where the management powers over the coastal areas are the prerogatives of state or provincial governments, the central government needs to take the lead role to create the impetus and to coordinate the formulation of a common national policy and ICZM plan. The impetus could be in the form of incentives such as funding, capacity building or provision of the necessary expertise required for the formulation and implementation of the plan.

In the USA, the Federal Coastal Zone Management Act, 1992 (CZMA) is the basis for collaborative efforts between the federal government and the states which have agreed to establish an ICZM plan. The Act does not impose jurisdictional obligations on the states. It is a voluntary, "incentive-based Act under which participating States undertake to develop their own ICZM plan" (Coastal Zone Inquiry, 1993). The Act provides incentives in the form of funding and the authority to control the activities of federal government agencies within a particular state by insisting that they conform with and be consistent with the ICZM plan and policies established by that particular state. At the same time the federal government assumes certain control by having the power to approve and monitor the plans proposed, ensuring that they are in line with national priorities.

Under the USA's 1992 CZMA, the National Ocean and Atmospheric Administration (NOAA) is the lead agency responsible for the coordination of the implementation of the Act. It operates with the assistance of specialised agencies such as the Protected Species and Habitat Conservation Office and the National Marine Fisheries Service.

The role of the lead agency is crucial to the success of achieving the objectives and goals of an ICZM plan. Success depends on its ability and authority to coordinate and most importantly to adopt a holistic approach. The pace and success of integration and coordination depends very much on the ability to remove the national institutional administrative and legal divides that exist between institutions, especially between those responsible for the marine and terrestrial areas.

Integration

The formulation of an integrated ICZM policy detailing the long-term and immediate ICZM goals requires the involvement of all relevant agencies and organisations. This integrated policy acts as a basis for the development of integrated management action plans and programmes.

Integration is required at three levels:

- System integration of the physical, social and economic linkages of land and water use;
- Functional integration calling for activities within the coastal zone to be consistent with the goals and objectives of ICZM; and
- Integration of management and development policies and action.

Coordination, on the other hand involves coordinated activities of various government research and management institutions/agencies, coastal communities, stakeholders, private sector and Non Government Organisations towards the achievement of common goals and objectives through the implementation of agreed strategies established within the framework of the ICZM plan.

The ASEAN-US Coastal Resources Management Plan project established in the 6 ASEAN countries in 1989 calls for coordination at three levels:

- Vertical coordination between the central, regional/state and local/provincial government;
- Horizontal coordination between the various sectors at each of the government level involved in the ICZM plan; and
- Coordination to ensure that at any one time all relevant individuals/organisations/stake holders are pursuing the same goals and objectives.

The extent to which integration and coordination is achieved in the institutional arrangements set up for implementing national ICZM plans varies from country to country. The pace of moving from a piece-meal sectoral approach to final integration and coordination of action to achieve common objectives and goals depends on the competence and capacity of the government organisations involved, in particular that of the lead agency. The most crucial factor is the political will of the various governments involved to work towards mutually agreed long-term goals of sustainable management of coastal and marine resources as opposed to short-term development goals based solely on socio-economic criteria.

This is the case of Sri Lanka which moved from the sectoral approach in 1963, with the establishment of the Sri Lanka Coast Protection Unit. This graduated into a Coast Conservation Division of the Ministry of Fisheries in 1978 and into a department in 1984. The culmination of all these activities is the approval by the cabinet of a Coast Conservation Act and a Coastal Zone Management Plan in 1990 (Boelart-Suominen et al, 1994).

SESSION ACTIVITIES 7.6

- Ask participants to divide into groups of five to discuss their national/regional/local legislation which have sway over the coastal and marine areas. List the various activities in the coastal and marine areas and identify the line agencies/ministries/governments which have management and jurisdictional authority over these activities. Identify the geographical boundaries and areas over which the ICZM plan will apply. Identify who will be affected by the ICZM policy. Identify which line agency/authority/government is responsible for implementing and enforcing the various aspects of the policy. Most importantly they should identify the inter-agency jurisdictional conflicts or grey areas of jurisdiction that exist between line agencies/authority/government.
- Ask participants to develop recommendations amending existing jurisdictional, institutional arrangements and decision-making processes relating to the activities in the coastal and marine areas. The amendments should reduce redundancy in decision making processes among the agencies/authority/governments which have authority over the activities in the coastal zone. The jurisdictional and institutional systems recommended should be based on a holistic perspective and the organisational structures should ensure that activities of all agencies and stakeholders are consistent with the objectives and goals of the ICZM plan.

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