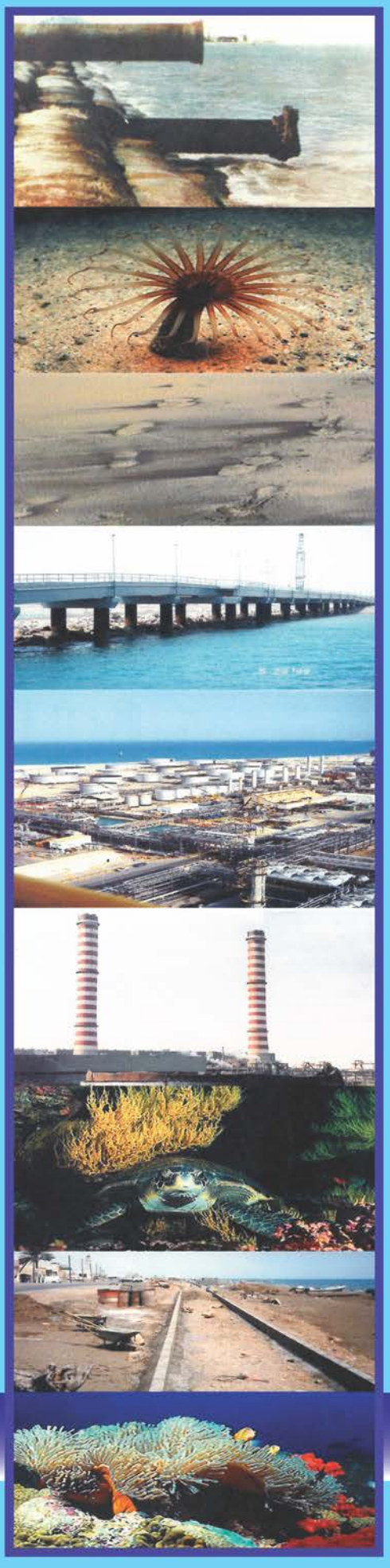

Integrated Coastal Areas Management

Guidelines For The ROPME Region

Kuwait, 2000

ROPME/GC-10/001

INTEGRATED COASTAL AREAS MANAGEMENT: GUIDELINES FOR THE ROPME REGION

KUWAIT, 2000

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In the name of God,

the Compassionate, the Merciful

PREFACE

It is now widely accepted that sectoral activities produce combined environmental impacts resulting in marine pollution (particularly created by oil production related activities), fresh water pollution, air pollution, loss of marine resources, loss of natural land resources, land degradation, destruction of historic sites, etc. Very often, the hitherto policies to reduce coastal degradation have been based on the sectoral approach and have, therefore, failed. In most of the cases, the efforts based on sectoral approach made the coastal environmental problems to be transferred from the realms of the sector where they were created to the "jurisdiction" of another sector contributing, nothing or very little to the effective improvement of the environmental situation in the coastal area concerned. This situation is fairly typical in many coastal areas of the world. The ROPME Region is no exception. However, a number of activities, so far, have been undertaken to improve the environmental situation in the coastal areas of the region. But these efforts were far from adequate and steps had to be towards a more effective management of the regional coastal areas. The preparation of these guidelines is necessary, but only the first step to start a more organised programme towards achievement of the sustainable development of the coastal areas of the ROPME Region.

Sectoral approaches to the management and planning of resources utilisation can no longer meet the requirements of the management of complex systems such as coastal areas. This was well understood by the participants of the United Nations Conference on Environment and Development (UNCED) held in Rio in 1992. It was within this framework that "Agenda 21" (a major document-manifesto for the 21st century adopted at the conference), called for the promotion of adaptable and flexible process of integrated coastal areas management (ICAM). Its Chapter 17 on *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*, concluded 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". The Conference further concluded that the coastal area contains diverse and productive habitats and ecosystems important for human settlement, development and local subsistence, and noted that more than half the world's population lives within 60 km of the shoreline. It recommended that new integrated approaches be developed to marine and coastal area management and development, at the national, subregional, regional and global levels.

The United Nations Environment Programme (UNEP) was among the first to recognise that organised efforts have to be undertaken for a more effective management of coastal areas. It has stimulated, in early to mid nineties, the preparation of a number of methodological guidelines whose aim was to serve as the basis of a more practical coastal management efforts. These initiatives were undertaken in a number of areas covered by the UNEP's Regional Seas Programme. The first guidelines for ICAM were produced in the Mediterranean Region, later to be followed by similar actions in the Caribbean, Eastern Africa, Western Africa, South East Pacific, East Asia, etc.

The Regional Organisation for the Protection of the Marine Environment (ROPME) supports and co-ordinates, on a regional level, the rational management of the marine environment as a whole, and the coastal areas specifically. It is towards this end that the preparation of the Guidelines was commissioned. In this endeavour ROPME is being supported by UNEP. These efforts are also based on the experience and results achieved in the above mentioned regional seas, in particular those of the Mediterranean Action Plan and its Priority Actions Programme.

The first draft of the Guidelines was presented and reviewed during an expert meeting convened in Muscat in late May 1999. On the basis of the comments given by the experienced regional experts, the document was finalised soon after that meeting.

It is important to stress that in no way, neither ICAM, as a tool, nor these Guidelines, as a methodological basis for ICAM, can be understood as a panacea for all problems of coastal areas, nor are they a universal tool applicable in the same way in all the countries of the ROPME Region. However, there are proposals in the Guidelines that are applicable in almost any coastal situation such as the gradual process of ICAM implementation within some or all of the seven steps that are proposed. Other elements such as: the importance of individual natural resources, possibilities of implementation, institutional arrangements, or the application of tools and techniques, must be understood and applied with flexibility and with regard to the conditions prevailing in every particular area. We must encourage all of our technical personnel to use these guidelines and learn from their application, any shortcoming or observation that can make them more useful.

It is hoped that these Guidelines will be used as a tool by a large audience for the implementation of ICAM in the ROPME Region. We shall be grateful for any comments, amendments, and proposals for the improvement of the Guidelines, especially those based on the experience in their practical application.

ROPME has received the full support of UNEP and the close cooperation of many regional experts and the Consultant Mr. Ivica Trumbic in carrying out these important tasks. We are grateful to all the contributors whose assistance made these Guidelines materialize and to all those concerned from Member States that facilitated the preparation of these guidelines.

Finally the contribution of Dr. Hassan Mohammadi, Acting Co-ordinator, in final editing of the Guidelines is highly acknowledged. The work done by Ms. Nahida Al-Majed, Environmental Specialist, in the design and proofing the manuscript is greatly appreciated. The acknowledgement would be forwarded to Mr. Saji Omman for typing the final text and to Mr. Abdulqader Basheer for in-house printing.

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Executive Secretary of ROPME

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EXECUTIVE SUMMARY

Population pressure, particularly the growth of urban areas, combined with the rapid expansion of economic activities in coastal areas which are not always sustainable, and the extensive exploitation of marine resources, has created a world-wide concern about sustainable development of coastal areas and their natural and environmental resources. The harmful impacts of these human activities are visible all over the world and to some extent in the ROPME Region. This document is largely based on resource and environmental conflicts and their resolution in this region.

Coastal resources are used and exploited for the achievement of the economic and social objectives. Oil and gas extraction, urbanisation, industry, fisheries and aquaculture, energy production, tourism and recreation, transportation are only some of the most prominent coastal activities in the ROPME Region. These sectoral activities produce combined environmental impacts resulting in marine pollution (particularly from oil), air pollution, loss of marine resources, loss of natural land resources and land degradation, destruction of historic and architectural heritage, loss of public access to the coast, noise and congestion.

The evidence reviewed for this document shows that governmental policies to reduce or arrest coastal degradation have produced only limited results. Policies have mainly been based on the sectoral approach and therefore failed to take into account the overall impact of coastal development on resources. Because of the sectoral approach, preventive policies were difficult to develop and were usually ineffective. In a few areas, where relatively high levels of co-ordination between sectoral policies were achieved, coastal resources were managed in an efficient and environmentally acceptable way. It is now generally accepted that coastal systems are far too complex to be managed through independent sectoral policies. Rather than being transferred from one sector to another, from one region to another or from one resource to another, the existing as well as potential problems should be viewed and resolved within a comprehensive environmental, social and economic management framework.

The document therefore suggests that integrated management of coastal areas is required to lay the foundation for sustainable development which will reduce or eliminate pollution, rectify other impacts, and prevent these occurring in the future. The objective of the document is to set down the guidelines for such integrated management. It is addressed, in the first place, to national policy makers who need to provide the necessary political will, who can create the administrative and legislative framework and who can generate the financial means to set up and operate integrated management. It also offers sufficient guidance for the authorities responsible for implementing policy in a specific coastal area.

Integrated coastal areas management, or ICAM, is defined as an adaptive process of resource management for sustainable development in coastal areas. Sustainable development requires that the quantity and quality of coastal resources are safeguarded in order that they not only satisfy the present needs but provide a sustained yield of economic and environmental services for future generations.

The guidelines for the ICAM process are presented in three main stages:

(a) Initiation, (b) Planning, and (c) Implementation. In all three stages strong political commitment at all levels of government is needed if the ICAM process is to be carried out successfully.

The major objective in the first, Initiation, stage is to asses the feasibility of the ICAM initiative in a certain area, and to see what minimal requirements exist that will allow for the start of ICAM process, and for the achievement of reasonably stated objectives.

In the second stage of ICAM process (Planning), the preparation of the Integrated Coastal Master Plan is envisaged. It should be based on an extensive and participatory procedure which includes four separate phases:

(i) the preparatory phase with the identification of sectoral problems, resources and major stakeholders;

(ii) analysis including present and future uses of coastal resources and their interaction, and an assessment of the sustainability levels;

(iii) definition of goals of ICAM and strategies; and

(iv) preparation of integrated plans and policies, and of a plan of action.

The most important guidelines for the planning phases address: the definition of the coastal area appropriate for ICAM, establishment of the institutional mechanism needed for integrated planning, creation of legal instruments needed for integration and preparation of policy instruments, and the financing mechanism for ICAM.

The Implementation stage is broken down into two phases: (i) implementation of plans and (ii) monitoring and evaluation of the implementation. The most important elements in these phases are the application of environmental and economic evaluation techniques, application of appropriate policy instruments, employment of the necessary enforcement mechanisms and evaluation and updating of the management process on the basis of monitored results. To ensure proper implementation the guidelines propose a wide range of instruments for coastal resource management and environmental protection. In particular, they recommend the combined application of land-use controls and regulatory and economic instruments (such as charges and resource pricing) for pollution control and conservation.

An authority should be in charge of the ICAM process. Such lead agency, should be appointed by the government and play a major role in ensuring that all steps in the process are carried out with the participation of all parties involved, including the private sector and the public at large. The various development ministries (industry, energy, transport, public works, tourism, agriculture and fisheries) prepare their own plans and feed them into the integration process. The lead agency, the development agencies and local authorities operate together as 'coastal area management authorities' to undertake the ICAM process.

What are the benefits of ICAM? There are many instances where direct economic benefits from the improved coastal management were identified. ICAM also brings as closer to the effective valuation of our coastal resources so that we could be fully aware of the non-efficient and non-sustainable resource management practices. Many land policy tools used in coastal areas, as a result of the implementation of ICAM process, contribute to the protection of coastal land and natural habitats, otherwise being exposed to the indiscriminate destruction. Increased awareness levels of the coastal issues within the local population, decision makers and other stakeholders, if this activity is part of the ICAM process, could also contribute to the coastal protection and conservation. But above all, it is the linkages between various coastal sectors and knowledge of the need for the multifaceted process of coastal development which raises the hopes for a better coastal management.

1. INTRODUCTION

The purpose of this document is:

- to provide, within the context of the conditions prevailing in the ROPME Sea Area (RSA), general guidelines for national policy-makers, managers and professionals involved in the development and implementation of integrated coastal and marine areas management (ICAM) programmes, plans and projects aiming at achieving sustainable development of coastal and marine areas; and
- to assist in development of national guidelines for integrated coastal area management and development, and thus contribute to the implementation of principles and recommendations adopted by the United Nations Conference on Environment and Development (Rio de Janeiro, June 1992).

The ROPME Region has witnessed one of the highest rates of economic growth in the world, over the past three decades. As a consequence, the sudden and haphazard mushrooming of coastal developments in this period has been staggering. ROPME Member States have been, however, aware for a number of years of the unsustainable patterns of their development and the urgent need for an integrated management of coastal and marine areas. To this end, they have established a number of protected areas in the Region which are notable for their flora and fauna. Bahrain, Qatar and UAE have ambitious plans for nature reserves which are at different stages of development. I. R. Iran, Oman and Saudi Arabia have established well-defined marine reserves, sanctuaries and protected areas. Some Member States have taken major steps towards developing their coastal zone management plans and their integration with national development plans. Saudi Arabia has prepared a coastal zone management plan for the eastern part of the kingdom, Oman has developed a National Conservation Strategy and costal zone management plans, I.R.Iran has developed National Strategy for Environment and Sustainable Development, and Kuwait is in the process of finalizing its National Conservation Strategy.

Special efforts towards institutionalising integrated coastal area management as a potent tool for achieving sustainable development of coastal areas have been employed in the Sultanate of Oman. That was the reason why the Member States have suggested that Oman be taken as a model while adapting UNEP ICAM Guidelines to the needs of the countries bordering the ROPME Sea Area. During the last 15 years a number of coastal zone management plans have been prepared in the Sultanate of Oman with the help of the IUCN, namely:

- Coastal Zone Management Plan for Greater Capital Area, June 1986
- Coastal Zone Management Plan for the area from Quriyat to Ra's al Hadd, April 1988
- Coastal Zone Management Plan for Dhofar: Action Plan and Resource Atlas, October 1989
- Coastal Zone Management Plan for Musandam, February 1991
- Coastal Zone Management Programme: A Framework for Action, June 1991 and June 1992.

The above plans provided a solid basis for the creation of an appropriate institutional system in the country that would be the backbone of all ICAM efforts. First, the most appropriate ministry has taken the role of guiding these efforts (the Ministry of the Regional Municipalities and Environment), and co-ordinating the activities of other relevant ministries and institutions which could have any stake in the development and protection of coastal areas. Second, a large group of young experts has been

created, whose expertise was and will be crucial in management of coastal areas. And finally, a number of concrete actions in protecting the most important parts of the Oman's coastal area, and not letting any desired activity to be located there, are the most practical fruits of the efforts implemented in the last decade. The initial evaluation has shown that the decision to use Oman as a model for ICAM was well taken. A number of examples have been found to prove that statement and, wherever appropriate, they have been presented in this document in the form of boxes.

The guidelines contained in this document are based primarily on the experience of the countries bordering the RSA, but also of other regions, particularly those with similar physical and developmental conditions. The presented guidelines are not a rigid set of prescribed steps and procedures. Rather they represent a flexible approach consisting of alternative options serving the same goal. The choice and application of the most suitable option in a given situation will depend on the size, nature and actual circumstances of the area planned to be covered by the ICAM programme, plan or project.

The document is not an exhaustive manual covering all aspects and details encountered in the ICAM process. That level of elaboration of coastal issues could be found elsewhere (some of the relevant references are provided in the list of literature). The document is kept intentionally short, with only a brief description of major coastal issues and problems, and presentation of bare essentials of the ICAM process. With that in mind, the reader is advised to read the whole document, because in a relatively short time she/he could grasp the whole idea of ICAM.

The basic structure of the document follows from the above. After the introduction (Chapter 1), major coastal issues and problems, uses, impacts, interactions and effects, and the justification for ICAM is provided (Chapter 2). Basic stages and phases of the ICAM process are described in Chapter 3, while the tools, techniques and instruments for the implementation of ICAM are proposed in Chapter 4. For a closer insight into the ICAM process, the document provides the relevant bibliography. We hope that the document will provide enough substance to allow coastal managers to tackle the most profound coastal problems in their respective coastal regions.

2. JUSTIFICATION FOR ICAM

2.1. Common problems and conflicts in coastal areas

2.1.1 Introduction

The coastal zone is an area of intense activity, an area of interchange within and between physical, biological, social, cultural and economic processes. It is composed of multiple interacting systems: maritime, terrestrial and riverine. Changes, at any point in any part of the systems, can generate chain reactions far from their point of origin and possibly in a totally different system whose environmental conditions will be subsequently altered.

The ROPME Sea Area is a region that contains important coastal marine and terrestrial environments. It is a tropical sea where shallow coastal areas have traditionally supported highly productive ecosystems from which fish and other aquatic resources are harvested. In addition to natural protective and defensive functions against coastal erosion and flooding, these systems provide valuable services in terms of recreation, coastal tourism, marine transportation and other. The biological importance of the ROPME Sea Area is that it harbours important shrimp and other demersal fisheries, mangroves, scattered coral reefs and seagrass beds. Petroleum exploration and extraction, and associated maritime traffic is strategically important for the area's economies. But that poses serious threats to its coastal environments. The rate of population and economic growth in the coastal areas has also increased the pressure on the environment. Dredging and filling operations, domestic and industrial discharges and the unsustainable use of fresh water resources, highlight the need for effective use of integrated coastal area management.

Because coastal areas are today attracting population and economic activities faster than inland areas, competition is increasing over the allocation and use of coastal and marine resources, including space. Conflict over the allocation of coastal resources, therefore, is the inherent characteristic of coastal areas. Typical conflicts occur over:

- access to the coastline for some activities, particularly those that require locations on the sea-land interface (marinas, hotels, transport terminals, etc);
- incompatible uses which cannot exist in juxtaposition, such as recreation activities and aquaculture in marine areas;
- private ownership, which prevents public use of or access to coastal resources;
- long-term goals for conservation which inhibit immediate economic interests, e.g., whether to preserve or drain wetlands;
- provision of environmentally protective infrastructure in accordance with the rate of economic development, e.g., the expansion of sewage collection and treatment in keeping with hotel construction.

BOX 1

Key Environmental Issues in the ROPME Sea Area

1. Sea based pollution (marine activities)
   - ship-based pollution
   - marine transport risks
   - offshore oil leaks and spills as a result of offshore operations
   - artisanal fisheries
   - fishermen dumps
2. Land based sources of marine pollution
   - municipal waste water discharges
   - industrial discharges (including desalinisation and cooling waste)
   - solid waste
   - dust fallout
3. Coastal zone degradation and habitat destruction
   - dredging and filling
   - inadequately planned construction in the coastal zone
4. Unsustainable use of freshwater resources
   - changes in hydrological conditions
   - overexploitation of coastal groundwater resources

Adapted from: Lintner, S., S. Arif and M. Hatziolos. 1996. *The Experience of the World Bank in the Legal, Institutional, and Financial Aspects of Regional Environmental Programs: Potential Applications of Lessons for the ROPME and PERSGA Programs.* Washington, D.C.: The World Bank.

The current distribution of coastal resources is the result of geological, physical, biological, ecological, meteorological and other factors. Coastal resources can be regarded as commodities in the production of goods and services. The sustainable use of resources could be defined as the minimisation of non-renewable resource use, the efficient use of renewable resources, the reduction of waste generation, the recycling of wastes into productive activities, keeping discharges and resource uses within the absorptive (carrying) capacity of natural systems, and forcing polluters to pay for the costs of remediation. It is a necessity because it prolongs the existence of sensitive ecosystems, secures use of finite resources over the long run, helps alleviate developmental pressures upon coastal resources, and can provide large economic benefits for the coastal population. However, it can be seriously affected by man-made or natural events or processes, not all of which are immediately visible, such as:

- impacts generated by major development projects;
- accumulative impacts generated by a number of development projects which may be individually insignificant but which together may precipitate environmental damage;
- sudden natural episodic events of immense impact, such as earthquakes;
- prolonged low-scale pollution; and
- sudden man-made disasters, such as major oil spills or accidental discharges of industrial wastes.

One of the fundamental features of the coastal area is that its resources, and the activities along it, have interlinked onshore and offshore components.

The sand supply to beaches is an outstanding example of this interdependence. Sand is moved by wave action from sediment sources to sediment sinks. The onshore-offshore and the longshore movements of sand determine which beaches will be supplied with sand and which eroded. This pattern is dynamic, changing day by day, by season and by year according to seasonal changes in wave patterns or as the result of intense storms or of changes in sand supply caused by construction activities.

Similarly, water-dependent habitats require an intricate mesh of saline and freshwater flows on- and offshore. Changes upstream can affect the quantity and quality of the freshwater supply, changing its biological, chemical and sediment content. Changes downstream may result from the intrusion of sea water into the aquifer and a change in clarity resulting from an influx of suspended solids. Coastal resources, dependent on a delicate balance between water flows, may suffer severe stress from changes in hydrological conditions.

The same onshore-offshore interdependence can be found in man's activities along the coastline. Oil pollution from offshore spills, accidental and intentional ship discharges of oil and ballast waters, domestic sewage and industrial discharges from land-based sources will degrade the quality of beaches and inshore water for tourism and for aquaculture.

The interdependence of activities and resources in the coastal area explains why a sectoral approach to coastal area management has not been able to achieve satisfactory results. Each economic sector generates a range of impacts on various coastal and marine resources, but their combined impacts generate acute problems for the resource base on which their survival depends and cause conflicts between sectoral interests. A cost effective solution to one sector may be economically and environmentally detrimental to the needs of another sector.

It is now therefore being recognised that effective management of coastal and marine areas should be based not only on an analysis of individual activities and their impacts, but also on the combined effects of sectoral activities on each other and on coastal resources. The approach to coastal resources management and to sustainable development

of coastal areas has to be holistic, co-ordinating and integrated in order to ensure that economic and social benefits from coastal resources are not dissipated by destructive practices or inappropriate use.

2.1.2 Definition of coastal zone and coastal area

The term *"coastal"* is, in the majority of cases, defined as a *"sea- land interface"* or "*a place where land, water and air meet"*. Consequently, a *"coastal zone"* is most frequently defined as *"land affected by its proximity to the sea and that part of the sea affected by its proximity to the land"* or, in other words, the area where the processes which depend on the sea-land interaction are the most intensive. This interface is taking place along two axes: the axis running along the coast and the axis perpendicular to the coastline. In terms of the basic definition of the coastal zone, there is little controversy related to the coast-wise axis, since it enables an easy definition of the boundaries of the coastal ecosystems. Quite the contrary, there is much dispute with regard to the cross-shore axis. Thus, definitions of the coastal zone vary from those covering the entire watershed areas in the hinterland part of the coast to those including a narrow coastal strip only. In any case, the definition of the boundaries of a coastal zone depends on criteria stemming from the goals of the particular ICAM initiative.

"Coastal area" is a notion which is geographically broader than the coastal zone, the borders of which require a less strict definition. This notion indicates that there is a national or sub-national recognition that a distinct transitional environment exists between the ocean and terrestrial domains. This notion is of extreme importance for ICAM. Many processes, be they environmental, demographic, economic or social, actually take place within the boundaries of the coastal area, with their extreme manifestations being most visible in the area of the coastal zone.

A graphical presentation of the elements of the coastal zone and the coastal area is given in Figure 1. *"Ocean waters"* cover the largest part of the sea belt, up to 200 nautical miles off shore (Exclusive Economic Zone). *"Coastal waters"* cover a narrow near- shore sea belt, its width varying from one country to another (in the United States this belt is approximately 3 miles wide). *"Intertidal area"* is the area between the lowest tide line and the shoreline (the landward extent of the tidal influence), including estuaries and coastal wetlands. *"Coastline"* is the contact line dividing the land from the water bodies. It usually coincides with the line marking the landward extent of tidal influence. *"Oceanfront or shorelands area"* is part of the land up to the highest line of tidal influence. This is a relatively narrow belt, with its inner borders usually reaching the first coastal road or encompassing the areas reserved for the public access to the coast, protection of sensitive habitats, etc. This belt is rarely wider than 1,000 m. *"Coastal uplands"* are defined as an area of the interior between the shorelands and, most frequently, the highest peak of the closest mountain range. Sometimes, the depth of the belt is limited (for example, in the United States the limit is 5 miles). *"Inland"* may be any area outside the aforementioned belts. However, it should not be considered as an altogether unimportant zone, since many processes affecting the state of the coastal zone originate in that area. Generally speaking, that coastal waters, intertidal area, coastline, shorelands area and coastal uplands are the elements of the coastal zone. In addition to the coastal zone elements, the coastal area contains the ocean waters and the inland area.

The coastal zone may be drawn wider or narrower in order to meet the programme goals. But the coastal zone always includes the intertidal and supratidal zones of the water's edge that include coastal

floodplains, mangroves, marshes, and tideflats, as well as beaches and dunes, and fringing coral reefs. In general, there are multiple aerial foci for ICAM:

- an administratively designated area, in the sense that the administration will designate the responsibility to manage to some government or general jurisdiction, such as province;
- an ecosystem area; the coastal ecosystem have to be included within the coastal area's or zone's boundaries in their entirety;
- a resource based area, e.g. a mineral body, oil fields, fisheries, marine habitats, protected areas, etc.;
- a demand area, i.e. the wider area from which demands are generated on the designated coastal zone, such as migrations, use for recreation, marine transport etc.; and
- a management area, with regard to the strictness of the management measures implemented; very narrow coastal strip with a very strict regime where very few economic activities are allowed, immediate hinterland zone, where urbanisation and industral development are the most important activities and land use planning instruments are implemented, and a wide coastal area with flexible management regime.

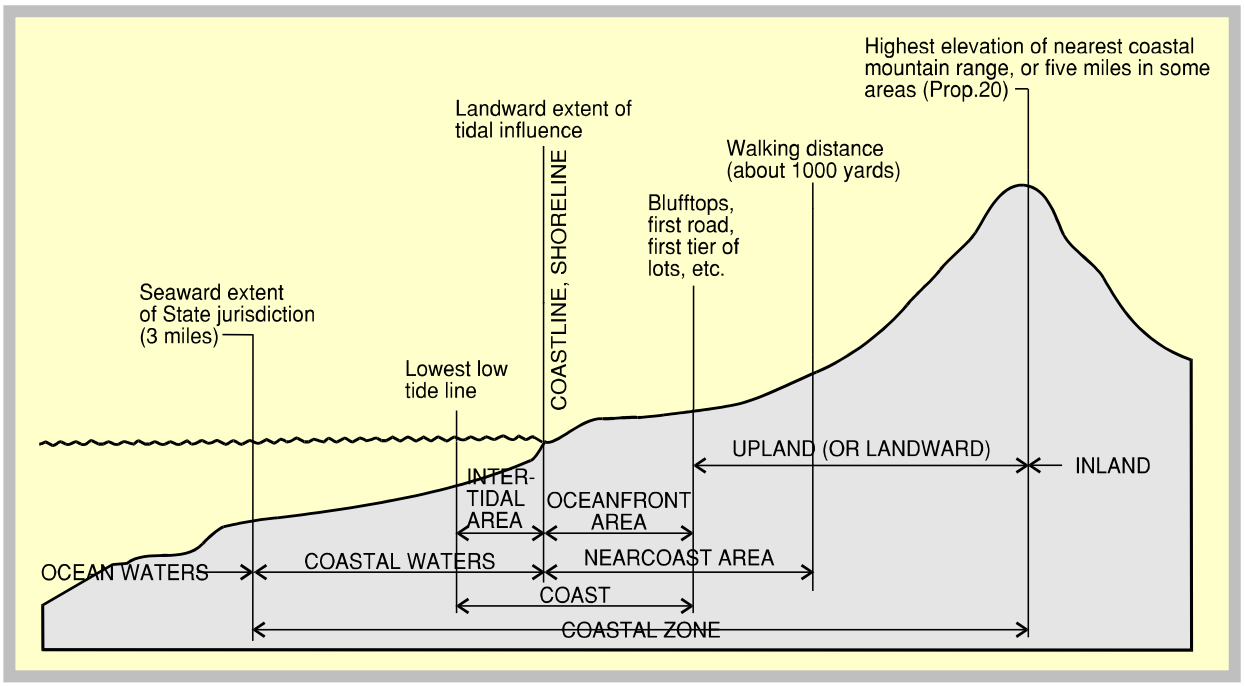


Figure 1: Parts of the coastal area

Source: California Coastal Zone Conservation Commissions. 1975. *California Coastal Plan*. San Francisco: California Coastal Zone Conservation Commissions.

2.1.3 Coastal resources

A resource is *something material or abstract that can be used to satisfy some human needs and desires, or make up for lacks of it*. Basically, resources are divided into natural, human and man-made. However, in the context of resource management, this term is reserved just for substances, organisms and properties of the physical environment (natural resources). The term is only used when: (1) there is knowledge

and technological possibility to utilise something, and (2) there is a wish to utilise something. It can be said that resources are a cultural concept, and that something that is considered a resource in one society does not necessarily has to be treated in the same way by others which lack the wish or knowledge to utilise that.

Another important division of natural resources is between stock and flow resources. *Stock (or non-renewable)* resources are those which have taken million of years to form and cannot reproduce themselves at a rate meaningful to people (minerals, land, oil, gas, etc.). *Flow (or renewable)* resources are those which naturally regenerate to provide new supply units within a human time-span. However, whether a resource belongs to one category or another depends only on man's decision and can be changed.

A coastal resource is most frequently defined as a *natural area or feature in or near a coastal zone, the existence of which depends on the coast*. The value of that resource, if treated as a commodity, grows because it is located in the coastal zone when the resource has economic, environmental, recreational, cultural, aesthetic or any other value for humanity.

Coastal zones feature a large variety of coastal resources. *Coastal waters* contain the greatest variety of marine resources and water birds, as well as significant recreational, transport, cultural and aesthetic values, aquaculture potentials, etc. *Coastal land* consists of sand dunes, headlands and cliffs, reefs, bluffs, bays, lagoons, wetlands, flatland and hilly or mountainous area, etc. The most important resources of *inland surface waters* are watersheds and freshwater supplies.

Most frequently, coastal resources are renewable. For the requirements of ICAM, it has to be pointed out that they behave as systems, that there are interactions between them, that they can be utilised in many ways, that between the various kinds of their utilisation there can be complementarity or conflicts, that they supply private goods as well as public goods, etc. The coastal resources have to be at the disposal of the present, and remain at the disposal of the future generations. Sustainable utilisation is a prerequisite for this continuity. This implies a perception and understanding of coastal resources as a capital investment with an annual yield, where the yield and not the resource is being utilised.

2.1.3.1 Sands and dunes

Natural beach processes create natural defences against attack by waves, currents and storms. The sloping near-shore bottom causes waves to break offshore, dissipating energy while rushing up the beach foreshore up to the ridge or crest of the berm. The upper flat beach is only reached by storm waves. There is a direct relationship between energy of the waves and the sand grain size. Larger particles are found on high energy beaches. Beach sediments range from fine particles, carried in suspension, to coarse pebbles and cobbles, depending on their source and longshore transport by waves and currents. Beach characteristics are usually described by particle size and composition, width of sand beach, steepness of foreshore, presence of sandbar or existence of barrier islands.

Well developed sandy beaches are by no means scarce resources, but their conservation is an important part of coastal zone management. The beach area is dynamic, adjusting according to changes in wave energy both under normal conditions and under storm conditions. Sand will be deposited where wave energy is dissipated; sand will be removed from the beach where wave energy is not satisfactorily dissipated

and the remaining energy erodes beach berms or dunes, particularly under storm conditions. Under natural conditions, the beach will undergo periods of stability, where sand supply equals sand loss, and periods of erosion followed by periods of rebuilding. Alternate erosion and accretion are part of normal dynamic coastal processes. So are movements of sediments along the shore, known as littoral transport, which are both parallel and perpendicular to the shore.

Sandy beaches are a relative hostile environment; their ecosystems are of relatively low bioproductivity compared to wetlands. The beach is an area in constant motion, poor in organic matter and lacking the essential nutrients necessary for the development of a well established food chain. As grain size decreases towards slit and mud and retained organic matter increases, an increase in species numbers and diversity is found. As a resource, sandy beaches are of extreme importance to recreation and tourism activities, where the presence of wide gently-sloping, fine sand beaches can provide the essential element for economic development. The beach then becomes highly sensitive to pollution which could reduce its attraction to visitors.

Coastal dune systems are of greater ecological interest and are highly sensitive to damage by human activities. Their survival now depends on maintaining a plentiful supply of sand, and on the vegetation which enables its stabilisation.

2.1.3.2 Banks, cliffs and bluffs

Banks, cliffs and bluffs are frequently formed by rock formations or semi-consolidated rocks, and are vulnerable to erosion by processes at the toe of the slope and at the top. Currents and wave action at the toe directly undercut the cliff face, undermining the stability of the cliff and creating notches or overhangs. When the overburden becomes unstable, possibly as the result of weathering or as the result of seepage or accelerated infiltration of surface water, adding weight and causing lubrication at the head of the cliff, the cliff material slumps, slides or falls. Material accumulated at the base of the cliff will then be removed by wave energy.

2.1.3.3 Bays, lagoons and estuaries

The most productive and most vulnerable coastal areas from an ecological point of view are the “wet” ecosystems, the interfaces between marine, terrestrial and riverine habitat. Upper wetlands contain salt tolerant plants, capable of withstanding flooding by tides. They store nutrients and organic detritus. Lower wetlands collect and store dissolved mineral nutrients; plant tissue is washed out into coastal waters. Wetlands are particularly important as habitats for shore and wading birds. The mixing of freshwater from land-based sources with seawater, creating water systems of varying salinity, together with variations in bottom composition (fine mud sediment to coarse sand particles) influences the type of coastal wetlands.

The management of coastal wetland resources should recognise the important characteristics which influence the carrying capacity of the ecosystem, such as:

a) Shelter: wetlands develop in areas protected from wave action or at low energy coastlines where wave energy is well dissipated. Protection enables the retention of suspended particles and living matter.

b) Light penetration and turbidity patterns: shallow waters and the amount of suspended particles, detritus and organisms are important factors in determining rates of photosynthesis.

c) Salinity: mixing patterns and saltwater intrusion influence the diversity and distribution of biota.

d) Circulation: water movement and the transport of suspended plankton are important for the maintenance of

wetlands. Tidal flux may be particularly important for transporting nutrients and flushing out wastes.

e) Storage: wetlands develop in areas of high nutrient cycling where they can store nutrients for later use.

2.1.3.4 Visual coastal resources

Visual coastal resources are those images which become valuable through man's visual perception of them. Visual resource value may not necessarily coincide with the foregoing resource values identified in this annex; it may be another facet of their importance in coastal zone management. Most of the methodologies used in landscape analysis include a combination of characteristics which contribute to visual diversity, and to visual harmony.

Visual diversity of line, point and area features is particularly strong along the coastline, due to:

- contrast between land areas and water areas, between gentle shores and steep cliff edges, between vegetated surfaces and exposed rocks;
- multiple topographic, vegetation and water interfaces as environmental conditions change from marine to terrestrial and riverine habitats;
- vividness generated by the dynamic movement of waves, spray, flowing water, light and shade;
- vibrant colours with a combination of blues (water), greens (vegetation), yellows (sand) and browns (rocks).

Visual landscape value is also found in characteristics which contribute to visual harmony, including:

- continuity of the open sea water surface and continuity of the coastline;
- congruity of lines, patterns, shapes and sizes of natural and man-made elements and structures which blend together, complementing each other.

2.1.3.5 Historical and archaeological resources

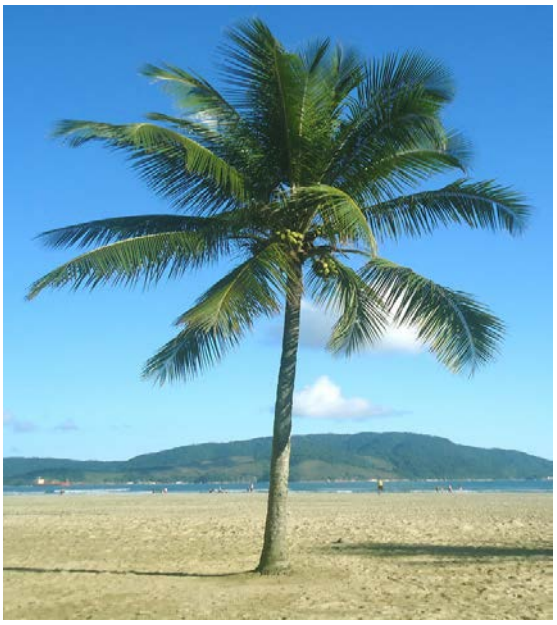
The coastal zone is rich in the remains of civilisations, leaving remnants of maritime activity and of coastal activity. Coastal civilisations focused on shipping, shipbuilding, fishing, trade and commerce, harbour installations and port related industries.

Underwater remains include:

- wrecks of ships and their cargoes;
- submerged harbours;
- sunken cities, the result of eustatic changes in sea level.

The seabed in many cases, preserves underwater antiquities by layers of sediment and by the lack of oxygen which slows the process of degeneration of wood, metal or organic materials.

On land, coastal civilisations have left monuments of their built structures, including harbours, storage facilities, aqueducts and the public and private facilities of flourishing urban centres. Coastal zone management should identify and conserve historical and archaeological remains for this and future generations.



2.1.3.6 Coral reefs

Tropical coral reefs are the most diverse of all ecosystems. It includes animals and plants and provide food and shelter for a greater variety of living things than most other natural areas in the world. They support one third of the fish species.

Many massive coral colonies are known as “reef builders” and collectively form the large masses of coral rock called a coral reefs. There are three basic types of coral reefs: fringing reefs, barrier reefs, and atolls. Coral reefs are a vital part of the coastal environment in the tropics. the skeletons of corals break down to rubble and eventually to sand which helps build up shore lines and beaches. Coral reefs also protect coastlines and coastal villages from large ocean waves created by storms and cyclones.

The activities of people present the greatest threat to coral reefs. Corals are collected for use as building blocks or for sale as souvenirs for tourists. In some areas, corals are being destroyed by destructive fishing methods, such as the use of explosives and poisons. Other activities, such as dredging harbours, coastal building projects and forestry may release silt into the water which blocks off sunlight or smothers the coral polyps. Use of the inappropriate fishing nets can seriously damage corals. Once destroyed corals may take a long time to grow back.

2.1.3.7 Mangroves

Mangroves grow in sheltered areas of brackish waters, where freshwater mixes with seawater, halfway between the land and the sea. thus their roots grow in an alternating environment of sea water and freshwater runoff from the land. There are 90 different types of mangroves. Due to the severe climatic conditions in conjunction with limited habitats and niches only one eurythermal and euryhaline species, *Avicennia marina* occurs in the RSA.

Mangroves play an important role in providing shelter for marine creatures and in producing large amounts of organic matter which is used as food. Mangroves are also important in protecting and building-up of shorelines. Mangroves also provide:

- permanent homes for species such as oysters and crabs;
- nursery areas, or areas where the young grow up before moving out to deeper waters, for animals such as shrimps;
- breeding areas for fish;
- feeding areas for larger fish.

Mangroves usually grow in flat muddy, insect ridden areas, which very few people regard as worthy of saving. As a result, mangrove areas are often used as rubbish dumps, or the trees are cut down and the land filled in for housing or other development.

Mangroves are particularly affected by:

- changes in the tidal flow or salinity of the surrounding water;
- construction work or coastal development which cause sediments to build up, or to be washed away from mangrove root systems, and
- pollution such as chemicals, oil or excessive amounts of sewage in the water.

2.1.4 Land and marine uses: their impacts on coastal areas

The following paragraphs identify some of the impacts of the main land and marine uses most commonly found in coastal areas of the ROPME Sea Area.

2.1.4.1 Urbanisation and settlement

The main impacts of urbanisation and settlement relate to physical needs for space and to impacts generated by uncontrolled or untreated wastes. Urban settlements on the coast have expanded rapidly in the last twenty years, mostly in the developing countries. Irreversible impacts of urbanisation may include the encroachment of building on arable land (one of the foremost destroyers of mangrove communities), forests, open space, the beach or valuable habitats, such as wetlands. Reversible impacts may include the generation of effluents, emissions, wastes and noise which could be prevented, abated or reduced by preventive measures at source or by adequate facilities for collection, treatment and safe disposal. The need for space has generated projects for land reclamation. Shoreline modification involving infilling adjacent to the shoreline or the creation of offshore artificial islands with links to the shoreline, may cause irreversible impacts if the land reclamation is located along or adjacent to shores of high coastal and marine ecological or landscape value. Major ports and harbours are the focus of intense activity and experience many user conflicts and are very vulnerable to environmental degradation. The location of ports attracts industry, with associated environmental and socio-cultural effects.

BOX 2

Estimated total population and the coastal population in the ROPME Member States estimated for the year 1998.

Member States	Population (est. 1998) (in million)	Coastal Population	Percentage of coastal population
State of Bahrain	0.6	0.564	94%
I. R. Iran	64.1	6.410	10%
Republic of Iraq	21.8	1.744	8%
State of Kuwait	1.9	1.336	37%
Sultanate of Oman	2.5	1.575	63%
State of Qatar	0.5	0.290	58%
Kingdom of Saudi Arabia	20.2	1.818	9%
United Arab Emirates	2.7	1.809	67%

Source: ROPME. 1999. *Regional Report of the State of the Marine Environment.* Kuwait: ROPME.

2.1.4.2 Tourism and recreation

As tourist demand rises, coastal user conflicts increase and greater stress is placed upon the environment on which it depends. The impacts of tourism and

recreation are similar to those of urbanisation and settlement, but have some particularly problematic characteristics. Irreversible physical impacts of development may cause damage to the very resources that attract visitors, such as fragile ecosystems, vulnerable visual landscapes and valuable historic and archaeological sites. It is not rare to find that mangrove areas, coral reefs and salt marshes are destroyed to provide sites for tourist development.

The generation of effluents is highly seasonal; the provision of treatment facilities adequate for the large influx of tourists for a relatively short season has often been regarded as uneconomic and unjustified by coastal communities. The number of people per unit area is generally greater in tourist areas than in non-tourist areas of similar size, and so as a result the impacts are more concentrated. The tourist sector is becoming increasingly aware that protecting environmental quality is an essential basis for its own success and tourism can therefore have a positive impact by demanding adequate facilities for the prevention and treatment of pollution.

BOX 3

Impacts of tourism on coastal and marine areas

In the early stages of mass tourism development, the impacts of tourism were largely viewed as positive, particularly with regard to their influence on the economic development of a region or a country. The influx of "foreign" cash into an economy was viewed as an "export" industry from an economic perspective. Consequently, tourism was seen as a desirable sector to target for development. However, more recently it has been recognised that there are costs associated with tourism development (...)

As the growth of marine tourism has become widespread, an increasing number of reports show that significant environmental, social, cultural and even economic damage can result. However, there are also success stories, where the development of marine tourism has, on balance, improved things (...)

Source: Orams, M. 1999. *Marine Tourism: Development, Impacts and Management.* London: Routledge.

Biodiversity reduction, resource depletion, and human health problems may result from the accumulated environmental effects of tourism. A most serious impact from tourism development, world-wide is decline of water quality. Oftentimes, resource plundering and environmental deterioration for tourism are root causes of social disruption. If the situation deteriorates sufficiently, there is also loss of jobs, income, and hard currency earnings, factors that lead to social instability. A successful tourism strategy will therefore seek to maximise the economic benefits of tourism development, while preserving the natural environment and the cultural milieu upon which it depends.

Source: Clark, J. 1998. *Coastal Waters: The Conservation Challenge.* Oxford: Blackwell.

Recreation and tourism facilities are developing very fast in many countries of the region. These facilities include marinas, water sports, fishing, marine parks, diving, archaeological siting and other entertainment.

Such facilities are expanding and developing considerably well in Bahrain, Oman, and U.A.E. where they are extensively used by both local nationals and expatriates and by visiting tourists. They are also being established in Saudi Arabia and Iran.

With the development of recreation and tourism facilities in the coastal area as an important industry for the diversification of national incomes, a number of luxury hotels and extensive range of restaurants have been built with necessary coastal roads to cater for the diverse needs. These installations if not well designed and managed may have adverse effects on the marine and coastal environment, and should therefore be carefully monitored and regulated with a view to protecting this valuable resource against degradation, damage and misuse.

Source: ROPME. 1999. *Regional Report of the State of the Marine Environment.* Kuwait: ROPME.

Perhaps one of the greatest impacts of tourism is on sand dunes. They are very fragile habitats and they represent the temporary store of beach sediment in the supratidal zone. It has been shown that any area subjected to visitor pressure will, at some time, show signs of degradation. Special damage could be done to sand dunes from off-road vehicles, horse riding and sports playing such as golf, volleyball, soccer, etc.

2.1.4.3 Industry

The location of industrial plants on the coastline, if it is in ecologically sensitive or visually valuable landscapes, or in areas of potential for tourism or recreation will have an irreversible impact, similar to that generated by urbanisation. However, industry is an integral part of sustainable development in coastal areas and many of its impacts can be reduced, depending on the type of industrial plant and the efficiency of pollution-control equipment installed.

If the most important factors for the location of industry are taken into account (suitable land, supply of raw materials, need for water, means of waste disposal, and means of transporting) it is clear that the coastal areas offers many advantages. Coastal locations, particularly those for heavy industries, pose a variety of threats that could extend considerably beyond the plant sites. Discharge of untreated industrial effluent to marine waters, discharge of inadequately treated or untreated industrial effluent to sewerage systems incapable of treating them, gaseous and particulate emissions from industrial processes and fuel-burning, disposal of solid wastes, particularly hazardous wastes, and the generation of obnoxious odours or noise are all reversible impacts which could be restricted by imposing performance standards and reduced by control equipment at source or collected and treated before safe disposal.

Location of heavy industry may also attract the development of “spin-off” manufacturing industries that could also be environmentally damaging. Planning decision related to industrial siting must consider the secondary development a heavy industry will induce.

2.1.4.4 Fisheries and aquaculture

Fishing remains a major source of nutrition, as well as an important economic activity in many areas. This refers to as much to the ocean fishing as to the small scale artisanal fisheries. In many countries, small scale fisheries are the largest suppliers of animal protein.

The need for an unpolluted marine environment for fishing has sometimes been the reason for initiating coastal zone management programmes. It is essential that water quality and critical habitats be protected and that convenient boat landing and fish processing facilities are available to fishermen.

Major problem with fisheries is overfishing, and the practice all over the world has shown that this resource is not being utilised sustainably. Many important fishery grounds have been led to resource depletion. On the other hand, the improper fisheries practices have brought significant problems to some important ecosystems (for example, the dinnertime fishing and improperly used nets seriously damage coral reefs).

Aquaculture is rapidly developing activity which requires unpolluted marine space but it may be responsible for impacts of pollution and disease affecting local fish populations due to impacts of wastes, nutrients and upsetting the ecological balance for other fish species. One of the more recent socio-economic problems resulting from large scale aquaculture development is the increasing frequency of disease outbreaks. Wastes discharged into coastal waters from aquaculture and changing weather conditions are also thought to contribute to the increasing incidence of red tides that can cause mass fish kills resulting in major losses of income and threats to public health.

BOX 4

Fisheries in the ROPME Sea Area

The fisheries of the ROPME Region, particularly shrimp, are of considerable importance to the Region. Over 1,000 fish species, six species of shrimp (*Penaeus semisulcatus, P. indicus, Metapenaus affinis, M. stebbingi, M. monoceros, Parapenaeopsis stylifera)*, two species of spiny lobsters (*Pnulirus homarus, P. versicolor*), one species of shovel nose lobster (*Thenus orientalis*), one species of cuttlefish (*Sepia pharaonis*), one species of abalone (*Haliotis mariae*), one species of crab (*Portunus pelagicus*) support the commercial fisheries in this region. Until almost middle of the century, pearl oysters (*Pinctada margaritifera and P. radiata*) represented a major source of income in the ROPME Region. The environmental extremes of the area has limited the distribution of many species, some live as close to their thermal tolerance limits as 1^{o}C during some parts of year.

The total marine harvest for this region ranged between 337,000 and 531,000 metric tons during 1985-1993, almost all of the harvest produced from territorial waters. Artisanal fisheries contributed over 79% of the total landings. The overall total landings have shown a downward trend since 1992 when they peaked at 531,445 tons with successive declines in 1993 and 1994, through landings at the end of this decade are still significantly higher than at the beginning 337,300 tons versus 504,300 tons.

Source: ROPME. 1999. *Regional Report of the State of the Marine Environment.* Kuwait: ROPME.

2.1.4.5 Energy production

Energy production has major irreversible physical spatial requirements on- and offshore. Plants not only require space for production, fuel supply and storage but also impose constraints on land and marine uses in their vicinity. Operational impacts include gaseous and particulate emissions, disposal of fly ash from coal burning plants, risks of oil leaks and spills, noise from gas turbines, and some thermal pollution of seawater for cooling. Many of the operational impacts can be reduced or prevented by pollution control measures.

Renewable sources of energy (solar, wind, waves, etc.) in general hardly generate any of these impacts. However, siting of windmills and solar panels may have negative impacts on the landscape and overall consumption of the coastal space.

2.1.4.6 Oil and gas extraction

Oil and gas development onshore and in shallow waters in coastal areas has been well established over 100 years. In the past 20 years there have been major advances in offshore oil and gas production and new technologies are permitting exploration and production in ever deeper waters. World production of gas and oil in coastal areas is constantly rising. The ROPME Sea Area is considered as the most endowed area in the world with oil resources, not only with regard to the present production but also with regard to the proven reserves.

All phases of oil and gas production (extraction, transport and refining) can cause serious environmental impacts to coastal waters. The major potential environmental threats are:

(a) pollution by oil spills from blowouts, pipeline ruptures, and transport accidents;

(b) pre-emption or destruction of vital habitat areas;

(c) general disruption of the coastal environment; and

(d) primary and secondary environmental and socio-economic impacts from a wide variety of associated onshore facilities.

In order to prevent negative consequences from sudden oil spills it is necessary that the relevant coastal governmental administrations prepare Oil Spill Contingency Plans. These plans should be frequently tested and updated. Due to the transboundary nature of the accidental oil spills it is extremely important that these plans be prepared at the regional level. The de-commissioning of oil and gas rigs is likely to be an increasing problem in the future.

BOX 5
Major oil spills in the ROPME Sea Area

Source	Amount (gallons)
1991 oil disasters	240,000,000
1983 Nowruz field	80,000,000
1981 Storage tanks(Shuaiba)	31,170,000
1978 Well Blowout & Pipeline (Ahvazin)	28,000,000
1985 Tanker Nova (140 kms. off Kharg Island)	21,350,000
1983 Tanker Assimi (Ras Al-Hadd)	15,800,000
1983 Tanker Pericles GC (30 kms. off Doha)	14,000,000

Source: Oil Spill Intelligence Report

2.1.4.7 Transportation

Road, air and maritime transport have extensive spatial requirements. Not only do their linear alignments and the location of terminals and parking facilities require space, transportation facilities also impose constraints on the use of land around them by creating areas exposed to noise and pollution, and by imposing physical and ecological barriers on the land crossed by them.

Maritime transport is likely to have significant impacts on coastal resources for port and channel construction and maintenance, for navigation routes, and for other sea uses. Operational impacts include noise and air pollution, and risks from the transport of hazardous wastes or oil spills. Oil residues, ballast waters and tar balls caused by marine transportation may ruin many tourist beaches, affecting the income of the surrounding communities.

2.1.4.8 Agriculture

The spatial impacts of coastal agriculture are limited, though the draining of wetlands for agricultural use is an example of an irreversible physical impact from this activity. Agriculture is particularly responsible for the wide dispersal of non-point sources of pollution by the overuse of fertilisers, pesticides and chemical sprays which penetrate to and pollute freshwater sources, marine waters and soils, either directly or via air pollution. The over-pumping of groundwater for irrigation has resulted in the pollution of aquifers by saltwater intrusion – in some areas now irreversible. Soil erosion and salinization of land are impacts of improper farming practice.

2.1.4.9 Conclusion

It is apparent from the above paragraphs that the combined impacts of several economic sectors on coastal resources may be far more severe than the impacts of each sector alone. Moreover, the damage to, or deterioration of coastal resources generated by one sector may undermine the resource potential or survival of another. Some of the impacts may be irreversible, permanently changing the quantity or quality of coastal resources. Others may be temporary and can be alleviated or abated without causing any long-term effects on, or alterations to the coastal resource base.

2.1.5 Effects of economic activities on coastal resources

The following paragraphs identify how coastal resources are affected by economic activities and indicate the kind of measures that can be taken to prevent the damage to, or deterioration of coastal resources.

2.1.5.1 Marine pollution

Most marine pollution is from land-based sources: domestic and industrial effluents, drainage from agricultural run-off, stormwater run-off in urban areas, or from solid waste disposal, airborne sources of pollution, and sediments from erosion or land reclamation. Marine sources of pollution are operational discharges (waste and ballast) from marine transport, oil leakage from oil exploration, exploitation and refining, and accidental discharges, including spills.

This kind of pollution is dangerous because of the long range effects of the environmental damage. While accidental and large oil spills receive the greatest attention, long-range but low-scale oil pollution can produce equally large damage. Other potential dangerous kinds of marine pollution are related to the transportation of hazardous and toxic substances. The severity of the effects on coastal resources of these types of marine pollution will depend on the composition of the pollution (nutrients, toxic substances), their quantity and level of concentration, and on hydrological conditions in the recipient waters.

Damage from marine pollution can affect the health of local residents, reduce attractiveness to tourism and recreation, damage marine ecosystems, reduce revenues from fisheries and aquaculture and reduce coastal property values. While zero marine pollution is an unrealistic objective, the adequate prevention or collection and treatment of all wastes and effluents would very considerably reduce levels of marine pollution.

BOX 6

Damages from oil spills in the 1991 war in the Inner ROPME Sea Area

During the 1991 war, the large oil releases formed a substantial oil slick. The movement of this slick was southwards, down the Saudi Arabia coast where winds continuously drove it onto the shore. The most heavily affected areas were the salt marshes and bays located between Ras Al Khafji and Abu Ali in the south. The environmental impact of this slick was great, causing the deaths of around 30,000 marine birds, the oiling of 20% of the mangroves on the eastern coast of Saudi Arabia along with hundreds of square kilometres of seagrass and mudflats, and damage to around 50% of the coral reefs. Other (secondary) sorts of damages also occurred. (...) Long term damage to the coastal environment has not been as serious as originally feared. Evaporation studies on oil suggest that winter evaporation can be double that of the summer, meaning that there was rapid evaporation of the oil spills, as they tended to occur under winter conditions. (...) Oil contamination of subtidal sediments was greatest in sheltered muddy flats (500-900 per thousand in some places). Many areas had escaped large scale problems of sinking oil, partly because of the fact that widespread use of dispersants did not occur, but also because much was carried on the surface. (...) Penetration of oil into sediments was also a slight problem. (...) Overall, however, contamination appears to be restricted to the top few centimetres, and as a result, pollution effects are less severe than if the sediment was bioturbated.

(...)

A survey carried a year after the spill revealed that while there was evidence that much of the oil had degraded, there were also areas which appeared fresh and were being supplemented by continuous releases from the sediment. (...) A second survey, carried out in 1992, revealed that damage done to many of the coral reefs had been largely superficial, despite the oiling which they have received. Locally, however, three reefs in Kuwait showed serious signs of stress, typified by bleaching and mortality. (...) Colonies of seagrass appear to be thriving, despite the fact that they had undergone complete covering in oil. Algal mass suffered extensive damage in the upper intertidal zone. (...) There was evidence of problems and mortality in fish stocks, but there are other factors which could also have caused this effect.

Source: French, P. W. 1997. *Coastal and Estuarine Management*. London: Routledge.

2.1.5.2 Freshwater pollution

Freshwater is polluted by the same land-based sources as marine pollution, but also by non-point sources from agriculture and by the intrusion of seawater into the coastal aquifer.

The most serious consequence of freshwater pollution is the loss of safe drinking water. Pollution of surface water bodies may also give rise to a health risk and may reduce attractiveness to recreation if accompanied by odour.

Adequate prevention, or collection and treatment of all wastes and effluents is essential. Further steps could be taken to protect freshwater catchment areas from polluting activities by imposing restrictions on the use of fertilisers and pesticides and by preventing excess extraction of water from coastal aquifers because it takes decades for a polluted aquifer to recover.

2.1.5.3 Air pollution

Air pollution from industry, energy production, traffic and air conditioning facilities consists of gaseous emissions, particulates and odour. Under certain conditions, photochemical smog develops. A serious problem in the ROPME Sea Area is the dust fallout from the deserts.

The severity of the effects on air quality will depend on the composition of the emissions, their quantity, their concentration, the height at which they are emitted and the topographical and meteorological conditions for dispersal. Several coastal areas suffer particularly from a heavy concentration of air pollution sources and others from smog where dispersal conditions are inadequate.

Damage from air pollution is predominantly to the health of local inhabitants, but it may also degrade the quality of the environment for tourism and result in damage to historic buildings and monuments. Air pollution is also an indirect cause of marine pollution.

Air pollution can be prevented by well established technological measures. Filters and scrubbers can be incorporated at point sources and restrictions can be imposed on the sulphur content of fuels burned. Non-point sources are more difficult to control, especially in relation to traffic and the use of agrochemicals. Pollution generated by road traffic can be reduced by technical measures (use of catalytic converters), but measures will still be needed to reduce traffic movement, e.g., by the encouragement of public transport.

2.1.5.4 Loss of marine resources

Physical changes to marine resources by severe pollution can result in a permanent loss. Damage to living marine resources can cause a loss of revenue to the fishing sector and a loss of ecological resources of value for nature conservation.

Marine and coastal ecosystems, particularly wetlands and sea grass beds, are important as spawning grounds and nurseries for many commercially valuable species, of high value for nature conservation and for the preservation of biodiversity, and are potential habitats for aquaculture. Wetlands are vulnerable to surface alterations and changes in hydrologic patterns which disrupt their functioning. Coral reefs are highly productive ecosystems. Mangrove forests have an indispensable role in protecting the tropical seas coastlines, as well as in being the natural habitat for many species. All of these ecosystems can be protected by carefully defined and controlled management regimes.

Loss of sand or beach material is also a loss of a marine resource. It is frequently the direct result of extraction for building materials or the indirect result of man-made interference in natural beach processes. The extraction of beach material can simply be stopped by regulation.

BOX 7
Wetlands in the ROPME Sea Area

Tidal mud flats represent the greatest contributions to primary production in the RSA. The most extensive mud flat system are located in the NW of RSA in the approximity of the Shatt Al-Arab delta. Detailed studies of the mud flats carried out in Saudi Arabia and in Kuwait have shown that the cyanophyta-dominated algal mats are covering mud flats. It is also accounts for most of the productivity in RSA, providing a major feedings area for wintering waders and passage migrants which fertilise these flats as they feed during their brief stay. Tidal mud flats also include sabkahs that also support mats of cynophyta, diatoms and bacteria, e.g. nitrogen fixing bacteria which also contribute to the overall productivity of tidal mudflats. Experts identified 624 species of organisms in tidal flats, compared to 452 in the sand biotope and 360 in the seagrass beds of the eastern coast of Saudi Arabia.

Drainage of wetlands and mudflats is an important emerging issue in the north-western part of the RSA. This action will have negative consequences on the fisheries and ecology of the area, and should therefore be vigorously addressed as a major regional challenge.

Source: ROPME. 1999. *Regional Report of the State of the Marine Environment .* Kuwait: ROPME.

2.1.5.5 Dredging and land reclamation

Most of the coastal development projects in RSA require extensive dredging and land reclamation operations. Immediately after the land is claimed from the sea, a series of changes which considerably affect the natural marine environment are set in motion. The effect of these changes will vary according to the size of the land claim, and the geomorphological characteristics of the area. However, despite these environmental problems and, sometimes, significant loss of marine resources, land reclamation has been practised for many centuries because the gains from the newly acquired land have been considered greatly to outweigh the drawbacks of land claim.

Large projects could have adverse environmental effects on the coastal environment. It includes damage to the spawning ground of various marine species and to seagrass beds. Removal or alteration of the benthos that form the main source of food for many commercial fish species, increase in siltation due to outslips of fine sediments. The release of fine material during dredging operations resulting in increase of water turbidity that may irritate or clog fish gills, interfere with visual feeding and inhibit photosynthesis. Land reclamation can disturb the natural the natural hydrodynamic conditions of the coastal waters and the fill material is not stable under local beach processes, so significant erosional problems may develop.

Construction of coast protection and sea defence works or harbours and breakwaters for marine transport and marinas can easily interrupt sediment transport, resulting in a reduced supply of beach material, coastal erosion, loss of beach width, and exposure of property to flood damage. Preventive measures are based on principles of working with, not against, natural processes and imposing restrictions on offshore and onshore construction.

As a remedial measure, strict government restrictions on dredging and land reclamation should be imposed. If such activities could not be totally avoided, environmental assessments for such operations should be carried out, and authorised dredging operations should follow clear operational standards. Impacts of such projects on the adjacent marine and coastal ecosystems should be carefully assessed and monitored.

BOX8

Dredging

Because of the need to protect the newly claimed land from renunciation by the sea, some sort of flood defence has to be installed.(...) Typically, this defence is an earth embankment, sometimes faced with stone, although occasionally defences may be concrete walls, particularly of high hinterland value, such as land claim for industrial development, port activity, oil extraction, etc.(...) If the flood defences are constructed using the material derived from the upper salt marshes, and if the land is to be farmed, it needs to be left to allow the salt content to be reduced sufficiently to allow crops to grow.(...)

The need for flood defences to protect land claim is also important in an environment of continuing sea level rise. (...) Although strictly speaking this effect is a natural phenomenon, and so not a result of human influence, the very process brings about many and varied responses from humans in an attempt to protect the developed coastal strip, and hence the process of sea level rise and land subsidence, collectively referred to in terms of relative movement of the sea, and termed *relative sea level rise,* has a profound impact on how we manage the coast and how we interact with it.(...)

The modifications to the remaining intertidal area caused by land claim require that if access to ports is to be maintained, the channel has to be artificially maintained. This maintenance often takes the form of dredging. It sets in motion a series of environmental modifications.(...) Another major problem with dredging is what to do with the removed material. In some cases, where dredging is occurring around ports, the contamination levels in the dredged material are so high that the only safe environmental option is to treat dredging as contaminated waste, and to process accordingly. In other cases, two options could be employed:

I. Material is taken offshore and dumped in a licensed dump site. In process terms, this represents a transfer of sediment out of the nearshore system into large inactive sediment sink. However, the loss to a system of large quantities of sediment can produce major deficits to the local sediment budget.

2. The "soft" methods can be employed, that is, the creation of coastal habitats as a means of defence. If dredging are of suitable grade and sufficiently free from contamination, then a good use.: for them is in the creation of such coastal habitats, whether by their use in beach feeding or in mudflat accretion. By carrying out such a process, the creation of habitats helps defend coasts but, perhaps more significantly from the sediment budget point of view, keeps the sediment within the sediment system.

Source: French, P. W. 1997. *Coastal and Estuarine Management.* London: Routledge.

BOX 9

Land reclamation: Management guidelines

Reclamation, or " land claim", as it is probably more accurately described, has enabled the population of many coastal areas to make increasing use of the coastal zone for agriculture, industry and settlement.

Every shoreline construction project affects natural habitats and ecosystem function. Whether it be clearing, grading, landfilling, laying foundations, or erecting structures, there will be effects. Shore construction has complex ecological effects. Often short-term solutions cause serious long-term problems.

Intertidal areas at the shore edge are especially important parts of the coastal ecosystem, including the mangrove forests, salt marshes, tide-flats, and beaches. They define the ecological boundary between land and sea. But, when shoreline development begins, these habitats are often the first to be obliterated. (...)

Threats to the productivity of unique coastal natural resources systems arise from uncontrolled development activities and their side effects , such as ... shoreline filling ... and other development activities that are distinct from those on land. (...) Wetlands are particularly at risk from shoreline development because wetlands simply do not have the carrying capacity that land areas have for supporting commercial and industrial activities or urban occupancy (...) Filling should be prohibited in wetlands for any purpose other than the installation of supports for permitted elevated structures. (...) Regarding biodiversity, significant disruption of wildlife species and habitats could have a serious impact. Critical habitats like sea turtle nesting sites are particularly vulnerable and could be in need of protection. Any reduction in biodiversity could apply to either the short term (construction period disturbance) or to the long term (permanent loss of habitat), but the latter is less likely. (...) Regarding animal species, significant problems can arise from fright disturbance of animals by machinery and workers, by annihilation or nest destruction, or by physical disturbance of habitat. Potential reduction of natural areas and wild species of commercial, ecological, or intangible value should be prevented. (...)

Management implications of reclamation for industrial, urban, aquacultural or agricultural, and port development activities include the following:

- Should be preceded by natural survey and classification of wetlands by both natural values and best-use alternatives;
- Should avoid interference with freshwater inputs from streams, rivers, and sheet flow;
- Should avoid contamination of freshwater inputs;
- Should be preceded by impact assessment studies;
- Should be sited in areas with suitable soil chemistry to avoid expensive remedial measures, crop failures, and low yields;
- Should alternate with natural areas managed to provide nurseries and the range of traditional uses maintained at sustainable levels;
- Should be composed of multiple use management and should be confined to zones in wetlands where it interferes least with critical habitats and the coastal protection function.

Source: Clark, J. R. 1996. *Coastal Zone Management Handbook.* Boca Raton: Lewis Publishers.

BOX 10

Coastal Erosion

Coastal erosion is defined as the landward retreat of the shoreline. There are two main causes of this landward retreat:

1. The relative rise in sea level
2. The net loss of material at the coastline

Coastal erosion is existing along the ROPME Sea Area, particularly along the coastlines consisting of beaches exposed to wave action, where the supply of sediments is restricted. In some sea areas of Oman coastal erosion has reached a critical level as a result of both man-made structures and natural processes. Over large areas of Al-Batinah coast, erosion rates are likely to be in the order of 0.3-0.6 m/yr, and in some local areas may be more.

Source: James Dobbin Associates Incorporated. 1992. *Coastal Erosion in the Sultanate of Oman*. Muscat: Ministry of Regional Municipalities and Environment.

2.1.5.6 Loss of land resources

Coastal resources of especially high natural and visual value include (in addition to wetlands) river mouths, coastal forests, sand dunes and rocky shores with headlands and bays. Urban, tourist, industrial or other physical development may disturb or degrade the special characteristics of the land resources by earthworks or by incongruous or monotonous development. They may also deplete the supply of green and other open spaces separating built up areas and reduce the land options left open for future generations. Insensitive development will ultimately result in a loss of attraction for tourism.

Many countries now recognise the importance of protecting open spaces in coastal zones and designate a considerable proportion of coastal land to be preserved for the present and future generations (good examples are the achievements of the British Natural Trust, or French Conservatoire de Littoral – Coastal Conservancy).

2.1.5.7 Loss of historic and archaeological resources

The heritage of cultural resources are found both on- and offshore where each civilisation has left its remains. Ancient or traditional forms of building, historic sites and monuments and archaeological remains are easily damaged by:

- demolition where their importance has not been recognised or where property values are high;
- neglect through abandonment and by the lack of funds for maintenance;
- inappropriate additions where population density necessitates the creation of extra living space;
- concealment by new building; and
- corrosion of natural stone structures as a result of air pollution.

Historic and ancient structures are also readily damaged by seismic activity. The loss of such cultural resources represents a loss of the human and cultural heritage for present and future generations and a loss of tourism attractions.

Preventive measures include identifying and regulating sites which should not be allocated for any type of development, encouraging new but compatible uses which could maintain old buildings, imposing restrictions on construction height and building materials in historic areas, and rehabilitating structures damaged by air pollution, marine corrosion or tectonic movement.

2.1.5.8 Public access to space and resources

Many of the problems and conflicts in coastal areas centre around the issue of what constitutes public or common property. In many countries access to the coast is regarded as a public right, and any restriction of public access is a loss of resource, whether the land is actually in private or public ownership. In other countries marine resources, particularly fish, are regarded as common property to be retained by whoever captures them. The use of the sea as a communal basin for waste disposal reflects the attitude that coastal and marine resources are common property. Practices vary about resources found under the land: underground water sources and minerals may be considered common property or they may belong to the owner of the land surface.

This document proposes that access rights should be secured for the public to certain coastal and marine resources, while respecting property rights and traditional uses and practices. The access rights may vary between countries but will usually include a right of physical access along the seashore and a right of access, as frequently as possible, from inland to the seashore. These may be secured by public purchase or easements. Public access rights to coastal and marine resources (fish, water, minerals) have to be regulated to prevent mismanagement and over-exploitation.

Restrictions on public access to space and resources can have environmental costs and benefits. Loss of public access means loss of opportunities to local residents and visitors but certain constraints on public access may be environmentally beneficial by acting to protect fragile resources.

2.1.5.9 Noise and congestion

Noise and congestion are temporary effects which degrade, but do not damage, coastal resources. They are most commonly generated by traffic and transportation (road, rail and aircraft movements) but are also generated by industry and occur at major concentrations of public activity (sports, entertainment, etc.).

Noise can easily be abated within buildings by acoustic treatment of openings and by the use of appropriate building materials. Noise abatement in open areas is not easy to achieve; noise barriers can be used to create “acoustic shadows.” However, in coastal areas with mild or hot climates where much social activity takes place outdoors and late at night, noise can be a significant environmental disturbance to residential areas.

2.1.6 Summary of interactions between coastal uses, activities and resources

Table 1 presents in a concise way the possible interactions which may be significant in coastal and marine areas. The arrows point in the direction of the likely interaction: activities may have effects on resources, or damaged resources may limit activities, or the interactions may be both ways.

The strength or significance of the interaction is indicated as follows:

← A significant interaction

⇇ A highly significant interaction

An explanation of the interactions is given in the text above. The possible preventive actions indicate what types of solutions may be appropriate. The interactions presented in the matrix are those likely to be found in the ROPME Sea Area, and may vary from country to country and between subnational regions.

Effects	Urbanization	Tourism	Industry	Energy & production	Fisheries & Aquaculture	Transportation	Forestry	Agriculture	Oil & Gas Extraction	Marine Protected Areas	Possible Preventive Actions
Marine Pollution	↑↑ ←	↑↑ ←	←	←	↑↑ ←	←	←	←	←	↑↑	Adequate facilities of effluent Collection and treatment. Restrictions on non-point sources.
Freshwater Pollution	↑↑ ←	↑↑ ←	↑ ←	↑ ←	↑↑ ←	←	←	↑↑ ←	←	↑	As above and protection of water catchment areas. Prevention of overpumping.
Air Pollution	↑ ←	↑↑	←	←		←		←	←		Pollution abatement equipment. Restrictions on fuels burned. Encouragement of public transport.
Loss of marine resources	←	↑ ←	←	←	↑↑ ←	←	←	←	←	↑↑	Management of fisheries. Designation of marine reserves. Restrictions on extraction. Encourage natural beach processes.
Loss of land resources	←	↑↑ ←	←	←		←		←	←	↑	Designation of protected areas. Protect open spaces. Rehabilitate damaged open spaces. Keep spatial options open.
Loss of cultural resources	←	↑↑ ←	←	←		←					Designation of sites, buildings & monuments. Encouragement of new, compatible uses. Restrictions on building height and materials.
Loss of public access	←	↑ ←	←	←	←	←					Regulations to guarantee public right of access. Prevention of obstacles to access. Clear definition of public and private rights to resources.
Noise and congestion	↑↑ ←	↑↑ ←	←	←		←					Noise abatement equipment at source. Acoustic building and acoustic barriers. Restrictions on locations of noise sensitive activities.

Table 1: Matrix of possible interactions between economic activities and effects on coastal resources in the ROPME Sea Area

BOX 11

Simple working definitions of risk and hazard for use in coastal planning and management

- Hazard: An event or process with potential for harm to people, property and the environment
- Risk: The occurrence probability of hazardous events
- Hazard impact: The consequences of hazardous events to people, property and the environment

2.1.7 Risks and hazards

Natural, man-induced and man-made risks and hazards have to be taken into account in ICAM.

Natural risks are not necessarily predictable though their probability may be known and those areas most exposed to risk can be identified. Such risks include seismic activity, flooding, tsunamis (tidal waves) and landslides. In some high-risk exposure areas, previous experience has already indicated what steps should be taken to reduce the loss to life and property. Some countries have adapted to the known risks and already incorporate risk management measures in their policies for coastal and marine areas. Elsewhere, scientific knowledge and experience are well known, administrative steps may already have been taken (e.g., building codes), but lack of implementation has resulted in inappropriate development in high risk exposure areas. Experience shows that where preventive measures have not been taken (e.g., residential development not in accordance with building codes in seismic risk areas) or where historic or ancient monuments are located in high risk areas, large financial investment is needed over a long period of time to reduce risk levels.

A number of coastal areas are seismically active zones, affected by earthquakes. Due to the present trends of urbanisation and development, the possibility of severe damage to people and settlements has enormously increased. A prerequisite for the mitigation of the seismic risk is the existence of a national policy defining the process of seismic risk management and the roles of involved authorities and other parties. An assessment of seismic risk within ICAM is indispensable, requiring land-use planning based on macro and micro zoning of seismic prone areas and building methods and standards which provide for seismic events.

Coastal cliff instability is partly a natural risk and partly man-induced. Coastal cliff shores are dynamic: the rate of cliff recession depends on rock resistance, cliff-top drainage, wave energy, and whether or not there are natural or man-made forms of protection. Disturbing the cliff by earthworks, changes to drainage patterns, excavation or removal of vegetation may cause destabilisation. The zone along a cliff head may collapse and the zone along a cliff toe may be subject to rockfalls.

Measures can be taken to prevent encroachment of building in the unstable areas at cliff head and toe, to channel surface drainage away from the cliff face, and to design recreational and tourist development of cliff shores to include cliff stabilisation measures which would not transfer the problem of instability up- or downshore.

Technical hazards are man-made. Some of those that occurred in the recent past had catastrophic dimensions (Chernobyl, Bhopal, Seveso, etc.). While all possible preventive measures may have been taken, there will still remain a degree of risk from industrial processes that include hazardous substances, their storage and safe disposal.

The risk of accidents and the areas likely to be exposed to technical hazards and risks should be taken into account in ICAM.

2.2. The need for and the concept of ICAM

2.2.1 Sustainable development

The origins of the concept of sustainable development can be traced down to the moment when first doubts emerged about the prospects of unlimited economic growth, especially when it was realised that the environment had a limited capacity, both as a resource and as an absorber of residuals. The first debates, in the early '70s, had a "catastrophic" flavour presenting society with the dilemma of choosing between economic growth or protection and improvement of the quality the environment.

In the early '80s, a significant step forward was made in the debates. First, the focus was put on a possible complementarity between economic growth and the environment. Then the term "economic growth" was replaced by the more complex and appropriate term "economic development".

It was the *World Conservation Strategy* prepared by International Union for Conservation of Nature (IUCN) in 1980 that first introduced the term "sustainable development", but it failed to integrate economics with environment. This concept achieved its definitive affirmation through the UN Conference on Environment and Development held in Rio in 1992 and in its main document: the Agenda 21.

The term itself does not cause many controversies. Development is a certain set of goals and objectives for society. It is more than mere income growth or economic growth; it means improvement of the quality of living. Sustainable development implies such socio-economic system which secures that these goals are sustained. Also, there is a consensus on the basic principles of this definition: an awareness of future needs, concern for the environment and equity. An awareness of future needs means that care should be taken of the long-term consequences of present human activities; concern for the environment means that environmental values have to be taken into account, because conservation of the environmental quality is one of the foremost development goals (quality of life); while equity refers to providing for the needs of all social strata today (intragenerational equity) and equitable access to resources for future generations (intergenerational equity).

Due to the complexity, sensitivity and limitations of the natural systems, and the value of the natural resources, coastal zones and areas fall under those environmental domains in which it is particularly important that the concept of sustainable development is applied. Sustainable coastal development implies respect for environmental limits and for the social and economic objectives as well. It implies an attempt to promote greater liveability and quality of life, and an equitable and just distribution of resources and opportunities in the coastal zone. These objectives are in line with the general objectives of sustainable development as advocated in Agenda 21 of UNCED.

Accordingly, the basic principles of that concept must be reflected in the practice of ICAM. First, ICAM must not to be viewed as an exercise to be performed then abandoned, but as a process consisting of a number of common rules of environmental behaviour. ICAM aims to provide an effective instrument for achieving a balance between social and economic development and the protection and rational use of coastal resources.

In implementing sustainable development in coastal areas through ICAM, several aspects of the sustainable management of resources have to be addressed, namely:

- what should be the *critical stock* of coastal resources able to deliver sustainable outputs;
- what should be the *critical level of quality* of coastal resources compatible with the critical level of stock able to deliver sustainable outputs;
- what species and ecosystems need to be *preserved*, and at what level, to provide their output on a sustainable basis;
- what are the factors and what should their level be to maintain the *quality of life* in coastal areas on a sustainable basis?

BOX12
Sustainable fisheries

Management of coastal fisheries must have the basic objective of ecological sustainability. Management will have to decide which policy measures will allow this general objective to be achieved in each local circumstance., taking account of economic and social factors as well as the conditions of fisheries resources. At the same time, management measures must take account of the dynamic nature of coastal fisheries whereby physical, ecological, social, and economic processes interact constantly.

As a result of the nature of fisheries, the concept of sustainability cannot be compared with other subsectors or, indeed, with other economic activities. Fisheries resources are finite and increasingly scarce, and the biological limit of their productivity has been reached or surpassed virtually everywhere. Investing more resources in exploiting fisheries resources, with the exception of aquaculture, will no longer result in increased productivity and profitability (see Figure 11). On the contrary, today, increased productivity for one user (thanks to improved gear or vessels, for example), will necessarily lead to decreased productivity for other users. Management actions will therefore revolve around resource allocation, trade-offs, careful monitoring and enforcement.

Management must take account of the constraints that will determine the policy options. These relate to matters such as:

- The limited biological productivity of fisheries resources;
- The importance of defining conditions of access to those resources;
- The risk factors, in particular ecological and market variability;
- The difficulty of establishing an adequate information base; and
- The difficulties surrounding the establishment of a suitable and effective institutional framework.

The key issue is to achieve the stated objectives sustainably and this will depend on the condition of the resource base (stocks, habitat, environment) and the capacity of management measures to improve it, the economic performance of the fishing activity, and the effectiveness of the development and management framework.

Management strategies must be flexible, adapting to the changing nature and conditions of the resource through time and concerned to improve socio-economic performance within the sector, while decreasing negative impacts deriving from other sectors and from sector itself.

Source: FAO. 1998. *Integrated Coastal Area Management and Agriculture, Forestry and Fisheries. Rome:* FAO.

2.2.2 The need for ICAM

Managing complex systems, such as coastal areas, requires an integrated approach capable of co-ordinating the implementation of all three major objectives of the sustainable development, and bringing together the multiple, interwoven, overlapping interests in the coastal area in a co-ordinated and rational manner, harnessing coastal resources for optimum social and economic benefit for present and future generations without prejudicing the resource base itself and maintaining the ecological processes.

The sea cannot be regarded as a common basin for effluent disposal, nor can air sheds be regarded as available capacity for air pollution. Almost all coastal and marine areas produce or support multiple products and services. Sectoral solutions usually "transfer" the problem between resources, products and services. Tourism will not flourish if the area loses its attraction to visitors; fisheries are usually on the receiving end of everyone else's problems. Industry and energy facilities can degrade the environment for all other activities. There is, therefore, a need to bring sectoral activities together to achieve a commonly acceptable coastal management framework.

BOX 13

The Urgency for ICAM

The need for coastal states to accelerate the development of capabilities for integrated coastal area management arises because:

- current trends of increasing poverty in coastal communities are resulting in degradation of the coastal area and deterioration of the quality of life;
- current pressures from development and population are increasing land-based sources of marine pollution and human intervention with river basins, adversely affecting coastal processes.

The pressures include:

- accelerating the decline of habitat and natural resources, including beaches, mangroves, wetlands, corals and sea grasses, as well as fisheries and other coastal and marine resources; and
- increasing vulnerability to pollution, beach loss, habitat loss and natural.

The changes may, in turn, limit options for future development:

- many degraded and threatened coastal resources and ecosystems are in need of rehabilitation and restoration;
- efforts to develop capabilities for integrated coastal area management and implement national programmes may take 10 years or more; and

Source: World Coast 2000. 1993. *Preparing to meet the coastal challenges of the 21st Century: Conference statement.* Nordwijk, The Netherlands.

Major source of conflict in environmental disputes include the existence of competing resource demands, differences in human values regarding the relative worth of resources, and inadequate knowledge or understanding of the costs, benefits, and risks involved in proposed actions.

As a result of high demand for coastal resources, and limited supply of resources to be exploited, conflicts are inherent to coastal areas. Therefore, an effective management for sustainable development of coastal areas, and integrated one has to fall within this category, will need to anticipate, avoid and resolve conflicts in the course of the process of its implementation.

As pressures increase, problems can no longer be transferred. The transfer of coastal erosion downshore, or water pollution downstream, or air pollution dispersed further afield by ever higher smoke stacks are not acceptable solutions to coastal conflicts. Mechanisms have to be created within economic and social systems to ensure that environmental costs are incorporated into economic evaluations and not passed on to other areas or to future generations. These mechanisms will need to fit the complexity of coastal systems. An integrated approach aims to bring together the conflicting demands of society for products and services, anticipating current and future short, medium and long-term interests. It has to maintain options open for future uses of marine and coastal resources and be capable of responding to uncertainty.

It therefore requires far more extensive analysis than the sectoral approach, and by incorporating external effects, it should generate economically, socially and ecologically acceptable policies for coastal and marine management.

Management of coastal areas has been, practically, known throughout the whole history of mankind. However, the increased scale of coastal problems, particularly in this century, has brought the need for a special discipline – the coastal zone management. It is a discipline and not a science because it doesn't create, but uses the knowledge created in other fundamental and non-fundamental sciences related to terrestrial and marine ecosystems as well as to social sciences, and integrates that knowledge in an effective management approach with the objective of solving the problems of coastal areas. Coastal managers primarily, with the help of scientists, are needed to implement that approach.

The history of organised efforts in coastal management doesn't go that far. Table 2 presents an overview of development of coastal zone management. The first coastal act was brought in US only in 1972, later being followed by similar undertakings in a number of countries, international institutions and organisations, predominantly within the UN system. The ROPME Sea Area countries are renowned for their organised efforts in coastal zone management. A number of plans has been produced and management procedures implemented.

The foregoing paragraphs justify why the management of marine and coastal resources needs an integrated approach. That approach should be the Integrated Coastal Area Management – ICAM.

2.2.3 The principles and concept of ICAM

Resources of coastal zones and areas provide a flow of goods and services, but often include a variety of complementary and inconsistent activities. If left alone, social and economic forces at work in coastal areas competing for scarce resources would result in overexploitation of resources, negative environmental effects, equity problems and a loss of social well-being. Therefore, coastal zones and areas require management.

Phase	Period	Key Features
I	1950-1970	• Sectoral approach • Man-against-nature ethos • Public participation low • Limited ecological considerations • Reactive focus
II	1970-1990	• Increase in environmental assessment • Greater integration and co-ordination between sectors • Increased public participation • Heightened ecological awareness • Maintenance of engineering dominance • Combined proactive and reactive focus
III	1990-present	• Focus on sustainable development • Increased focus on comprehensive environmental management • Environmental restoration • Emphasis on public participation
IV	Future	• Establish coastal area management based on ecological empathy, precautionary management and shared governance

Table 2: Phases in the development of coastal management

Source: Kay, R. & J. Alder. 1999. *Coastal Planning and Management.* London: E&FN Spoon.

Coastal zone management is an activity within the broad field of resource management. Resource management may be defined as a *conscious process of decision-making whereby natural and cultural resources are allocated over time and space*. This allocation aims to optimise the attainment of stated objectives of a society, within the framework of its technology, political and social institutions, and legal and administrative arrangements.

The differences between the coastal zone management and other kinds of resource management are: (1) in the fact that the field of activity of the coastal zone management is related to a very specific geographic area, and (2) in the issues it is dealing with. Furthermore, the rich mix of human activities, natural resources and tightly linked ecological processes in coastal zones and areas, and the resulting problems and conflicts cannot be addressed by traditional single-sector approaches. Multisectoral and cross- sectoral, or integrated coastal area management becomes a necessity.

There are numerous definitions of this activity. The one defining it as a *process of achieving goals and objectives of environmentally sustainable development in coastal areas, within the constraints of physical, social and economic conditions, and within the constraints of legal, financial and administrative systems and institutions* seems the most comprehensive.

ICAM is also a *continuous, proactive and adaptive process of resource management for environmentally sustainable development in coastal areas*. More specific coast and marine related principles have been extensively elaborated elsewhere, two of which are presented in the Boxes 11 and 12.

ICAM *is not a substitute for sectoral planning, but focuses on the linkages*

between sectoral activities to achieve more comprehensive goals. ICAM seeks to:

- identify where resources can be harnessed without causing degradation or depletion;
- renew or rehabilitate damaged resources for traditional or new uses;
- guide the level of uses or intervention so as not to exceed the carrying capacity of the resource base;
- ensure the integrity of coastal ecosystems' biodiversity;
- ensure that the rate of loss does not exceed the rate of replenishment;
- reduce risks to vulnerable resources;
- respect natural dynamic coastal processes, encouraging beneficial ones and preventing adverse interferences;
- encourage complementary rather than competitive activities;
- ensure that environmental and economic objectives are achieved at tolerable cost to society;
- develop human resources and strengthen institutional capacities;
- preserve and promote social equity and introduce the participatory approach;
- protect traditional uses and rights and equitable access to coastal resources.

Fundamental to ICAM is the comprehensive understanding of the relationships between coastal resources, their uses and the mutual impacts of development on the economy and the environment. These relationships need to be understood and expressed not only in physical and environmental terms, but also in economic terms. They are important in planning, policy formulation, implementation and performance evaluation. As coastal resources are used simultaneously by the different economic and social sectors, integrated management can only be accomplished when all these uses, users and relationships are clearly known. It is therefore far wider than static land use planning, requiring a multi-disciplinary approach to the management of dynamic processes in the terrestrial and marine environments.

BOX 14
Some principles for ICAM

1. The coastal area is a unique resource system which requires special management and planning approaches
2. Water is the major integrating force in coastal resource systems
3. It is essential that land and sea uses be planned and managed in combination
4. The edge of the sea is the focal point of coastal management programmes
5. Coastal management boundaries should be issue-based and adaptive
6. A major emphasis of coastal resources management is to conserve common property resources
7. Prevention of damage from natural hazards and conservation of natural resources should be combined n ICAM programmes
8. All levels of government within a country must be involved in coastal management and planning
9. The nature-synchronous approach to development is especially appropriate for the coast
10. Special forms of economic and social benefit evaluation and public participation are used in coastal management programmes
11. Conservation for sustainable use is a major goal of coastal resources management
12. Multiple-use management is appropriate for most coastal resource systems
13. Multiple-sector involvement is essential to sustainable use of coastal resources
14. Traditional resource management should be respected
15. The environmental impact assessment approach is essential to effective coastal management

Source: Clark, J.R. 1992. *Integrated Management of Coastal Zones*. FAO Fisheries Technical Paper No.327. FAO: Rome

BOX 15

Objectives of Integrated Coastal Area Management

ICAM focuses on three operational objectives:

- strengthening sectoral management, for instance through training, legislation, staffing;
- preserving and protecting the productivity and biological diversity of coastal ecosystems, mainly through prevention of habitat destruction, pollution and overexploitation;
- promoting rational development and sustainable utilisation of coastal resources.

Source: The World Bank. 1993. The Noordwijk Guidelines for Integrated Coastal Zone Management. Washington, D.C.: USA

ICAM should focus on facilitating horizontal and vertical dialogue, agreements and compromises between all parties involved in the use of coastal and marine resources. It is a participatory process that involves strategic planning that considers local values, traditions, needs and priorities to define overall priorities and objectives for the development and management of coastal areas. Issues of land tenure and property rights should also be considered within the process of integrated coastal management. Finally, although the principles and methodological approach adopted in ICAM have a general value, each country will need to interpret and apply ICAM in its own national and local context.

Integration is crucial to ICAM. There are different types of integration, and in a successful management intervention in coastal area, at least the following kinds of integration have to be achieved:

- **vertical** integration (among institutions and government levels within the same sector);
- **horizontal** integration (among various sectors at the same administrative level);
- **planning** integration (among plans at different spatial levels, see Figure 2; the plans should not be in conflict with regard to their goals, objectives, strategies and planning proposals, see Figure 3);
- **temporal** integration (co-ordination between short, medium and long term plans, and programmes);
- **systems** integration (all relevant interactions and issues are considered, but early in the process focused on the most important ones);
- **functional** integration (management interventions should be consistent with coastal area management goals, objectives and strategies);

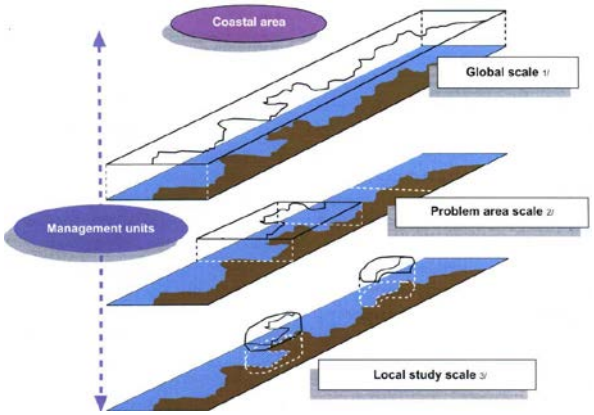


Figure 2: The integration of spatial management levels of ICAM

Source: FAO. 1998. *Integrated Coastal Area Management and Agriculture, Forestry and Fisheries.* Rome: FAO.

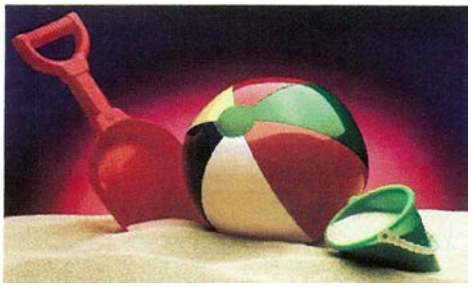
Figure 3: An example of the planning integration: The case of Sulawesi Selatan Province (Indonesia) coastal planning system

Source: Kay, R. and Alder, J. 1999. *Coastal Planning and Management*. London: E&FN Spoon.

- **policy** integration (coastal area management policies, strategies, and plans have to be incorporated in the development policies, strategies and plans);
- **land-water interface** integration; and
- **interdisciplinary** integration.

As stated before, the sectoral management is not excluded from ICAM. However, in order to be effectively integrated in ICAM process, responsible for sectoral coastal management will have to take in consideration the following guidelines:

- urban growth should be co-ordinated with the available capacity of infrastructure: uses should not be permitted beyond the absorbing capacity of available services;
- the location and operation of industrial, oil and gas exploration, extraction and refining, and transportation facilities should be controlled to prevent adverse impacts on tourism and on natural resources, and be required to incorporate measures for the prevention or abatement of water, land, air and noise pollution;
- tourism should be integrated with policies for development with nature and landscape protection, in a way which contributes, through revenue generation, to the protection and improvement of the very environment which attracts visitors;
- areas for aquaculture should be selected with due consideration to other coastal activities and to existing or possible discharges to marine waters;
- facilities for fishing should be maintained, with appropriate controls for the protection of fish stocks and of marine nature reserves;
- coastal agricultural use should be maintained not only for food production and employment but also for landscape management and as a valid use of open space for the purpose of separating urban centres and preventing continuous development along the shore;
- open spaces should be maintained to separate urban centres and to ensure the protection of natural and landscape coastal resources;
- development should not be permitted to encroach on the shoreline; the immediate coastal strip (whose width will vary according to natural conditions and to social and economic requirements) should remain free of construction and be recognised as far as possible as rightfully open to public access.



2.2.4 The integrated river basin and coastal area management

Coastal area management cannot concentrate on the coastal areas and coastal zones alone. The nature of socio-economic and environmental problems extends far beyond the boundaries of coastal area. An integrated approach to coastal zone management has to consider the catchment areas that impact the coast. Upstream agricultural runoff, deforestation and sewage, sediment transportation, as well as dam construction and irrigation schemes, are only some of the problems that can severely impact coastal water quality, resources, and geomorphological processes. Therefore, it is advisable that both areas be considered as one system. From the socio-economic point of view, a watershed management approach can also assist in reducing the immigration pressures on the coast.

The foci are different in each of these approaches, and efforts have to be employed to bring them methodologically closer. The approach to coastal area management is by nature a multi-resource and a land use planning oriented one. It deals with relatively small areas where a multitude of interests and conflicts exist. Land use planning based solutions are one of the most effective instruments in coastal zone management. River basin management is characterised by, mostly, a single resource approach (water resources management), operates across the wide area, and strategic issues are more important. Solutions for big infrastructural systems (dams, irrigation schemes, etc) are mainly proposed. The methodology is being developed how to integrate these two approaches.

2.2.5 The benefits of ICAM

The implementation of ICAM can stimulate and guide the sustainable development of coastal areas; it can minimise the degradation of the natural system, provide a framework for the management of multi-sectoral activities and maintain options for future uses of resources. As coastal states develop the capabilities for, and implement integrated management of their coastal resources, they provide local and national benefits, including enhancing economic development and improving the quality of life. These benefits are achieved through the protection of the environment (e.g. better water quality, biodiversity, etc.).

However, the benefits of ICAM are not always easy to establish, particularly in financial terms, because there are not so many initiatives that have progressed from planning to implementation. There is an increased effort to develop effective methods for evaluation of ICAM plans, programmes and projects. It can be argued that a lack of integrated planning and management will almost surely result in the degradation of the coastal environment and in negative economic trends in the longer term. For the moment, one of the simplest form of demonstrating the benefits is to compare the coastal resources management strategy on the basis of a “without ICAM” with “ICAM based” one. There have been attempts to calculate the net economic benefit of the implementation of ICAM programmes. Some evidence shows that, after an ICAM initiative, there has been an increase in GDP in some of these areas. However, there are still no methods that can precisely say that the increase in GDP could be attributed to ICAM intervention only, and not to some other developmental factors.

3. THE DEVELOPMENT AND IMPLEMENTATION OF ICAM

3.1 Approaches to ICAM

Most examples of ICAM to date have been generated at central government level, taking responsibility for marine and coastal resources for society as a whole. It is a top-down approach that, to be successfully implemented, requires the co-operation of local coastal communities. In some countries, local initiatives have generated a bottom-up approach where local stakeholders perceived that their local interests were being directly affected by coastal and marine activities.

Even where a government-sponsored approach is adopted, the intrinsic nature of ICAM requires the active involvement of local communities and stakeholders, bringing the top-down and bottom-up approaches together in a synergistic framework.

BOX 16

"Top-down" and "Bottom-up" approaches to ICAM

The extent of involvement of government and local groups in providing the initial leadership for ICAM differs widely among nations. For the discussion here, efforts initiated by central government are called "top-down", while those initiated by local groups are called "bottom-up". In the twenty cases examined, the majority were initiated by a "top-down" approach. This was true for both urban and rural settings, and for areas characterised by both traditional and modern cultural practices. All of the areas with market economies featured top-down approaches. Of the areas with subsistence economies, 60% featured "top-down" approaches, and 40% featured "bottom-up" approaches. This suggests that local groups are most willing to act, as they do in subsistence economies, when they perceive themselves to be direct stakeholders. A key to involving local groups in ICAM planning and implementation, then, appears to be enhancing awareness of the benefits of co-operation.

In general, the degree of government involvement in initiating ICAM appears to depend on the extent to which the resources being managed are viewed as public goods. Access to fresh water is often viewed as a personal right, by farmers and city dwellers alike, and thus tends to elicit more personal involvement from citizens. Access to fisheries tends to be seen as a collective right, and thus appears to more naturally involve central government leadership. Programmes with long histories tend to show increasing balance between government and local leadership as they evolve, regardless of how they are initiated.

The geographic setting also seemed to have some relationship to whether initiation was "top-down" or "bottom-up". All of the island nations examined in the case studies featured a "top-down" approach. Of the continental shore cases, 90% followed the same pattern. This may be partially attributed to the pressure from international agencies to initiate ICAM efforts, since these pressures are usually applied to central governments.

In general, the distribution of coastal resources appears to play a role in determining the level of government involvement. Issues involving local resources are more commonly taken on by local groups, who perceive greater direct benefits than they do for resources that benefit the society at large. Resources which are widely and evenly distributed tend to elicit a central government- driven management approach.

Source: World Coast 2000. 1993. *Preparing to Meet the Coastal Challenges of the 21st Century: Conference Report.* Noordwijk, The Netherlands.

BOX 17

Reasons for ineffectiveness of present coastal planning and management strategies

- co-ordination, both between sectors and between different levels of government, is lacking;
- public agencies lack financial and personal resources for effective integrated planning and management;
- there are limited opportunities for public participation in decision-making;
- an overall strategy for environmental protection and clearly stated goals are often lacking;
- the problem is further compounded by insufficient planning and regulatory authority based on complex, confusing and conflicting laws which may not be enforced;
- programmes react to issues rather than setting a framework within which decisions can be made;
- conflicting resource uses are at present resolved in an inconsistent and ad hoc manner, cumulative environmental impacts rarely being taken into account in the decision-making process;
- political and administrative boundaries very rarely reflect environmental ones;
- resources are allocated on economic grounds, often neglecting ecological considerations.

Source: Kenchington, R. and D. Crawford. 1993. "On the meaning of integration in coastal zone management" in Ocean & Coastal Management 21 (1-3): 109-128.

Though ICAM is in many cases a government sponsored, long term process, the private sector should play an important role in furthering sustainable development in the coastal region. Private investment can be harnessed with incentives as necessary, to contribute to implementing appropriate development programmes in accordance with ICAM whereas inappropriate short-term private investment should be deterred.

3.2. Stages of the ICAM process

In coastal areas, where accommodation to rapid change is often required, flexible decision making calls for a continuous process of planning, implementation and goal-adjustment. In resource management process, such as ICAM, decisions are being taken in three separate stages: initiation, planning and implementation.

Initiation of ICAM includes the analysis of triggering factors which could strengthen public awareness of coastal issues and the need to take actions in coastal areas.

Planning in ICAM refers to the development of policies and goals, and selection of concrete sets of actions (strategies) to produce the desired mix of goods and services from the coastal area over time. It is a goal- directed decision-making process involving the ability to anticipate future events, a capability for analysing and evaluating situations, and a capacity for innovative thinking to derive satisfactory solutions.

Implementation is the vehicle through which the plan is put into effect. It is the process of operational decision-making, working towards the objectives of the plan through interaction with relevant administrative, legal, financial and social structures, and with the public participation.

These three stages of ICAM contain the following phases:

- Initiation: initiation of ICAM;

- Planning: preparatory phase; analysis and forecasting; definition of goals and strategies; integration of detailed plans and management policies;

Implementation: implementation of plans; monitoring and evaluation. The management process requires that its phases be cyclically repeated. The results of the operative phases are constantly monitored, and the links between various phases include feed-back mechanisms ensuring timely correction of activities which, on the basis of monitoring and evaluation, may have taken a wrong direction. Table 3 indicates the major stages and phases of the ICAM process, together with activities, outputs, types of political decisions, and sectoral activities relevant to each phase of the process. Figure 4 shows how the links between major phases of the process are established, with feedback mechanisms having a prominent role.

Sectoral inputs	Stages	Phases	Activities	Outputs	Political decisions
Triggers: past decisions, new decisions, external influences	INITIATION	*INITIATION OF ICAM*	Analysis of prerequisites for ICAM. Tentative boundaries of the area. Preparation of the proposal for initiation of ICAM.	Proposal for the preparatory phase of ICAM	To start ICAM
Sectoral problem identification	PLANNING	*PREPARATORY ACTIVITIES*	Definition of coastal area. Identification of sectoral and cross sectoral problems. Proposal for general goals and objectives. Preparation of development environment, outlooks and tentative strategy. Identification of information gaps. Definition of legal, financial and institutional requirements for ICAM. Proposal for integrated Coastal Master Plan preparation procedure.	Coastal Profile ICAM programme	To establish ICAM as a continuous and long term process
Sectoral analysis and forecasting		*ANALYSIS AND FORECASTING*	Issue-oriented new surveys (generation of missing primary data). Analysis of natural and socio economic systems. Forecasting of future demand. Generation of cross sectoral scenaria and selection of preferred scenario.	Alternative scenaria	
Definition of sectoral goals and strategies		*DEFINITION OF GOALS AND STRATEGIES*	Proposal for sectoral and cross sectoral goals and objectives. Preparation of alternative strategies including legal requirements, financial implications and institutional arrangements. Evaluation and selection of strategy.	Management strategy	Approval of goals objectives and strategies
Sectoral plans		*INTEGRATION OF DETAILED PLANS*	Allocation of land and sea uses. Proposal for implementation procedures (legal, institutional, financial) and relevant instruments (EIA, CBA, etc). Definition of implementation stages. Draft Integrated Coastal Master Plan presented to relevant body for approval.	Integrated Coastal Master Plan	Adoption of Integrated Coastal Master Plan and relevant policies
Sectoral plans and policies	IMPLEMENTATION	*IMPLEMENTATION OF PLANS*	Phasing of ICAM proposals and policies. Application of economic, regulatory, and environmental evaluation instruments in development control. Adaptation of institutions to ICAM.	EIA CBA	Approval of implementation instruments used in the development control process
Sectoral monitoring		*MONITORING AND EVALUATION*	Redefinition of cross sectoral problems. Identification of inadequacy of instruments.	Evaluation study	Update of ICAM process

Table 3: Stages, phases, activities and outputs of the ICAM process

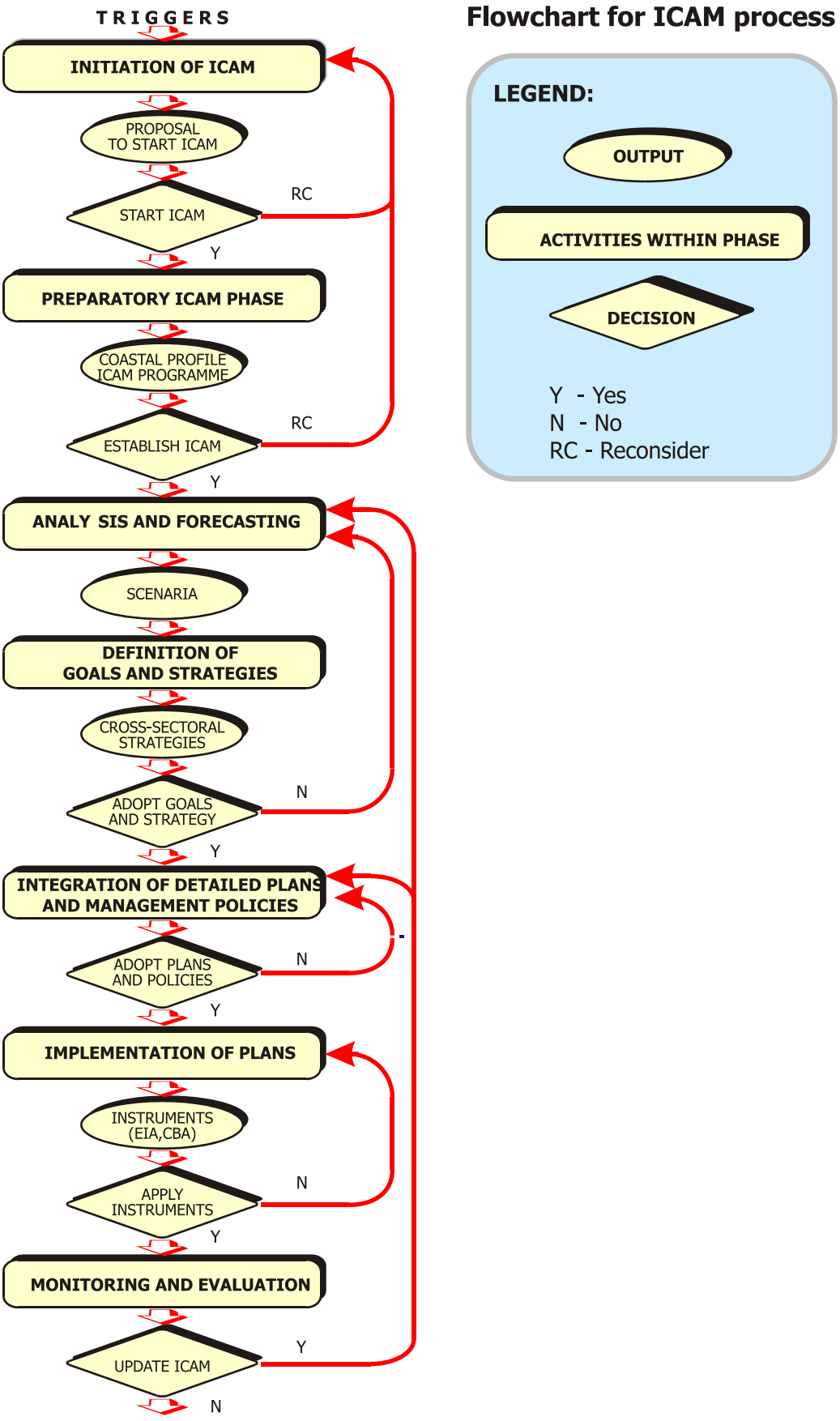


Figure 4: Flowchart of the ICAM process

3.2.1 Initiation of the ICAM process

Coastal and marine areas management practice in many countries shows that there are a number of triggering factors that could play the dominant role in the initiation of the ICAM process, such as:

- past decisions resulting in environmental degradation, accidents, multiple use conflicts or other problems;
- new decisions, particularly those that initiate major projects whose impact needs to be examined within ICAM;
- external influences such as international consensus to promote ICAM; and
- reactions from the community, or growing awareness.

One or a combination of several triggering factors can influence decision makers to initiate the process of ICAM.

Political decisions and commitments by the relevant authorities are needed to initiate ICAM and start the activities to develop an ICAM proposal. Decision makers should act on the basis of information about triggering factors either already available or deducible from analogous situations, and on a broad professional and social consensus about the need for ICAM. The level on which decisions should be taken will depend on the scale of the geographic area and its significance in the national context (national, sub-national, regional, or local).

All the elements necessary for deciding to start ICAM have to be contained in a proposal prepared by the concerned parties (authorities, scientific communities, NGOs, individuals, etc.). Such a proposal refers only to the activities to be carried out in the preparatory ICAM phase before the final decision to proceed with ICAM is taken.

The proposal to decision-makers, actually the feasibility study, should contain the following:

- analysis of the prerequisites of ICAM;
- general goals of ICAM;
- tentative boundaries of the geographic area to be considered;
- an assessment of the capacity of institutions for ICAM and of modalities for the horizontal and vertical links between institutions and organisations expected to participate in the preparatory phase;
- an assessment of the financial means available for the completion of the preparatory phase; and
- tentative workplan and time-table (activities, responsible institutions, time required).

Of particular importance is the definition of the role of the co-ordinating mechanism which will be responsible for guiding the ICAM process during the preparatory phase. At this stage of the process the main task of this co-ordinating mechanism is to bring together the various governmental and non-governmental institutions and organisations involved in ICAM in order to prevent conflicts among them, and to enable a rational use of financial and human resources needed for the implementation of ICAM.

Preparations for the initiation of the ICAM process necessitate some prerequisites to be met. Of particular importance are the following ones:

- political will and public (including NGOs and scientific institutions) awareness;
- scientifically based knowledge of the coastal and marine ecosystems;
- existence of global national strategies;
- recognition of the value of coastal and marine resources and potential benefits from sustainable management;
- management capability and adequate human resources;
- financial support.

BOX 18

The co-ordination mechanism for ICAM

The main purpose of the co-ordination mechanism for ICAM is to:

- promote and strengthen interagency and inter-sectoral collaboration;
- reduce interagency rivalry and conflicts;
- minimise duplication of functions of line agencies;
- provide a forum for conflict resolution among sectors;
- monitor and evaluate the progress of ICAM projects and programmes; and to
- implement actions resulting from the evaluation exercise.

Source: Post, J.C. and Lundin, C.G. 1996. *Guidelines for Integrated Coastal Zone Management.* Washington D.C.: The World Bank.

In the majority of cases, and particularly in developing countries, all the listed prerequisites will not exist in the moment of making decision on the introduction of ICAM. In other cases, some prerequisites will be only partially fulfilled. Regardless of such circumstances, the activity should not be given up, but a part of the programme in its initial phase should be aimed at meeting the prerequisites to the extent that is realistic.

The authorised political body takes the decision to launch the ICAM process, i.e. the relevant preparatory activities. That body can also decide that the conditions for launching have not matured, in which case it is advised to reconsider this decision after some period of time.

3.2.2 Preparatory phase of the planning stage

The purpose of this phase is to identify and support a proposal to decision-makers to establish continuous and integrated management of the coastal and marine area. This phase could be broken down into three major tasks:

- inception report;
- coastal profile; and
- ICAM programme.

The **inception report** describes the organisation of the ICAM intervention, possibly until the end of the first cycle of the process, providing also if the decision will be taken to extend the implementation of the process beyond the preparatory phase. The report will contain the following:

- detailed description of all phases of the process, broken down into tasks;
- description of the outputs in all phases of the process;
- workplan and timetable;
- experts to be involved in the process;
- logistical, organisational, institutional and financial components of the process;
- logical framework analysis.

The second task to be performed within this phase is to prepare a **coastal profile**. Based on the existing (secondary) data, a coastal profile helps identify the coastal resources, activities, uses, habitats and protected areas, as well as major resource management issues, such as open access to coastal resources, multi- purpose use, development patterns, user conflicts and specific priorities for management in a coastal area. The existing data often have to be complemented with a questionnaire containing questions on all relevant

aspects of development and environment of coastal areas. Questionnaires have to be filled out together by local and national experts.

The third task, to be performed using the coastal profile and inputs from various sectors and interest groups, is to prepare an **ICAM programme**, which is a problem-oriented document consisting of the following:

- precise definition of the coastal area, i.e. the area boundaries (for example, in the case of areas covering the totality of a national coastline it is desirable to include the relevant drainage basins and the national maritime exclusive economic zone; in the case of smaller island states, the inclusion of the whole national territory is advantageous);
- identification of the main problems of the area and their causes (sector by sector with emphasis on problems requiring cross- sectoral solutions);
- proposal of the general goals and objectives of development and environmental protection; preparation of development outlooks and tentative strategies for their achievement; analysis of the social and economic implications of the strategies proposed;
- identification of information gaps;
- analysis of other planning programmes and project activities, with the assessment of their impacts on the coastal area and in relation to their relevance for ICAM activities;
- proposal for the preparation of the Integrated Coastal Master Plan;

BOX 19

Potential focal areas in the preparatory phase of ICAM

The potential focal areas provide a thematic foundation for programs designed to enhance marine and coastal resource management. The focal areas have been selected for their ability to address key emerging trends and issues, often proactively. Many of the focal areas are at the cutting edge of coastal management solutions. Many areas also require a combination of strategic options to be successful.

- Demonstration sites (establishment of site specific ICAM projects may be the most pressing need in coastal zone management)
- Ecosystem focus
- Urban issues
- Land-based sources of pollution
- Watershed management approach
- Implementation of action plans
- Community-level economic development
- Eco-tourism.

Source: Linden, O. and D.Moffat. 1996. *Environment and Natural Resources in Coastal Areas of Developing Countries.* Stockholm: SIDA.

- analysis of legal requirements posed by the proposal (e.g. a need for new legislation or for changes in existing legislation);
- analysis of the financial requirements of the implementation of ICAM; and
- proposal of institutional arrangements needed to support the co-ordination and implementation of ICAM.

Coastal profile and ICAM programme can be prepared for several spatial levels in a

country. These levels can vary from national (in the cases of a small country or an island country where the coastal area encompasses practically the whole country), over sub-national regional (coastal region or a large island), and urban (area of a coastal city and its immediate hinterland), to the level of small coastal settlements (such as fishing settlements) or sites where there already exists or is planned certain development. Each spatial level determines the degree of detail into which issues have to be elaborated in individual documents. The basic rule says that the higher the spatial level the lower and less detailed the degree of dealing with various issues.

The above documents contain maps which present graphically the individual coastal issues. It is assumed that already in the initiation phase of ICAM analysis will be made of the existing graphic documentation, i.e. that themes and scales will be identified of the maps available with the relevant administrative departments in the area concerned. The existing maps represent not only the graphical basis for the preparation of the coastal profile and ICAM programme (as well as other documents at later phases of the ICAM process), but can also be an important source of information.

The scale of the maps to be used for the preparation of the coastal profile and ICAM programme is very important. It is determined by the scale of the maps already available with the relevant departments. One has to adapt to the actual situation since in this phase of ICAM preparation of new maps is not envisaged. The scales can vary considerably, as given below:

- national level: 1:200,000
- sub-national regional level: 1:200,000 – 1:50,000
- urban level: 1:50,000 - 1:10,000
- site level: 1:10,000 - 1:1,000

The ICAM programme, including the proposal of future activities, should be reviewed, and the decision on the ICAM process made. The decision-making body can decide to continue the planning phases of the process, or to stop the process. The decision to stop the process would assume that conditions do not exist for the continuation of the process, or that the proposed actions within the ICAM programme can be implemented immediately. In that case, these are just short-term measures, and the decision on the continuation of the process has to be reconsidered at a later time. The decision to continue ICAM has to be taken at an appropriate political level with sufficient authority to ensure long-term political and financial commitment to ICAM. This will ensure that the issues raised and proposals made in the documents resulting from the preparatory phase are implemented in the following stages of the process.

3.2.3 Analysis and forecasting

Following the preparatory stage, and once the decision to establish ICAM has been made, a far more detailed stage of analysis is to be carried out.

The purpose of this phase is to provide an analytical basis for the establishment of precise goals and objectives and definition of management strategies for sustainable development in the coastal area. However, this phase is strongly issue-oriented as the research is mostly aimed at the problems identified in the previous phase.

In this phase it is necessary:

- to carry out new surveys in order to identify selected issues within sectors of human and economic activities, natural system processes, and institutional arrangements;
- to analyse the natural systems in the coastal and marine area;

- to analyse the system of human and economic activities in the coastal and marine area;
- to estimate (forecast) future demand for goods and services from coastal resources, and their capacity to fulfil these requirements;
- to prepare alternative cross-sectoral scenarios, and to select the most effective one.
- Major tasks to be performed in this phase are the following:
  a) Surveys on selected issues in which new (primary) data are generated should only be carried out where information gaps have been identified. This activity refers to the updating of the existing data base, and to the increasing of scientific knowledge on coastal natural systems. This new information, and the information collected in the previous phase, is to be used for subsequent analyses.
  b) Analysis of natural systems is aimed at identifying socio-economic impacts on natural systems resulting from the use of resources. It should include the following:
     - estimation of current rate of resource use based on economic and social patterns in the coastal area;
     - assessment of the impacts of resource use practices on the state and stock of natural resources;
     - calculation of waste generated from economic and other urban activities;
     - calculation of waste being discharged into natural systems, and particularly in coastal waters;
     - calculation of waste generated in other regions and discharged in the natural systems of the planning area;
     - assessment of possible effects of hazards and risks on the state of the natural and socio-economic systems;
     - generation of information on the impacts of socio-economic activities on natural ecosystems.
  c) Analysis of the system of human and economic activities in coastal and marine areas is focused on the identification of their levels and spatial patterns. The following shall be analysed:
     - Demography (vital statistics, income levels, employment opportunities, population distribution, etc.);
     - Economy (industrial inventory, major inputs and outputs of industry, energy production and consumption, transportation structure, tourism, oil exploration and extraction, mining, consumption patterns);
     - Social structure (migrations, living conditions, health impacts of environmental degradation, cultural patterns, perceptions on the environment and resource uses);
     - Spatial structure (land and sea uses and capability, settlement structure, urban pattern, infrastructure systems);
     - Institutional structure (legal system, administrative structure and capabilities, resource management procedures, etc.);
     - Exposure to risks (sea level rise, technological risks and hazards, etc.).
  d) Forecasting future demand on coastal resources and their capacity to fulfil these requirements is based on the assessment of impacts of the planned activities in a coastal area. Forecasts should be based both on projections of existing trends and on forecasts of the activities not currently affecting, but expected to affect, the natural systems in the future.

e) The forecasts should be integrated in the form of alternative cross-sectoral scenarios, each of which refers to a different future development course (scenario method is explained in the Chapter 4). Using a number of criteria based on tentative goals and objectives (approved in the preparatory phase), the most appropriate scenario would be selected.

3.2.4 Definition of goals and strategies

This is one of the most important phases of the whole ICAM process. Before proceeding further, decision-making bodies at the highest level have to approve the goals and strategies of environmentally sustainable development in the coastal area concerned. This phase consists of several steps:

- refinement and adoption of goals and objectives;
- preparation of alternative strategies; and
- evaluation of and decision on the most suitable strategy.

Goals may be defined as general development and environmental guidelines which should be followed in the course of the ICAM process. The goals should be followed up to the moment when they are achieved or, perhaps, revised and amended. Public participation in goal formulation is essential in their realisation. Since goals secure the strategic guidance of the process, it is important that they are presented clearly and explicitly, and that they are not contradictory. Goals also determine the criteria used in the selection of strategic option, and the land and sea use in the later phases of the ICAM process

Goals can be broken down into a number of compatible objectives. The objectives should be operational, in a quantitative form where possible, and should be short-term compared with the longer-term time horizon of the goals. Goals can be divided into three categories: global, area- specific and sectoral.

Global goals are those which refer to issues and problems of general importance for coastal areas, which are of a multi-sectoral nature, and which do not refer to specific geographic areas (for example, a goal is to ensure the sustainable use and development of the resources of coastal areas, without undermining their ecological integrity).

Area-specific goals are also of a multi-sectoral nature, but are defined with regard to the specific conditions prevailing in smaller geographic areas (regional-international, national, sub- national-regional and local). For example, a country with a relatively undeveloped coastline may set, as one of its goals, the development of new facilities by encouraging investment in tourist centres. Contrary to that, a country with a highly congested coastline may set a goal of restricting the expansion of tourist and recreation facilities to existing centres.

Sectoral goals refer to issues within a single development or environmental sector typical of coastal zones. These goals can be applicable at all geographic levels. It is a common case in coastal areas that relevant authorities tend to stimulate the development of a particular sector which is based on the use of the abundant natural resources (tourism, fisheries, aquaculture, agriculture, oil extraction, etc.), giving it priority over other sectors.


DISCOVERY
VALLETTA
URAL
FRONT SYMPHONY

BOX 20

Goals and objectives of the Coastal Zone Management Plan for Musandam, Sultanate of Oman

The purpose of the Coastal Zone Management Plan for Musandam is to help preserve and where necessary restore the natural richness, variety and quality of coastal environment of Musandam. To achieve this, the Plan recommended actions to guide and control the coastal zone, and to help resolve critical management issues.

The Plan devotes special attention to Nature Conservation Areas. Musandam has a number of sensitive environments and resources that require clear identification as sites for special planning and careful management.

Also, as the coral environments of Musandam are so seriously threatened by fishery activities and other natural events, and because of their great value for fisheries and tourism, these have been identified as vulnerable sites in need of special investigation. Consequently, they have been the subject study and attention.

The specific objectives of the Plan are:

- to map the distribution of coastal zone activities and resources;
- to identify new policy, legal and institutional needs for effective coastal zone management in Musandam
- to indicate the major resource management issues resulting from existing and proposed development and activities;
- to propose a specific action and responsibilities for the resolution of these management issues;
- to propose necessary revisions to nature conservation area boundaries and zones; and
- to identify recreation areas for protection.

Source: Ministry of Commerce and Industry. 1991. *Coastal Zone Management Plan for Musandam*. Muscat: Ministry of Commerce and Industry.

All goals must be complementary, and be arranged in a hierarchy. The global goals provide the framework for defining the area-specific and sectoral ones, while the sectoral goals, if they are also area-specific, have to fit into the typical features of individual areas.

The next step in the implementation of this phase of the ICAM process is the development, on the basis of the goals and objectives defined by relevant government levels, of **coastal area management policies**.

The objective of ICAM is to avoid policy conflicts which often cause environmental problems in coastal areas. In other words, in this phase it is necessary to co-ordinate various aspects of individual sectoral policies (for example, among fisheries, tourism, land use, industry, etc.). The most important element of coastal area management policies is political commitment to see the policies translated into action.

When defining the policies, the goals, objectives and priorities must be clearly pointed out, and the framework that identifies financial, human, technical and institutional resources needed for their

implementation must be outlined. Policies should be carried out through the implementation of various management strategies.

Compared to policies, **strategies are a succession of logical steps aimed at the realisation of the goals and objectives which were set in a policy statement**. In this phase of the ICAM process, sectoral and cross-sectoral general strategies are defined. These will in turn produce a range of options for reaching the goals and objectives.

BOX 21

Coastal management strategies

Strategies to implement coastal resources policy in relation to individual economic sectors include:

- Management of fishery resources;
- Management of recreation and tourism;
- Management of extraction of minerals, sand, gravel, oil and gas; and
- Management of marine transport.

In addition, strategies are required that cut across sectors, such as:

- Pollution control;
- Management of coastal land use and protection of significant landscapes and conservation of coastal ecosystems;
- Management of overall economic growth; and
- Management of governmental and private use of coastal resources.

Source: OECD. 1993. Coastal Zone Management: Integrated Policies. Paris: OECD.

The objective of the next step in this phase of the ICAM process is the integration of sectoral and cross-sectoral management strategies. This step is based on the existence of a high level of inter-dependence among these strategies and on the need for their implementation in a co-ordinated way. A typical integrated strategy should pay attention to the pattern of future activities in the area, and indicate the intended changes in the physical, economic, social and environmental life of the coastal area as a result of the implementation of desired policies.

In most cases alternative strategies could be generated. When strategies are evaluated and one is chosen for presentation to decision makers the strategy should include a definition of criteria (qualitative) and standards (quantitative). Criteria and standards would permit the use of coastal resources within limits designed to protect them from irreversible damage. However, the standards may change over time as public awareness of environmental quality increases. The criteria represent the factors which the decision makers and other interested groups consider relevant for the evaluation of usefulness and the later adoption of a strategy. The sustainability of coastal area development should provide the fundamental criteria for the selection of strategies.

The final output of this phase is a document which may be called **Management Strategy** or a **Strategic Plan**. It should not be too detailed, but consist of the major dimensions such as: future population growth, economic structure, social patterns, basic land and sea use, major infrastructure systems,

environmentally sensitive areas, conservation requirements, priorities, institutional structure, legal and financial requirements, etc. This document is intended for the use of decision-makers with the aim of final acceptance of the coastal area management strategy which will serve as the basis for the preparation of the coastal management plan in the next phase of the ICAM process.

3.2.5 Integration of detailed plans

The document to be completed in this phase is the **Integrated Coastal Master Plan** (ICMP). Depending on the size and economic structure of the country, ICMP might be prepared for different administrative levels. Thus, for example, ICMP could be prepared for a small country, or an island state, but for large countries, particularly, those with a long coast, preparation of ICMP would be hardly possible and, above all, highly impractical. ICMPs are more often prepared for a specific coastal region, or a smaller coastal site, or a coastal urban agglomeration. Figure 5 shows how an ICMP could be positioned within the overall coastal planning system of a certain country.

ICMP is a complex document which requires considerable institutional and financial resources. The objective of the ICMP is to create conditions for making operational decisions in the implementation phase of ICAM, relative to the realisation of the concept of sustainable development of coastal areas.

By its nature, the ICMP is a document which offers a very wide perspective and which contains long-term solutions to the problems of coastal areas. ICMP specifies a course of action for interested persons, decision makers and professionals in the field in their performing of daily management duties. However, uncertainty increases as the perspective of the plan widens and the time horizon lengthens, and the possibility increases of the operative decision-makers being forced to deviate from the plan. It is possible to overcome this problem by introducing flexibility into the planning process, so that the institutions entrusted with its implementation can respond, through monitoring and feedback, to changes in the planning context.

The principal task in this phase is a detailed elaboration of the selected cross-sectoral management strategy prepared in the previous phase of the ICAM process. The ICMP should include the definition of physical requirements that the implementation of the integrated management strategy may generate in the planning area, and the preparation of the step-by-step procedure to implement the plan. This should include detailed site-specific proposals for land and sea use, based on the use of criteria for prioritisation of areas. Sectoral policies and programmes of action related to the development and protection of the resources of the area should be well integrated into these plans. An ICMP should pay particular attention to the points given in Box 19.

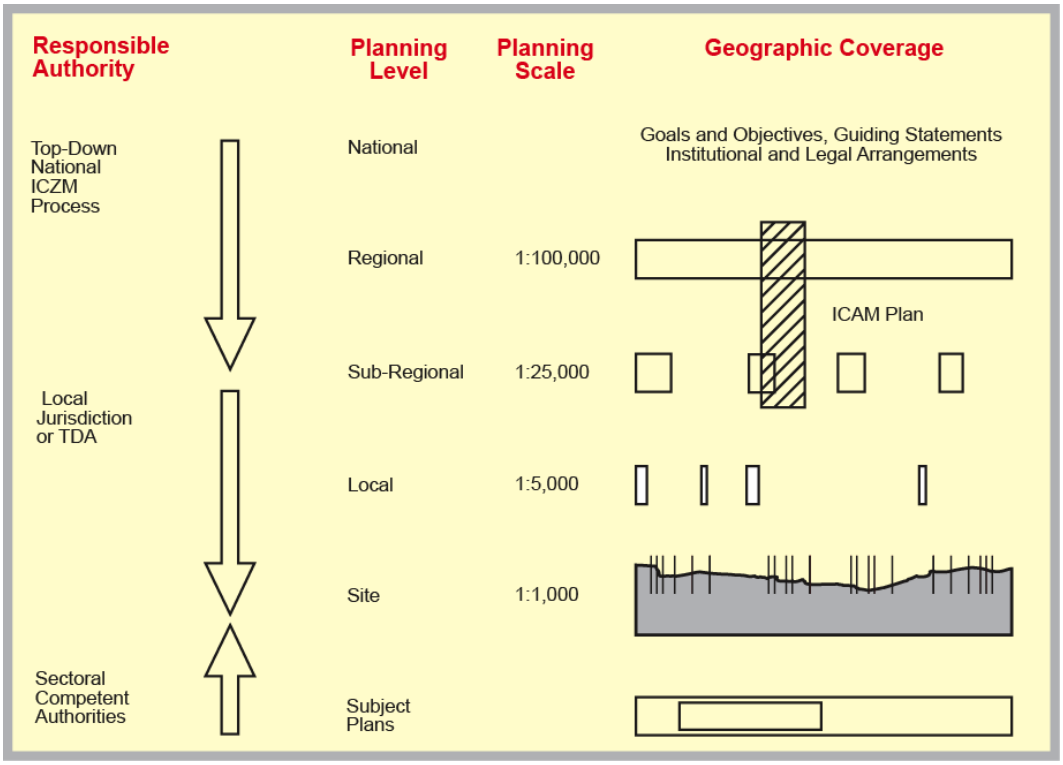


Figure 5: Coverage of integrated coastal area management plans

BOX 22

Some of the major land and sea uses in ICMP

i) System of urban and rural centres (boundaries of built-up areas, main economic and social functions, distribution of population, service areas, social facilities);

ii) Protected areas (natural areas, national parks, environmentally sensitive areas, marine habitats, cultural sites, coral reefs, historical and archaeological sites);

iii) Open spaces (protected natural areas, national parks, landscape reserves, coastal reserves, open spaces);

iv) Agricultural land (areas and sectors capable of expansion, permitted change from agriculture to other uses, protected agricultural land, irrigated land);

v) Forestry (mangroves, areas for wood production, grazing and recreational uses);

vi) Mining (oil extraction areas, gas fields, concession areas for oil and gas exploration, areas of proven oil and gas reserves, potentially exploitable areas which would not cause environmental damage);

vii) Industrial areas (areas where industry may be permitted, expected expansion of existing industries, additions of new industries, restrictions on polluting industries);

viii) Residential areas (major built-up areas);

ix) Tourism and recreational areas (centres and areas allocated for the development, areas of highly restricted development, accompanying recreational areas, ecotourism);

x) Sea uses (transport facilities, shipping lanes, fishing areas, oil extraction, mariculture, recreation, marine protection, marinas, diving areas, artificial reefs);

xi) Transport corridors and areas (road network: accessibility and hierarchy of network; railway network: inter- and intra-urban network, interrelationship with the proposed road network; airports: international, domestic, charter, agricultural, cargo; telecommunications: location of aerials, cable network);

xii) Other infrastructure (electricity network: location of power stations and sources of fuel, main transmission corridors, transformation stations, non-conventional sources of energy; water supply: reservoirs, pipes; sewerage system; oil refineries, storage and pipelines; irrigation system; desalinisation plants).

In addition, the ICMP should outline the basic administrative framework which the plan requires for its implementation, and which is already broadly defined within the ICAM framework. The ICMP should include those aspects of the proposed policies which can be implemented by existing laws and regulations, as well as those requiring new legislation, and the agencies which will play a key part in the process. The ICMP will also meet the need to:

- establish the procedures envisaged for the approval and the periodic revision of the plan;
- identify the authorities which will adopt the planning policies and introduce the planning controls into their operations;
- define expenditure priorities and the technical personnel required to implement the plan;
- ascertain how the required "development control" system will operate in principle and the extent to which this system exists (establishment of EIA procedure, cost-benefit analysis, etc.);
- ascertain the form of instruments proposed, such as building permits, planning permissions, industrial licenses, zoning regulations, development briefs, design directives, etc.;
- identify the legal basis and, if possible, the administrative body which will exercise these controls;
- ascertain the powers available to public agencies or corporations for compulsory land acquisition, land banking, land lease, and the practice followed in land valuation in cases of public land acquisition and restriction of private development rights for plan implementation purposes;
- ascertain the financial institutions which are expected to become actively involved in mobilising funds for projects, the local budgetary process, the revenue and expenditure structures, and, possibly, avenues for private-public joint ventures, and indicate the likely impact of the implementation measures on the existing structure of financial institutions and processes;
- specify the instruments to be used in the plan implementation (see section 3.3).

Crucial element of ICMP is the "**investment portfolio**", or the list of "bankable projects". This is usually being made in the last phases of the preparation of ICMP, when all the conflicts have been resolved and planning solutions provided. The responsible authority for the ICMP preparation should make an extensive list of possible projects and make a priority list of the investments. The investments could be in infrastructure, environmental protection, but also in capacity building, institutional strengthening and public awareness raising. The following criteria for prioritisation of investment projects could be used:

- if they contribute to the solution of most urgent environmental projects in coastal area;
- if their cost could be covered by the local government;
- if there is reasonable expectations for cost recovery;
- if the project proposals will contribute to the achievement of sustainable development of the coastal area;
- if the project aims at rational use and protection of coastal resources;
- if the project will not affect the environmentally sensitive areas, etc.

The investment portfolio consists of **project briefs**. Each brief will contain the following: short description of the project, a map showing the location and other environmental elements relative to the project, phasing of the project, responsible authorities, cost, responsible institutions, and the implementation plan.

3.2.6 Implementation of plans

The proposals defined in the Integrated Coastal Master Plan should be formally adopted at an appropriate governmental level. An adopted plan should have legal status, and the solutions and policies should be implemented in a well co-ordinated way. In coastal areas, a co-ordinating body takes the leading role in the plan implementation (tasks of this body are presented in greater detail in the section 3.3).

The plan implementation is most efficient if implementation phases are defined (see an example in Figure 6).This phasing is essentially a break-down of the ICMP proposals (which usually cover periods of up to 20 years) into short, medium and long term targets to arrive at a series of operational programmes fitting into identifiable 3-5 year periods over which detailed project planning, resource management and forward budgeting can be prepared and executed. In this way, the overall plan for the whole planning area, becomes implementable through specific activities in priority locations.

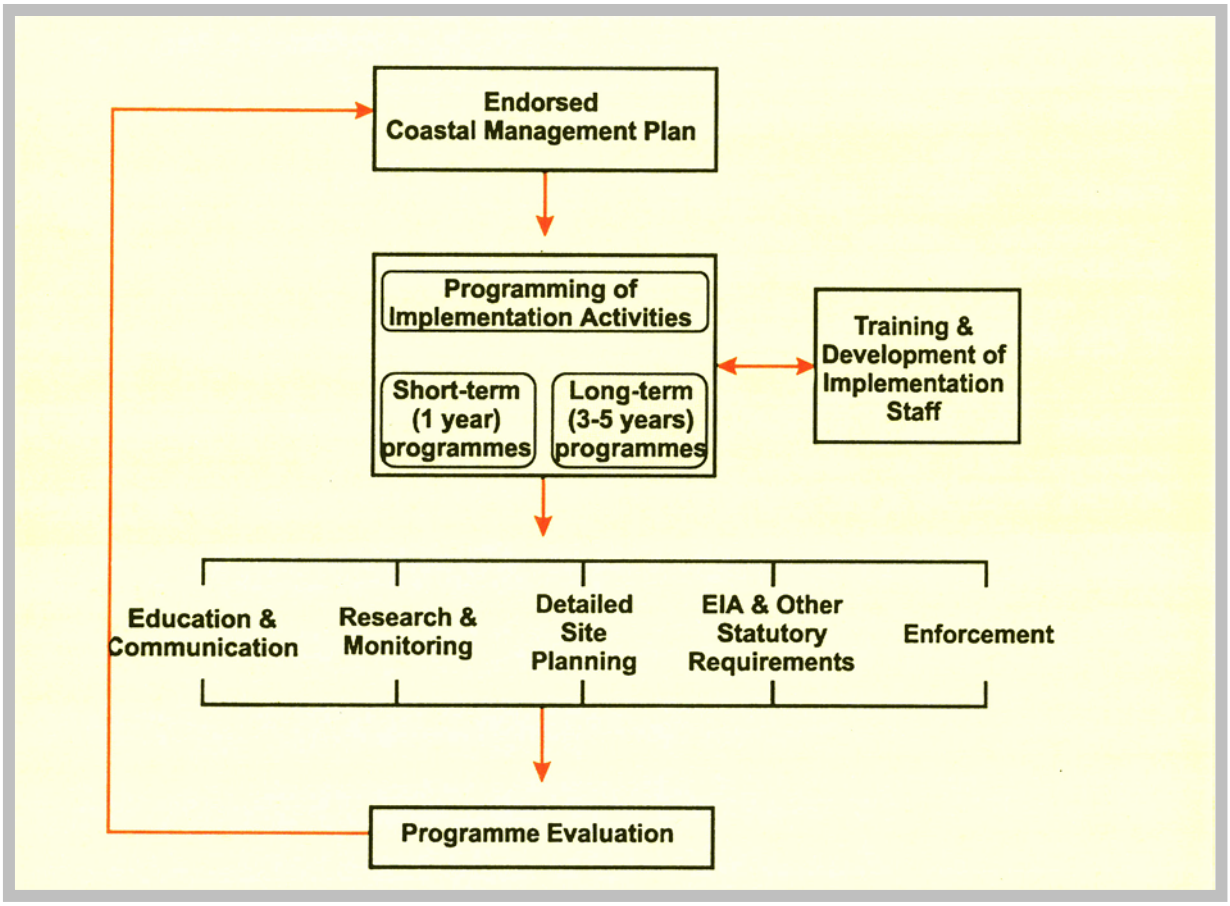


Figure 6: Generalised flow diagram of plan implementation

Source: Kay, R. and Alder, J. 1999. *Coastal Planning and Management*. London: E&FN Spoon.

The first period of plan implementation should be sufficiently self-contained to form a clear scenario of viable and specific actions but conceptually well integrated into the overall ICAM process and logically connected with the second stage. The same relationship should be maintained between all the periods of implementation. Phasing should be designed to translate the long-term strategy into specific actions and

locations, and to be carried out within a rolling programme where five-year objectives and annual targets follow on continuously.

To implement the process, the plan should be broken into smaller, manageable tasks within the resources and adaptive ability of the administrative system, the budgeting process and the public at large. This offers much more scope for flexibility and adaptability as smaller components of the proposed plan can be manipulated much more easily than the overall strategy.

An important advantage of phasing is the minimisation of risk and of uncertainty in the planning process. Phasing reduces the element of uncertainty in the implementation process by bringing long-range goals into closer perspective and limiting the range of time over which specific planning objectives are expected to be reached.

Of great importance in this phase is the application of instruments to determine the environmental effects of the plans and projects defined by ICMP. It is particularly recommended that Environmental Impact Assessment (EIA) and Cost-Benefit Analysis (CBA) be included in the process of ICMP implementation.

In order to increase the visibility of the ICAM process it is advisable that several demonstration projects on selected sites be carried out early in the implementation phase of ICAM process. These sites should be typical in order to characterise the overall situation in the planning area. Not always large resources are needed to implement these projects. A small project document will have to be prepared. The most important is that these projects be realised quickly in order to give a boost to the implementation of more difficult component of the plan.

3.2.7 Monitoring and evaluation

Monitoring and evaluation of ICAM implementation are both broadly concerned with the assessment of the performance of the ICAM polices and the results achieved by ICAM over the years, relative to the goals and objectives of the ICAM process.

The monitoring or “watchdog” part of the ICAM process must establish a regular flow of information on the decisions, actions and investments involved in the implementation of the ICAM. Evaluation uses the information generated by continuous monitoring to analyse:

- the effectiveness of ICAM decisions,
- the efficiency of the investments undertaken,
- whether the benefits of the ICAM process have been equitably distributed among the various social groups of the community; and the impacts of ICAM actions on the environment.

Monitoring and evaluation procedures are crucial to the ICAM process as they must systematically feed information back into the process. This will allow for continuous revision and up-dating of goals and objectives in the light of actual performance, effectively securing continuity and integration in the ICAM process. The implementation process should be under constant review to allow for necessary adjustments to the policies in the light of changing conditions. There is a limit to the flexibility of any process, and there is always a stage in the implementation process after which further changes are difficult to accommodate without high costs. It is, therefore, crucial that continuous evaluation is made of the costs and benefits likely to derive from adjustments to planning and implementation objectives. It is of utmost importance that performance indicators be selected and used from the very beginning of the implementation of ICAM. The first *ex-post* evaluation of ICAM should be made

3-5 years after the implementation of the ICMP has started.

3.3. Sustainability of ICAM

Sustainability in this context relates to the project's "life", and refers to the chances that it will, ultimately, succeed. Too many excellently prepared plans, programmes and projects have ended up on the shelves because in their implementation one or the other crucial components was missing. These components are:

- institutional arrangements;
- legal arrangements;
- financial mechanisms;
- political support; and
- public participation.

3.3.1 Institutional arrangements

One of the most frequent constraints on achieving ICAM is the lack of appropriate institutional arrangements. Due to its complex nature, ICAM requires a high level of integration within and between institutional structures. A high level of horizontal integration is particularly necessary between sectoral institutions at the planning stage and a high level of vertical integration is necessary within institutions at the implementation stage.

There are several possible institutional approaches to perform the task of ICAM, such as:

- creation of a national planning agency;
- formal establishment of an interagency or interministerial council;
- creation of a special co-ordinating commission or committee;
- formal designation of one of the line agencies or ministries to act as a "lead agency" and to oversee an interagency co-ordination process.

If many of the institutions needed for ICAM already exist, the linkages between them may have to be created or strengthened. Where no such institutions exist, a new institutional arrangement may need to be created.

Existing institutional structures may be composed of government and local authority representatives. This generates the need for building human resource capacity for ICAM both in the fields of coastal and marine sciences and in the fields of environmental management and conflict resolution.

Institutions for ICAM have three roles:

- an executive role, for decision making;
- a judicial role, for enacting regulations and directives, standards and procedures, enforcement and arbitration;
- a market role, allocating funds, offering incentives or subsidies.

Institutional arrangements are needed at three different levels for taking specific responsibility for coastal arrangements:

- national,
- regional (sub-national),
- coastal area (local).

National level administration should be concerned with development and implementation of broad coastal management policy; this would include preparation of a Coastal Area Management Act, a Coastal Area Management Strategy, and designation of a lead agency for coastal management at the national level, e.g. Environment Ministry or Department of Public Works or Ministry of Local Government. The role of the lead agency is to be a facilitator for bringing together various agencies involved in ICAM and stimulating a dialogue between them. The choice of a lead agency will vary from country to country depending on the

allocation of responsibilities in each country. At the national level environmental and conservation standards need also be laid down for coastal areas e.g. coastal water quality. There needs to be an interdepartmental (interministerial) committee for coastal management consisting of the major ministries operating in the coastal areas: environment, tourism, economic development, industry, public works, transport, forestry and agriculture. A degree of indicative national planning is needed to inform regional and local authorities of the intentions of national development policies.

At the **regional** level, depending on the authority of regional governments, more detailed but integrated planning and management are required within the responsibilities of the regional authorities. Such a process should ensure the consistency between the activities of local governments to reduce the danger of overloading the coast. This should also cover areas outside local governments and in some cases where conflicts with national authorities may occur, e.g. defence.

Detailed planning, development and implementation takes place at the **local** level. However here distinction should be made between areas where one local government authority can effectively manage the coastal zone and those areas where several local governments need to co-operate closely to plan and implement policy. This will depend on the nature of the coastal area both along the horizontal axis but more importantly on the perpendicular axis to encompass all the major activities having an impact on the coast.

BOX 23

Institutional framework for ICAM in the Sultanate of Oman

Intersectoral co-ordination for coastal zone management cuts across the jurisdictions and interests of many sectors, requiring well defined co-ordination mechanisms. For example, The Ministries of Communications, Agriculture and Fisheries Wealth, and for Regional Municipalities and Environment currently have responsibility for the control of different activities in the coastal zone under existing laws (Decrees 34/74, 53/81, 11/90, 117/91), but not for land use planning. The mandate for land use planning lies with the Ministry of Housing. The Supreme Committee for Town planning co-ordinates the planning process (the Planning Committee for Development and Environment in Dhofar Governorate fulfils this function in Dhofar), and defines polices. Economic planning's is the responsibility of the Development Council. There is clearly overlap between the planning roles of the Ministry of Housing, the Planning Committee for Development and Environment in Dhofar Governorate, the Supreme Committee for Town Planning, and the Development Council, and the planning needs and coastal zone management activities of the other ministries.

Source: Ministry of Regional Municipalities and Environment. 1992. *Coastal Zone Management Programme: A Framework for Action.* Muscat: MRME.

To cover all land resources and coastal waters all authorities involved in the operation, exploitation, conservation and maintenance in these resources should integrate their activities within a co-ordinating mechanism, for example a Coastal Area Management Committee. Such a committee might be established on a voluntary or on a statutory basis. It should meet regularly and could have the following functions in guiding the ICAM process: review major development proposals, take decisions on these proposals, define the functions of the participating bodies in the decision making process and ensures public

involvement, and assist in revenue raising and allocation of funds.

Coastal managers at the level of Coastal Area Management Committee would have to ensure the creation and the effective operation of such committees. They would have to be fully acquainted with national and regional coastal management policies and operations and use them for the operation of their committees. They would have to ensure that all the above functions of the coastal area management committee are carried out according to specific guidelines and sequence. Whatever the institutional arrangements, a manager will be needed to fulfil a central role in setting-up and running the committee and its various groups. The committees could be established at the local, regional (sub-national) and national levels of government, depending on the size of the country or a coastal area, as well as the nature of the coastal problems encountered.

3.3.2 Legal arrangements

Legal arrangements are needed at different levels to make ICAM possible. Many countries enacted a Coastal Area Management Act which sets out various institutional arrangements, property rights, user rights, access to judicial process, right of the public to intervene in the management process, and even financing mechanism for coastal planning. At the same time many other acts and regulations are in force in coastal areas dealing with a variety of activities: shipping, fisheries, conservation, transport and local government laws, etc. Some of these laws are often dated and they can be contradictory, particularly in their interpretation. Often there is little guidance in these laws as to their order of precedence.

BOX 24

Major categories of coastal legislation

a) the **national integrated coastal management approach** where legislation is enacted specifically to implement or promote existing ICAM policies;

b) the **national economic planning or resource management approach** which has given rise to ICAM as part of a larger project extending beyond coastal areas;

c) the **extended land use planning approach** characterised by attempts to modify terrestrial planning techniques to achieve more integrated management of coastal areas; and

d) the **special region approach** which is characterised by the implementation of integrated management of coastal resources within particular regions of the coastal area in order to achieve specific objectives which are more limited in scope than those typical of a full ICAM programme.

Source: Boelaert-Suominen, S. and C. Cullinan. 1994. *Legal and Institutional Aspects of Integrated Coastal Area Management in National Legislation.* Rome: FAO.

For coastal managers one of the main tasks is to ensure an interpretation of the various laws and regulations on coastal areas and activities that will facilitate the use of coastal resources without infringing environmental and conservation legislation. This should be achieved through negotiations in the coastal management committee. Should this fail recourse might have to be taken via the judicial process or other arbitration procedure.

Coastal managers might also have to take the initiative to demonstrate the need for specific and special environmental

standards for certain coastal regions where circumstances would require them. Coastal managers, for example, can assist local authorities in devising regulations on such matters as property rights in beach areas, access to the coastal strip, or minimum distance of buildings from the shore, when these are not specified in national legislation.

3.3.3 Financing mechanism

Three types of financing requirements are generally essential for effective ICAM: financing of the administrative structure, the planning, the information system and the project review mechanism; financing the infrastructure and pollution control expenditures; and financing of conservation measures.

Depending on the objective of expenditures the financing mechanism will be different, so that:

- to finance the administrative structure and related expenditures the money will have to come from the budgets of national, regional and local authorities;

- to finance infrastructure and pollution control, moneys can be largely generated from user charges and costs can be partially passed on to industry (user charges and similar financing instruments are described in Chapter 4 under implementation instruments);

- financing of conservation can be undertaken partly from private voluntary financing and partly from visitors' fees etc. of reserved areas.

Coastal managers' tasks in financing are different according to the type of financing involved:

- concerning funding from the various budgets, they should try to ensure that funding requirements be incorporated into the respective legislation; otherwise, the agency most interested in the proper management of the coast might have to provide the financing;
- concerning user charges and similar financing instruments, the manager will have to rely on them for the efficient implementation of measures as well as for financing; consequently he/she will be advocating and using them as part of the implementation process in conjunction with local authorities and other agencies. Part of his task will be to secure these funds for the installation of infrastructure and other services and minimise the amounts that are paid into general revenue and lost to coastal management;
- raising funds for conservation to set land aside in perpetuity is now a fairly common practice; private funds are often raised by interested environmental groups and their efforts are supported in various ways by coastal managers: for example private fund raisers usually need the assistance of the managers to establish under what conditions their efforts would be approved by the authorities; sometimes these funds are raised as matching funds (partly private and partly public). Conservation could be financed and maintained from visitors fees in the cases of unique sites or animal reservations, etc.

3.3.4 Political support

The political support is very often a crucial element for the success of an ICAM intervention. This is closely related to the “top-down” approach to environmental management which is characterised by the initiative of the governmental departments in the implementation of ICAM. As some surveys have shown, particularly in developing countries this approach is dominant and considering their somewhat rigid political structure, this is the only possible approach.

Decision-makers in various levels of government are in position to influence strongly the course of an ICAM initiative. Gaining their support will certainly benefit ICAM.

3.3.5 Public participation

Sustainable development and management of coastal areas requires a combination of "top-down" and "bottom-up" approaches. Public participation in the process is essential. Also, the successful achievement of ICAM will require the active participation of stakeholders in the public and the private sector in many of the institutional arrangements. In order to ensure adequate public participation in coastal planning and management and decision-making, the following is advised:

- make sure that decision-making process is consultative and open to all parties who want to or should be involved, and encourage such parties to do so;
- make funds available to those who would otherwise be unable to take part;
- ensure that all opportunities for public involvement are well publicised;
- support education and mobilisation programmes in schools and universities and other community programmes;
- hold public meetings;
- involve the public in monitoring human activities along the coast, impacts on the coastline, and implementation of laws, agreements, or other decisions;
- involve local businesses in programmes, and work with them to advertise the issues in their outlets;
- using public service advertisements and other media outreach;
- use innovative techniques for reaching different audiences and age groups, etc.

4. TOOLS AND TECHNIQUES FOR ICAM

The nature of coastal development, the environmental interactions of sectoral activities and the complex management requirements imposed on decision makers and professionals involved in ICAM require the employment of numerous specific tools and techniques. Most of them are based on methodologies which can be handled by national expertise available in many developing countries. The following broad classes of tools and techniques are recommended in the application of ICAM:

- data management;
- evaluation and assessment techniques (environmental assessment, risk assessment, economic evaluation, prospective studies);
- instruments for implementation: regulatory and economic, bargaining, negotiations and voluntary agreements, conflict resolution techniques; and
- education and capacity building for ICAM.

4.1. Data management

Data and information bases are essential tools of ICAM, helping to reduce the high level of uncertainty, thus providing decision makers with ways of identifying relevant coastal issues, indicating expected impacts of alternative actions, and providing information on present and expected costs and benefits.

Database for ICAM should be functional, and selected with regard to its application for the execution of defined tasks, such as:

- indication of areas or variables likely to be under pressure from future urban and coastal development;
- selection of sites most appropriate for essential public services which do not cause environmental degradation, e.g. sanitary landfills;
- identification of resources of high sensitivity to the impacts of oil spills, for protection policies;
- identification of priorities for nature conservation where sensitive ecological resources are in areas subject to upstream or up- shore pollution;
- planning of tourism development in relation to the carrying capacity of coastal resources;
- selection of alternative development scenarios or projects;
- identification of appropriate policy instruments;
- definition of appropriate financing mechanisms;
- monitoring of the impacts of changes in a watershed on water quality, water flows and on ecological habitats in estuarine regions.

For each of the above applications, and for many other issues relevant to integrated coastal area management, the database user must identify both the data input required and the way in which it can be manipulated to achieve the application required. In many cases it will be a man-machine interface, where part of the operations are carried out manually before input, part by computerised processing and part may be manual following output, where additional expert evaluation is needed. A computerised database for the coast is not an end in itself (unless the purpose is to produce an atlas) but an interactive tool which can contribute to management decisions.

BOX 25

A suggested data base for ICAM

a) resource inventory covering quantity and quality of resources:

- land area
- built-up area
- oil and gas reserves
- oil and gas exploration sites
- sites for oil exploration concessions
- agricultural land
- land set aside for conservation
- land set aside for special purposes
- forests (mangroves)
- water resources
- surface waters
- ground water
- coastal waters
- marine resources (seagrass, fishery grounds, nurseries, coral reefs)
- wildlife resources

b) economic inventory

- industry
- agriculture
- tourism
- fishing and aquaculture
- forestry
- transport
- energy

c) infrastructure

- roads
- railways
- air
- water supply
- sewage treatment
- water dams

d) pollution discharge inventory

- air pollution
- water pollution (liquid waste, oil, chemicals, hazardous waste)
- solid waste

The most common uses of a database in ICAM are:

- identification of the key indicators of existing conditions to the present state of the coastal environment;
- identification of coastal resources under stress or at risk, and their level of vulnerability or risk of degradation;
- forecasting the possible impacts of alternative development trends on sensitive resources;
- identification of areas of opportunity, using site suitability and exclusion criteria;
- simulation and testing of alternative options;
- monitoring and feedback;
- exploration of available information and alternative scenarios through interaction tool with query capability.

An important element of data management for ICAM is bringing together the data on physical/natural resources, and the economic information (such as economic benefits of the development, the economic cost of environmental damage caused by the development, costs of measures to avoid damage, and the benefits if damage is avoided or reduced). The integration of the physical and economic data is one of the most complex tasks in data management for ICAM.

Within the context of ICAM, one effective data management tool is the Geographic Information System (GIS). GIS is a specialised form of database system, distinguished by its ability to handle geographically referenced data, which can be displayed as map images, and which are capable of integrating environmental, social and economic data into one system. Geographically referenced data have the following basic characteristics:

- a variable to which attributes can be attached;
- its spatial location in two or three dimensions;
- its value at any point in time.

A simple use of GIS is storage and retrieval of geographic information, but it has the capability of contributing more useful analytical tools to the decision-maker. Data can be analysed using spatial models which check the value of a variable in relation to its spatial characteristics, e.g. distance between variables, occurrence of different variables at the same location and the connectivity between variables. Developments in dynamic GIS are now adding further capabilities for the spatial analysis of changes over time, capable of indicating the impacts of small scale accumulative developments dispersed over a large area. Examples already include the analysis of changes in surface water flows in a watershed, using 3-dimensional digital terrain analysis.

GIS can also provide the decision maker with a query capability. Any issue may be investigated in an exploratory fashion to provide answers to ad hoc spatial problems. It is therefore a plan-making and on-going management tool and is already well established in many systems of integrated resource information management. Experience shows that, with initial training and a minor investment in software and hardware, it is possible to introduce and efficiently use GIS as a decision-making tool in any mid-size town/community.

Developments in remote sensing, particularly with the aid of satellite imagery, are now making data available for every country, for inaccessible locations where data were previously difficult to collect, for time series at repeated, regular, known intervals, easily updated, and at a high level of resolution. But technological advance is not going to solve all data collection problems for coastal management. Even after utilising all the data that can be obtained through imagery,

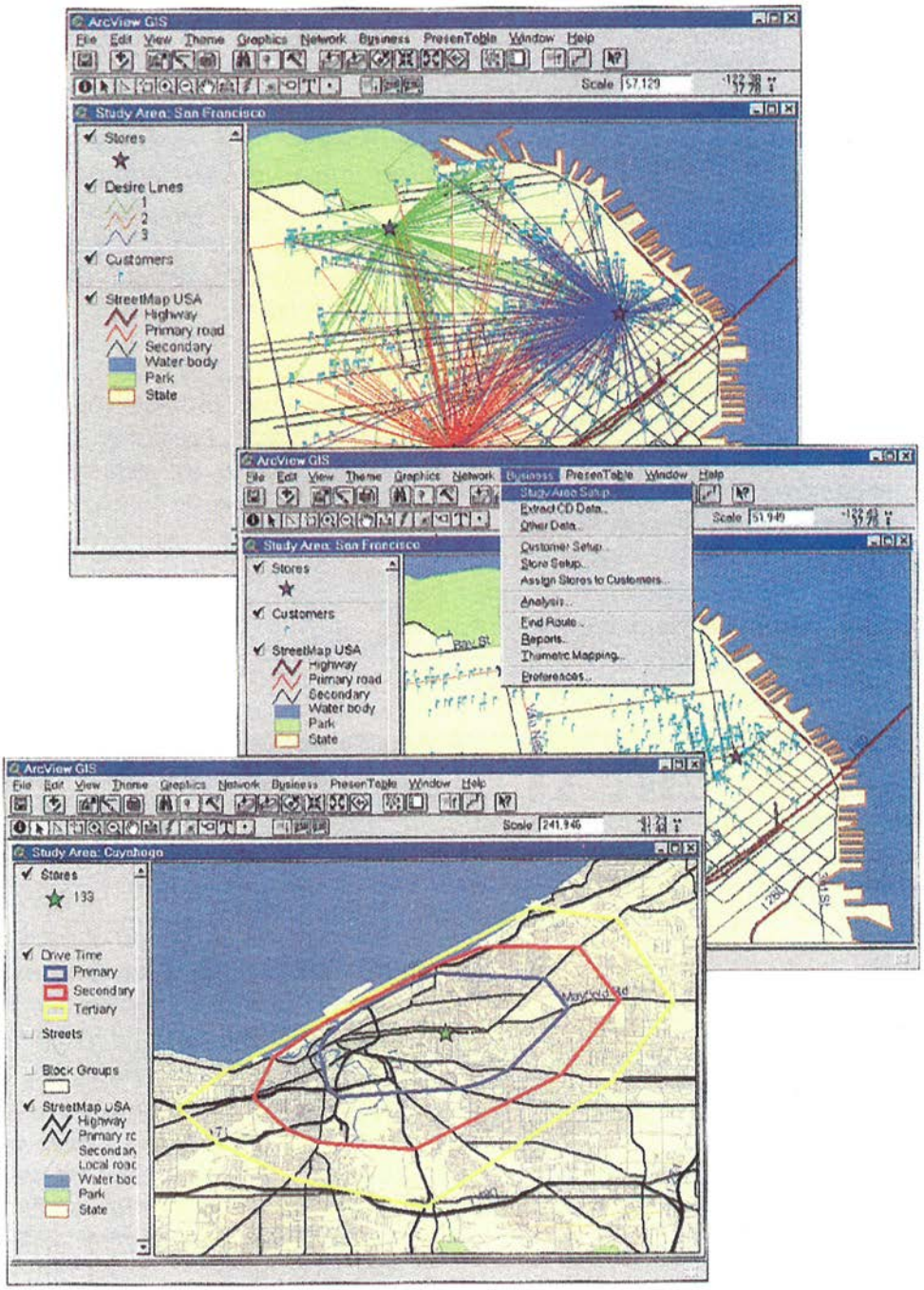
much will be needed from field survey. The only guideline for field survey which can be offered is that it should be reduced to the minimum necessary for the defined functions of the database system.

4.2. Evaluation and Assessment Techniques

The data collected and appropriately presented would in turn allow physical, environmental, economic and social evaluation both sectorally and in an integrated manner.

4.2.1 Environmental assessment

The specific objective of environmental assessment (EA) is to provide decision makers with information allowing them to introduce environmental-protection considerations early in the decision making process leading to the approval, modification or rejection of the project, activity or plan.



PROPOSED ACTIONS →

EXISTING CHARACTERISTICS AND CONDITIONS OF THE ENVIRONMENT ↓

INSTRUCTIONS

1. Identify all actions (located across the top of the matrix) that are part of the proposed project.
2. Under each of the proposed actions, place a slash at the intersection with each item on the side of the matrix if an impact is possible.
3. Having completed the matrix. in the upper left-hand corner of each box with a slash, place a number from 1 to 10 which indicates the MAGNITUDE of the possible impact; 10 represents the greatest magnitude of impact and 1, the least (no zeroes). Before each number place + if the impact would be beneficial. In the lower right-hand corner of the box place a number from 1 to 10 which indicates the IMPORTANCE of the possible impact (e.g. regional versus local): 10 represents the greatest importance and 1, the least (no zeroes).
4. The text which accompanies the matrix should be a discussion of the significant impacts, those columns and rows with large numbers of boxes marked and individual boxes with the larger numbers.

			A. MODIFICATION OF REGIME													
			a. Exotic flora or fauna introduction	b. Biological controls	c. Modification habitat	d. Alteration of ground cover	e. Alteration of ground water	f. Alteration of drainage	g. River control and flow modification	h. Canalization	i. Irrigation	j. Weather modification	k. Burning	l. Surface or paving	m. Noise and vibration
A. PHYSICAL AND CHEMICAL CHARACTERISTICS	1. EARTH	a. Mineral resources													
		b. Construction material													
		c. soils													
		d. Land form													
		e. Force fields and background radiation													
		f. Unique physical features													
	2. WATER	a. Surface													
		b. Ocean													
		c. Underground													
		d. Quality													
		e. Temperature													
		f. Recharge													
		g. Snow, ice and permafrost													
	3. ATMOSPHERE	a. Quality (gases, particulates)													
		b. Climate (micro, macro)													
		c. Temperature													
	4. PROCESSES	a. Floods													
		b. Erosion													
		c. Deposition (sedimentation, precipitation)													
		d. Solution													
		e. Sorption (ion exchange, complexing)													
		f. Compaction and settling													
		g. Stability (slides, slumps)													
		h. Stress-strain (earthquakes)													
		i. Air movements													

Rows = development actions
Columns = impacts
Cells: top-left = magnitude (1-10)
bottom-right = importance (1-10)

Magnitude / Importance

Figure 7: A portion of Leopold matrix

Source: Westman, W. E. 1985. *Ecology, Impact Assessment, and Environmental Planning.* New York: Wiley.

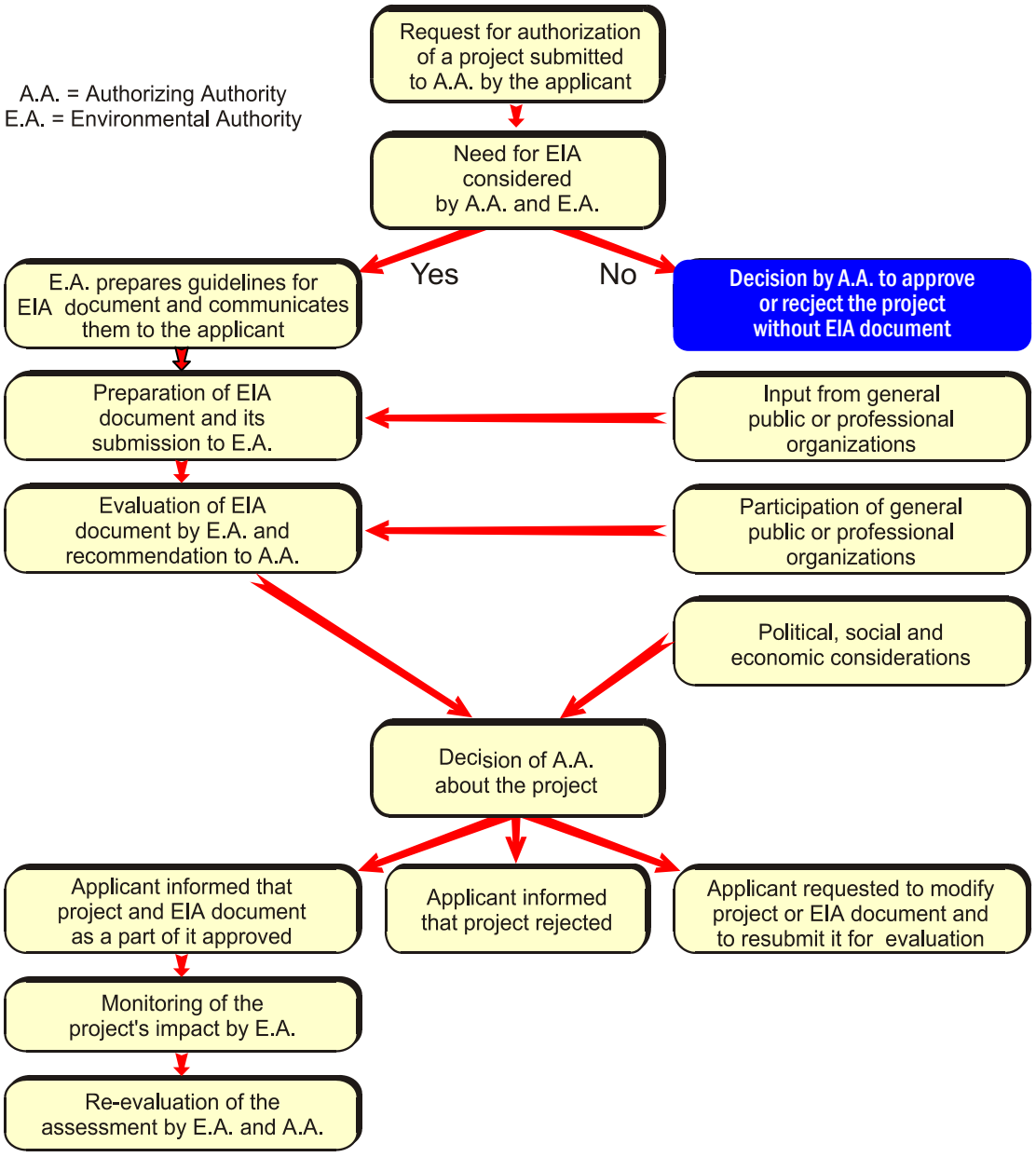


Figure 8: Simplified flow chart for the EIA procedure

Source: UNEP. 1990. An Approach to Environmental Impact Assessment for Projects Affecting the Coastal and Marine Environment. Nairobi: UNEP.

During the past 25 years a number of tools of EA have been developed and some of them successfully implemented: Environmental Impact Assessment (EIA), Strategic Environmental Assessment (SEA), Carrying Capacity Assessment (CCA), and Rapid Rural Appraisal adapted for coastal areas (Rapid Appraisal of Coastal Environments – RACE).

Most of these tools can be undertaken in considerable detail and with high degree of sophistication, but can also be applied in reduced and simple forms to suit the requirements of developing countries and small coastal communities.

Environmental Impact Assessment (EIA) is now a widely accepted tool. EIA is a process analysing the positive and negative effects on environment of a proposed project or activity. The process consists of identifying, predicting, interpreting and communicating the relevant potential impacts. Leopold matrix is widely used technique in this process (see Figure 7). In many regions, as well as in countries of the ROPME Sea Area, the application of EIA is mandatory for major projects which can have considerable environmental impacts. The preparation of EIA varies however considerably from country to country and at present there is no agreement on a global or regional level on procedures which may lead to comparable results. The complex EIA procedures used in some developed countries could be difficult to apply in developing countries due to the extensive data requirements and institutional and technical requirements needed for their implementation, the considerable time involved and the consequential costs in their preparation. Therefore, attempts have been made to propose practical approaches to the preparation of EIAs (Figure 8).

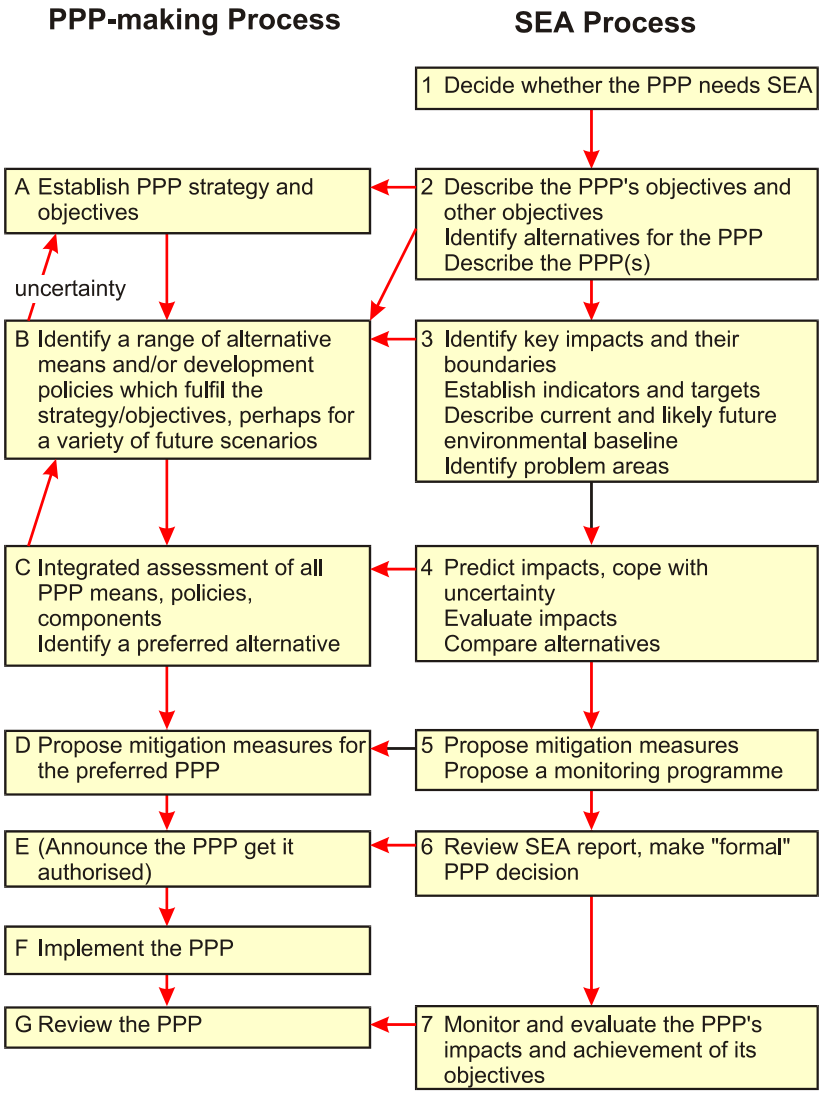


Figure 9: Stages in and links between PPP-making and SEA

Source: Therivel, R. and M. R. Partidario. 1996. *The Practice of Strategic Environmental Assessment*.

Strategic Environmental Assessment (SEA) is the environmental assessment of a strategic action being it a policy, plan or programme (PPP). It is a formalised, systematic, and comprehensive process of evaluating the environmental effects of a policy, plan or programme and its alternatives, including the preparation of a written report on the findings of that estimation, and using the findings in publicly accountable decision-making (Figure 9). In some countries this tool is even being used for environmental assessment of government budgets or some laws before they go in the parliament. SEA can be applied to three main types of actions: sectoral PPPs. which are related to specific sectors (e.g. oil extraction, tourism, urbanisation, etc.); area-based or comprehensive PPPs, which cover all activities in a given area (e.g. coastal land-use plan, development plan); and actions that do not give rise to projects but nevertheless have a significant environmental impact (e.g. agricultural practices, new technologies, etc.).

Strategic environmental assessment can be applied:

- with a sectoral focus (e.g. to waste disposal, drainage programme, aquaculture development, transport programmes, etc.);
- with a regional focus (e.g. to regional plans, rural plans, national plans),
- with an indirect focus (e.g. to technology, fiscal policies, justice and enforcement, sustainable development, sectoral acts etc.).

A system of the possible application in ICAM is presented in Figure 10.

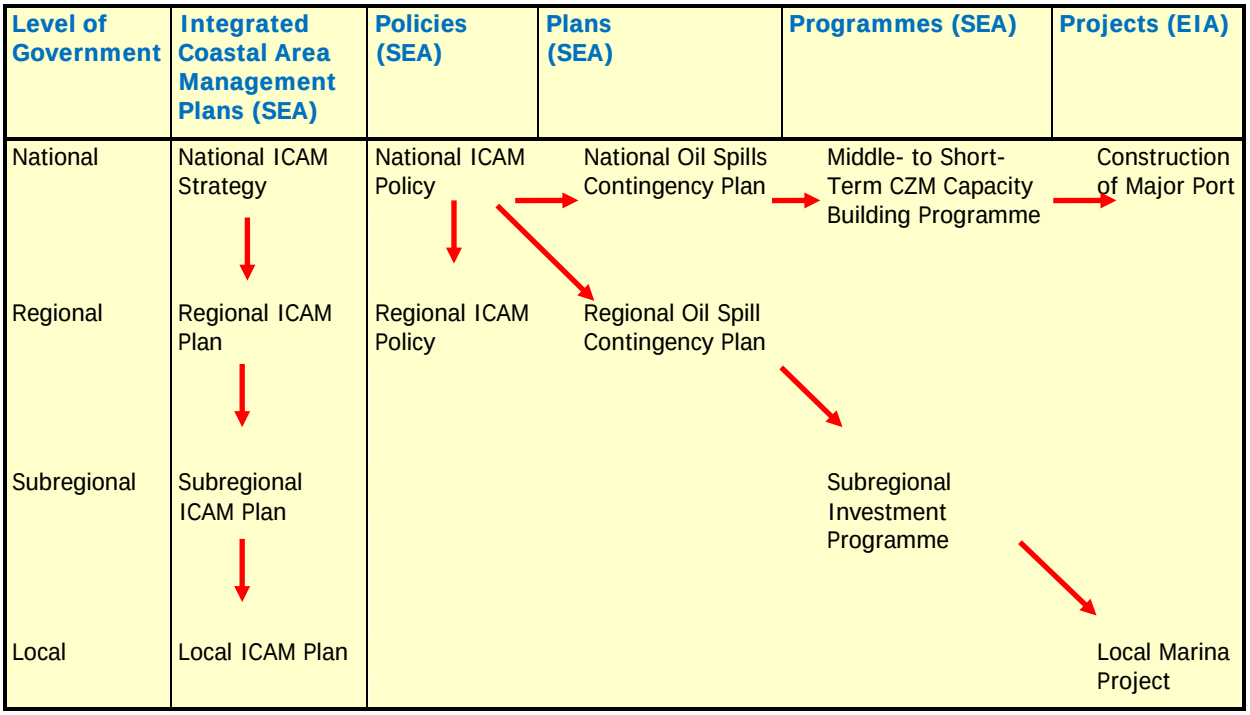


Figure 10: Tiered planning and assessment in ICAM (SEA=Strategic Environmental Assessment; EIA=Environmental Impact Assessment)

Adapted from: Barrow, C.J. 1997. *Environmental and Social Impact Assessment: An Introduction.* London: Arnold.

Carrying Capacity Assessment (CCA) can be best defined as assessment of the maximum load of activity or maximum number of users which can be sustained by a natural or man-made resource or system without endangering the character of that resource. The concept originates from the ecological studies where the users were plants. It was later used in agricultural studies (definition of the animal : land ratio, population capacity for agricultural land, etc.), traffic studies and, recently, in studies defining the capacity of tourist areas.

Carrying capacity is a relative concept. Its operational definition is dependent on the practice of managing the given resource as well as the characteristics of the user and the original state of the resource. This means that any capacity assessment is dependent on the management goals, ways the resource is utilised and the standards required by the potential user of the resource. A realistic assessment of the capacity is rather complex and frequently dependent on an arbitrarily set threshold beyond which the environmental consequences of overuse are considered undesirable. Thus, the capacity assessment is largely dependent on the value judgements of those who are determining them (managers, decision-makers, the public, etc.).

Because of the growing interest in the use of coastal resources and the vulnerability of coastal ecosystems, the carrying capacity concept is of considerable importance for ICAM, although it is hardly possible to arrive at exact figures. By defining the carrying capacity for tourism, for example, it is possible to get the framework for managing a certain area in the physical, economic, environmental, social and behavioural sense. Such application of CCA leads to the identification of the maximum number of users (tourists) which can be absorbed at any time by the receiving area without disturbing the physical, economic and socio-cultural environment.

Within the context of this definition, a mention should be made of the notions of the *"assimilative"* and the *"sustainable"* capacity, The term *"assimilative capacity"* applies in the cases when the environmental media are used, deliberately or unintentionally, for discharging waste materials from human activities. Natural systems can only absorb a certain volume of residues of different kinds over certain times without being adversely affected. The concept of assimilative capacity has to be applied, for example, in the case of untreated or treated liquid waste being discharged into a marine environment. The notion of sustainable capacity applies in the cases of renewable resources (fisheries, for example, see Figure 10), when the use of these resources has to be allocated over time to enable their use by future generations. The practical application of both concepts, assimilation and sustainability, departs from those principles respected in defining carrying capacity. By defining the carrying capacity for a certain activity it is possible to establish the framework for development and management of the areas under consideration. Figure 11 shows the framework within which the sustainable use of a certain resource, in this case fisheries, could be reached, implicitly indicating what is the carrying capacity of that resource.

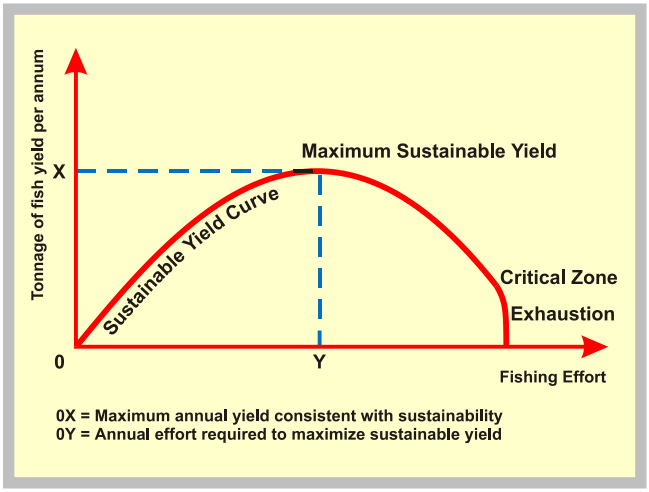


Figure 11: Sustainability of fishery resources

Rapid Assessment of Coastal Communities (RACE) is a technique originating from rural studies (Rapid Rural Appraisal – RRA), but applied to a coastal area it enables a rapid identification of major issues and problems. The RACE is a set of techniques and instruments used as a complement to ICAM. It uses only the existing (secondary) data. Direct contact with major users of coastal areas is an essential component of the RACE, which makes it appropriate only for smaller coastal communities and settlements. The RACE enables a faster implementation of individual phases of the ICAM process than in the case of traditional planning techniques. Out of 7 phases of the ICAM process, the RACE can be used in 4 important ones: initiation; preparatory phase; analysis and forecasting; and monitoring and evaluation (Figure 12).

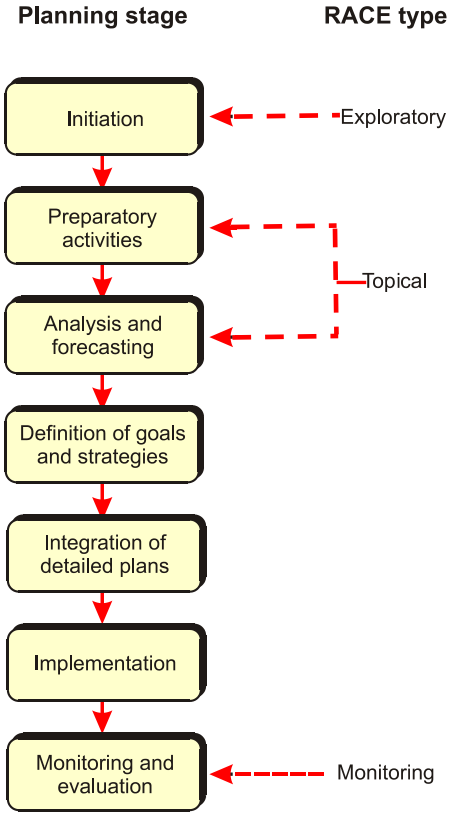


Figure 12: An ICAM process combined with RACE

Adapted from: Chua, T. E. & L. F. Scura (eds). 1992. *Integrating Framework and Methods for Coastal Area management*. Manila: ICLARM.

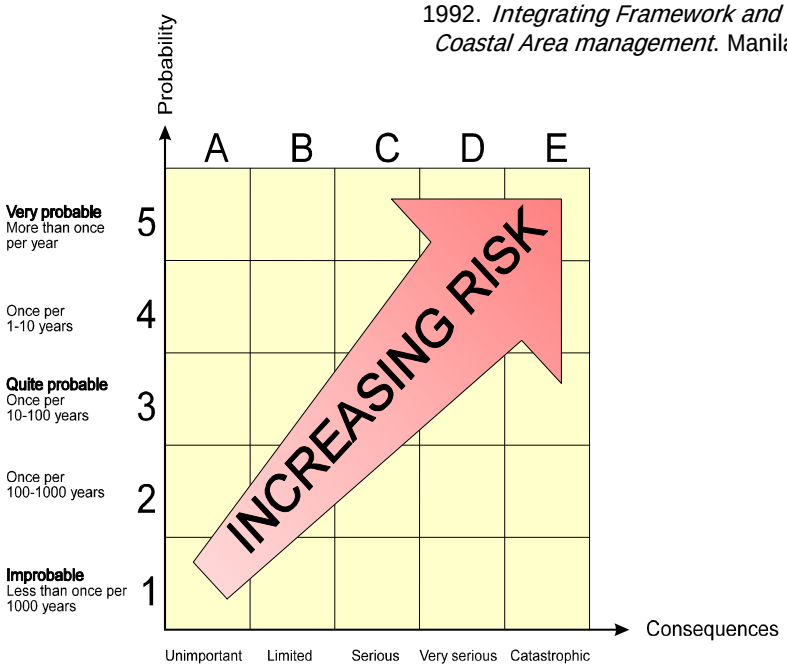


Figure 13: Risk matrix

Source: UNEP IE/PAC. 1992. *Technical Report No 12: Hazard Identification and Evaluation in a Local Community.* Paris: UNEP IE/PAC.

4.2.2 Risk assessment and management

One of the consequences of the intensive development of coastal areas and of the high population growth is that the probability of various risks is increasing, and ever larger numbers of people are exposed to them. The general awareness of exposures to natural risks (e.g. storms) and technical risks (e.g. tanker accidents) is increasing (Figure 13) but in many cases the relevant knowledge is incomplete, non-structured and not built into management policies and contingency measures. There are several instances of response to hazard and risk, as illustrated in Figure 14.

In order to mitigate or prevent possible negative, and sometimes environmentally catastrophic consequences of such hazards, risk management techniques should be part of ICAM. However, risk management can prepare only for probabilities of risks occurring and can only broadly estimate their consequences. Four steps can be distinguished in the risk management procedure (Table 4):

- identification of major hazards;
- assessment of the potential of individual hazards;
- policy decision and formulation of a plan that integrates the various management approaches to risks; and
- risk evaluation.

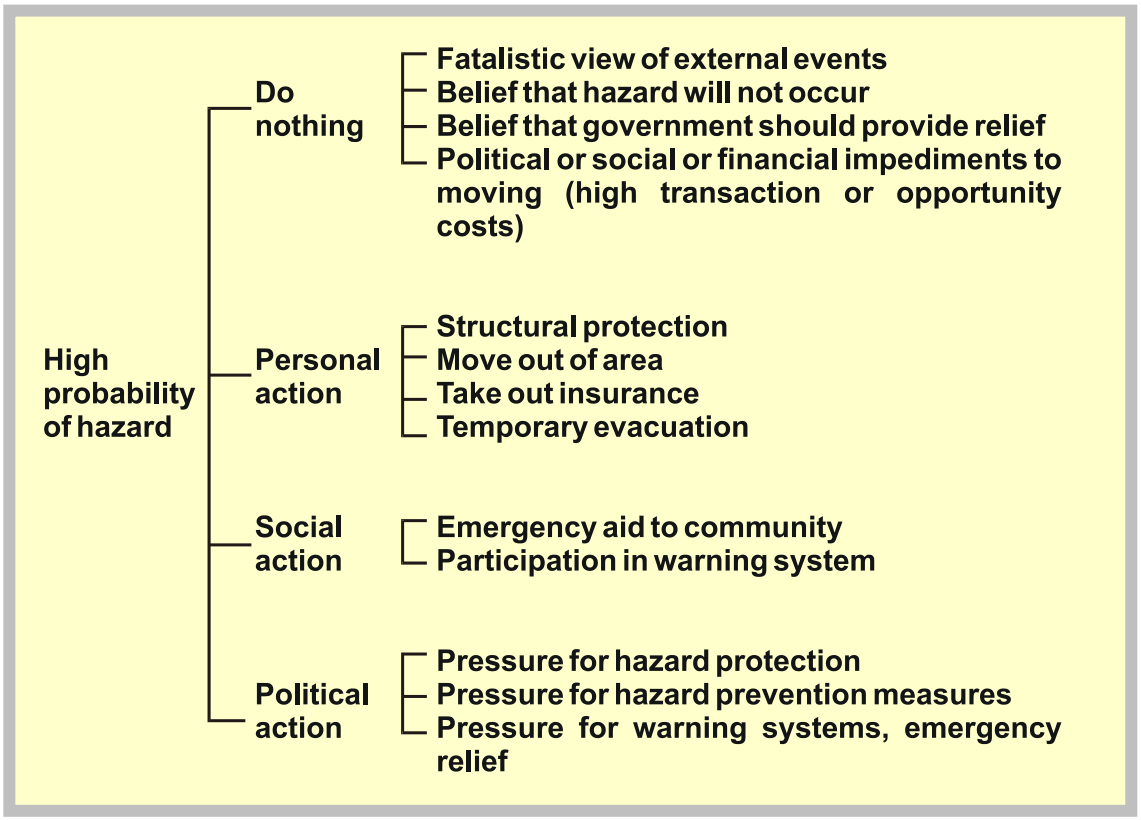


Figure 14: Response to hazard or risk

Source: Barrow, C.J. 1997. *Environmental and Social Impact Assessment: An Introduction.* London: Arnold.

Step	Description
Hazard identification and prioritisation	Determines what can go wrong by identifying a set of circumstances and established priorities of the most urgent hazards requiring policy action.
Risk assessment and characterisation	Evaluates how likely is it that a set of hazardous circumstances will arise and estimates their consequences. Determines subjectively the tolerable level of risk. Considers how risks can best be avoided, reduced to tolerable levels and controlled.
Policy decision and implementation	Considers how risks can best be avoided, reduced to tolerable levels and controlled.
Risk evaluation	Provides feedback about the net effects of risk mitigation.

Table 3: Definitions of the stages of the risk management cycle

Source: Kay, R. and Alder, J. 1999. *Coastal Planning and Management*. London: E&FN Spoon.

Earthquakes are one of the major coastal risks. For risks such as earthquakes a national plan is needed.

Mitigation of risks from hazards due to industrial, energy, transport and other activities is based on a multidisciplinary approach which takes into account all types of hazards existing in a specific coastal area. A specific method for dealing with industrial risks, APELL (Awareness and Preparedness for Emergency at Local Level), has been developed by UNEP-IE/PAC. Figure 4 presents a risk matrix used by APELL. Within ICAM the main responsibilities for carrying out the three steps in risk management specified above lie at the subnational and local level. The national authorities should be responsible for overall co-ordination, institutional and legislative aspects.

Risk from oil and other toxic spills due to ship accidents is a significant coastal hazard. The relevant management actions should be organised at the national level and all coastal authorities concerned should be included. The contingency plans for response to accidental marine pollution deal with environmental, administrative, operational, logistic and technical issues. The main elements of the contingency plan are coverage, spill risk assessment, behaviour and fate of spilled products, organisation of response activities and spill response.

4.2.3 Economic evaluation techniques

Apart from physical evaluations, such as measurement of carrying capacity, environmental impact assessment, and risk analysis, economic evaluations should also be carried out to ensure economic efficiency in coastal management. Neither carrying capacity assessment nor environmental impact assessment can provide economic information and therefore they are usually not sufficient for the economic partners in coastal management, e.g. industry, tourism and land developers to conduct negotiations. Only the combined results of economic and environmental assessments can provide acceptable options. This section proposes the use of the accepted economic evaluation techniques such as cost/benefit analysis and least-cost analysis for ICAM.

4.2.3.1 Cost/benefit analysis

Many outputs of coastal activities are channelled through the markets (tourist expenditures, industrial outputs, commercial fishery products). However, environmental benefits/damages (clean water and air, conservation of nature areas, etc.) are seldom traded in the markets. Furthermore, even market traded activities are evaluated only in financial and not in economic terms; and most activities and environmental protection require substantial expenditures that will produce benefits over a long period in the future. To provide a common denominator for these various activities, expenditures, costs, and gains require a comprehensive, analytic framework such as cost/benefit analysis (CBA).

a) Type of projects to be evaluated

All major infrastructure projects and other governmental expenditures need to be assessed for their economic efficiency, taking into account their environmental benefits and costs, including the expenditures needed to protect the environment. In coastal areas these include water supply, sewerage collection and treatment, road construction, energy supply facilities, harbour works, coastal protection construction, ship construction facilities, governmental building projects for offices and production facilities, defence installations, and waste treatment facilities.

Private investment projects also need to be evaluated, particularly when they are subsidised by the government. All private projects have environmental impacts which require pollution control or conservation measures either by the entrepreneur or by the government. These projects should not go ahead unless they are economically justifiable without direct or indirect "environmental/conservation" subsidies and produce no significant environmental impacts. The subsidies often take the form of taxation allowances, cheap land for tourism or cheap government loans for various types of development, governmental expenditures to minimise their environmental impacts or straight-out cash subsidies.

b) Practical implementation of the cost/benefit approach

In CBA a number of steps have to be carried out in a well defined sequence. These should include:

i) selection of the appropriate time frame for analysis; this should be for the life time of the project;

ii) identification and allocation of all costs and benefits;

iii) selection of the appropriate discount rate and discounting of all costs and benefits;

iv) presentation of the results either as benefit-cost ratios or as internal rate of return;

v) evaluation of results and making decisions.

c) Limitations of the CBA evaluation

Although CBA is now widely used in governmental decision making it has so far found not so wide application in the field of environment. The reasons for this are difficulty in quantifying and valuing environmental damages and benefits and the uncertainty associated with long term environmental impacts.

In spite of these qualifications it is recommended that coastal managers should make extensive use of CBA as one of the tools of evaluation. The method properly applied offers a framework for a systematic assessment of individual projects. The requirements for a listing of all costs and benefits necessitate the co-operation of various agencies (development, environment and economic). Even if not all costs and benefits can be quantified and valued, better decisions can be facilitated in many cases.

4.2.3.2 Least-cost analysis

Under certain circumstances it is possible to reach decision on investments on the basis of the differentials in their expenditures. Such is the case when the differences in the potential benefits, produced by alternative investments, are so small that they can be ignored. For example the coast could be equally well protected against storm damage by sea walls or by metal barricades in the sea. The difference can be found in the cost and in the visual impact of the type of construction.

In these cases it is sufficient to discount the cost streams to put them on a comparable basis. The applicability of this approach is limited but nevertheless useful under specific circumstances. Until now it has been widely used and is strongly recommended whenever cost-benefit analysis cannot be carried out.

4.2.3.3 Resource valuation

The basic question in the above presented techniques is the cost of natural resources. For some of these resources, as well as goods and services produced from the transformation of these resources, particularly those which are traded in markets, there are well established and accepted empirical techniques for measuring their value and the welfare changes they produce. The techniques utilised are mainly based on measuring supply and demand and determining changes in producer and consumer surplus, if market price and quantity data are used. These techniques have been used in determining the value of fish.

The resources, goods and services which are not traded in the market pose greater problems for the resource economists. Some innovative techniques have been invented and used so far, such as: indirect measurement techniques (Travel Cost Model, Random Utility Models, and Hedonic Techniques), and Direct techniques such as Contingent Valuation Method.

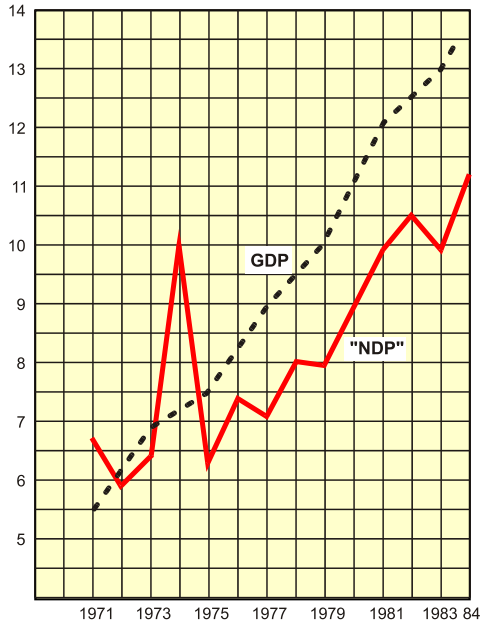


Figure 15: An example of difference between GDP and "NDP" - Net Domestic Product
(Indonesia; in constant 1973 trillion rupiahs)

Effects of the implementation of resource valuation techniques are presented in Figure 15. The example shows the case of Indonesia. Its 1973 value of GDP (calculated by "traditional" methods, i.e. only the benefits of resource utilisation were calculated, but not the cost of the resources utilised) was discounted by the cost of resources utilised. Such reduced amount of domestic product was named "NDP" (Net Domestic Product). The calculation was made by the Resources Institute.

4.2.4 Prospective studies: development-environment scenarios

Understanding of the interaction between the environment and foreseeable future development is an important prerequisite for ICAM. Prospective studies exploring future options are the tool for achieving such understanding. The basis for prospective studies is a systemic approach. It provides authorities, planners and managers with the opportunity of setting their development strategies within a context that assures the protection of the environment and facilitates identification of

areas of co-operation at local, national and international levels.

A development-environmental scenario is usually long-term (time horizon up to 30 years) and could be regarded as a link between the present and the future through a pathway built in stages of 5 - 10 year periods. A simplified picture of the phases of a scenario preparation lists: (a) setting up an initial scenario: (b) selection of hypothesis; (c) development of a pathway; and (d) definition of the possible evolution and possible final scenarios.

4.3. Planning for the marine protected areas

One means of protecting the biodiversity is to develop coastal and nearshore marine protected areas (MPA) that can accommodate carefully controlled levels of human use. In these areas controlled levels of tourism and recreational opportunities could be employed raising, thus, the quality of tourism and enhancing the lives of local people. These types of tourism (sustainable and eco-tourism) are gaining in importance and are generating new forms of investment that helps to support the conservation of coastal habitats and species.

A programme of protection of environmentally sensitive areas (ESA) should be part of any coastal zone management initiative. It should encompass all the surrounding areas, its population and activities. International Union for the Conservation of Nature (IUCN) has recognised six different classes of ESA, the highest class being "the national park". Zoning is widely used instrument in planning for MPAs. An example is given in Figure 16.

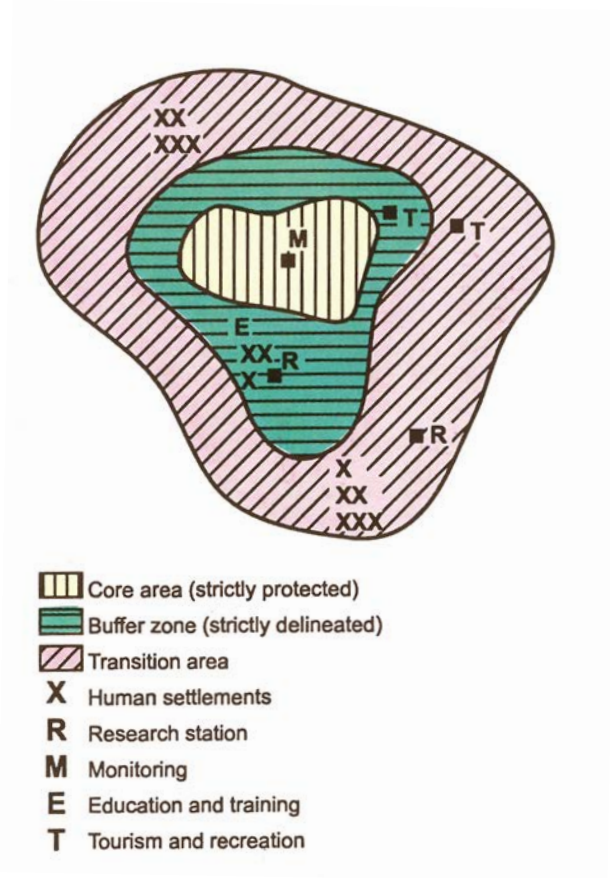


Figure 16: The "Biosphere" model of zoning marine protected areas

Source: Gubbay, S. (ed.). 1995. *Marine Protected Areas.* Conservation Biology Series. London: Chapman & Hall.

The ROPME Sea Area has significant community of coral reefs. Coral reefs represent one of the earth's most ecologically productive habitats. Their net productivity is actually higher than many tropical forests. Coral colonies grow in a variety of shapes and sizes and their common names often reflect their appearance. Many massive coral colonies are known as "reef builders", and collectively form the large masses of coral rock called a coral reef. Many coral reef animals are important food items for people living in tropical coastal areas (clams, crabs, lobsters and fish).

BOX 26

Coral reefs in the ROPME Sea Area

The Gulf of Aden has very poor reefs because of upwelling water and sandy shorelines, and this condition continues down the coast of Somalia and north to the Muscat area of Oman. Further north, Musandam has the most diverse reefs, while Iran probably has the most developed. The coast of the United Arab Emirates is low lying and mostly swampy. Offshore the water is very shallow and rich in seagrasses, and while it is generally muddy and unsuitable for most of the corals, there are numerous patch reefs. (...)

There is a fairly distinct Arabian coral species grouping. Within it there is a (...) Gulf of Oman/Arabian Sea group which then fuses with the Inner ROPME Sea Area (...)

In the Inner ROPME Sea Area, fewer coral communities exist: only five are recorded from Bahrain. Kuwait, Qatar, Bahrain and the United Arab Emirates have 30 species or less. Despite this, coral cover is high. The richest reefs known surround Saudi Arabian coast. At the entrance to the Inner ROPME Sea Area, Musandam contains reefs dominated by *Porites* and *Acropora*. In the Capital Area of Oman substantial monospecific reefs of *Pocillopora damicornis* occur. Coral dominated communities become rare further south.

Source: Great Barrier Reef Marine Park Authority, the World Bank, and IUCN. 1995. *A Global Representative System of Marine Protected Areas.* Washington, D.C.: The World Bank

BOX 27

Mangroves in the ROPME Sea Area

Mangroves in the inner part of the RSA are much less extensive than before the era of intense development in the Region. Only about 125-130 km^2 of mangrove vegetation remain, 80% of which are on the Iranian side. Due to the severe climatic conditions in conjunction with limited habitats and niches only one eurythermal and euryhaline species, *Avicennia marina* occurs in the RSA. Since air temperature drops to freezing in winter over extreme NW part of the Inner RSA, mangroves trees are found in Kuwait and most of NE part of the Inner RSA, mangroves trees are not found in Kuwait and most of NE coasts of Saudi Arabia.

Along the Oman's coast and islands, mangroves are scattered upon more than 20 sites, Northern Batinah, Capital area extending to Sur, Gulf of Masirah and Bar Al-Hikman, and the Dhofar region. Mangrove vegetation of *Avicennia marina* is varying from 2-6 m in height in the Gulf of Oman. And up to 10 m in the Arabian, whereas in the inner part of RSA proper trees are poorly developed and often stunted (1-2 m) at least along western shores.

Oman's mangrove communities include faunal assemblages of fish (more than 100 species), crabs, shrimps, *Penaeus indicus* and *P. semisulcatus*, shells and clams. Large wildlife includes over 200 bird species, three turtle species and four mammal species. Bird include cormorants, herons egrets, spoonbills, flamingos, and many waders, gulls and turns. Mahout and Bar Al-Hikman (Oman) hold internationally important concentrations of shorebirds, notably crabplovers, sandplovers, demlins and redshank. Green turtles, loggerhead and hawksbill turtles are often seen nesting on sandy shores of mangrove areas. Gross primary productivity in Avicennia stands have been estimated to be <1 kg $C/m^2/yr$, however the value of mangrove is much more important biologically.

In Qatar, the mangrove occupies the area to the north-eastern coast of Qatar peninsula, where it intermingle with the sabkha frontier vegetations. *Avicennia marina* (alquim) is the only present species in Qatar.

Source: ROPME. 1999. *Regional Report of the State of the Marine Environment.* Kuwait: ROPME.

The activities of people present the greatest threat to the coral reefs. Corals are collected for use as building blocks or for sale as souvenirs for tourists. In some areas, they are being destroyed by destructive fishing methods. Other activities, such as dredging harbours, coastal building projects and forestry may release silt into the water which blocks off sunlight or smothers the coral polyps. Once destroyed corals may take a long time to grow back.

The most important forests in the ROPME Sea Area are mangrove forests. These are the characteristic littoral plant formations of tropical and subtropical sheltered coastlines. Generally, mangroves are trees and bushes growing below the high-water level of spring tides. They are a resource of great value to coastal communities. The mangroves ecosystem is fairly resistant to many kinds of environmental perturbations and stresses, although high salinities could kill mangroves.

A common phenomenon which characterises the state of forestry in many coastal zones of the world, and so with the mangroves too, is the accelerated process of deforestation, being caused by:

- overexploitation: excessive use of wood for fuel, including the production of charcoal, and as building material;
- felling (clearance) of trees to obtain more land for agriculture, as well as for the development of industrial and tourist areas, and infrastructure;
- conversion of mangrove areas to aquaculture ponds.

The consequences of deforestation are multiple and exceptionally harmful since forests are one of the crucial elements of any ecosystem. Their devastation affects the ecological balance formed over millennia. Endangered are, or completely extinct, the habitats of a large number of species. Economic gains which could have been realised by way of a sustainable management, are irreversibly lost, let alone the once beautiful landscapes, which are the most valuable resources for recreation, leisure and rest.

BOX 28

Marine mammals in the ROPME Sea Area

Dugongs or sea cows are strictly herbivorous. Seagrasses form their staple diet. In the inner part of RSA, some herds of these marine mammals were discovered for the first time in 1980s. The largest ever record herd of over 600 individuals was observed in the Gulf of Salwah region between Bahrain and Qatar peninsula. The overall population in RSA between Ras Tanura and Abu Dhabi is estimated to be 3500-7500 individuals, making the inner part of RSA the most important area for these species in western part of its range, and second in global importance only to Australia. Other marine mammals of interest include whales and dolphins, i.e. Bryde's and Humpback whales, Bottlenose dolphin and Indo-Pacific humpbacked dolphin. Other dolphins and whales known to inhabit adjacent parts of the Indian Ocean are also likely to occur in inner part of the RSA.

About 20 dolphins and whales species exist in Oman's open waters, representing 25% of all known species in the world. They vary greatly in size from the slender agile spinner dolphins to the huge sperm whales. The Indo-Pacific hunpback dolphin, common dolphin, spinner dolphins, pan-tropical spotted dolphin and Bottlenose dolphin are the most common dolphins in Oman. Some dolphins occur in very shallow water (Indo-Pacific hunpback dolphin), others in slender coves and bays (e.g. Bottlenose dolphin) and still chasing fishes.

Source: ROPME. 1999. *Regional Report of the State of the Marine Environment.* Kuwait: ROPME.

BOX 29

Conservation measures for marine species

Endangered species (and marine mammals are falling within this category) are those in danger of extinction throughout all or a significant portion of their range: threatened species are those likely to become endangered within the foreseeable future. Because much of species loss is due to habitat loss, it is crucial to provide a means whereby the ecosystems upon which endangered and threatened species depend may be conserved.

(...)

A distinction of the sea is its limited endemism: marine species and subspecies are only rarely confined to certain small areas. There is great mixing of the oceans and its species and few sharply defined biogeographic provinces with unique species compositions. Since very few species are confined to narrowly bounded habitats, the chances that any species would be extinguished by human activities is very low. Saving species from extinction is thus not as strong a motivation for marine protected areas as is conserving renewable resources. World-wide, the endangered and threatened species lists include mostly big animals, including many of the coastal/marine mammals, such as dugong, river dolphin, some whales and other cetaceans, seals and sea lions, etc.

(...)

To conserve any marine species, careful management procedures must be directed to two goals: conserving species stocks so that the breeding potentials of populations are not destroyed by overharvesting, and conserving the support systems (e.g. nutrient inputs) and critical habitats (e.g. feeding, breeding, shelter, nursery, and migration areas) of these species stocks. It is also most important to avoid disturbing or frightening most wild species.

Source: Clark, J. 1996. *Coastal Zone Management Handbook.* Boca Raton: Lewis Publishers.

BOX 30

Turtles in the ROPME Sea Area

Marine turtles form a prominent part of the fauna of the Arabia which contains some globally important nesting beaches. In RSA, marine turtle populations have two components: (i) a small resident population, individuals of which are sometimes encountered in seagrass areas; (ii) a much larger migratory population, which breed on offshore coral islands, including Karan and Jana islands in Saudi Arabia. All the five pantropical species are known in the region: Hawksbill, Greens, Leatherbacks, Loggerheads and Oliver Ridley.

In Bahrain, the Green Turtle, Hawksbill, Leatherbacks and Loggerheads (*Chelonia myda, Eretmochelys imbricata, dermochelys coriacea and Caretta caretta*) occur and the former may breed in the Hawar Archipelago.

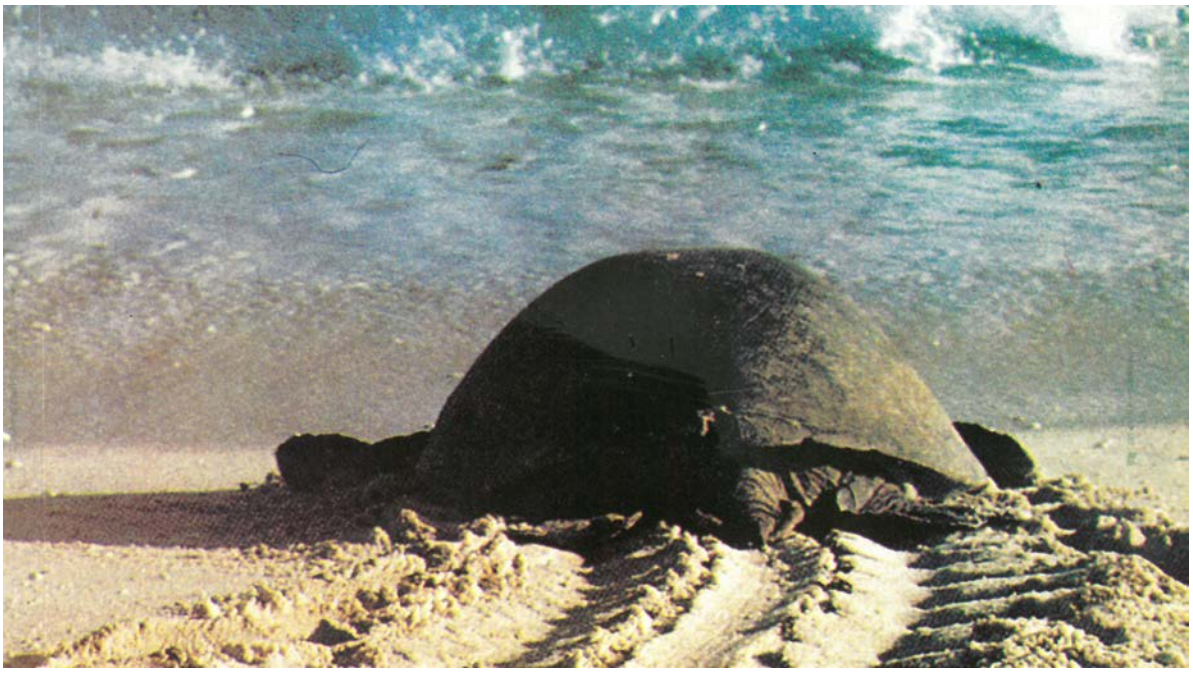
In Qatar, the island of Sharaawh has nesting populations of Hawksbill Turtles *Eretmochelys imbricata*; hatchlings are seen in early July but nestig numbers are reportedly very low.

In I.R. Iran, Green Turtles (*Chelonia mydas*) nest in small numbers at Bushehr (Bandar Abbas) and Ras Beris. Hawkbill Turtles (*Eretmochelys imbricata*) occur in significiant numbers in the area from Taheri (Siraf) to Bandar-e-Lengeh, at Qeshm Island and from Tang (Bandar Tang) to the Pakistani.

Green Turtles are most commonly seen turtles in Oman, and nest on at least 275 beaches spread along the entire coast. An estimated 50,000 to 60,000 green turtle egg clutches are laid each year in the Sultanate, the effort of about 20,000 turtles or more. This gives Oman probably the greatest number of nesting green turtles of any single Indian Ocean nations.

The most important part of the region for turtles is the Arabian Sea (Oman), both in terms of number of breeding species and abundance of individuals. Recent findings confirmed that Masirah Island holds the world's largest nesting population of Loggerhead, estimated at 30,000. Other significant sites are along the Dhofar coast and around Al-Halaniyat Islands. Hawksbill turtles exists in considerable numbers notably at Daymaniyat Island. The other turtles (Olive Ridley and Leatherhawks) are not present in significiant numbers in Oman.

Source: ROPME. 1999. *Regional Report of the State of the Marine Environment.* Kuwait: ROPME.



BOX31

Conservation measures for sea turtles

Seven of the world's eight species of sea turtle are in trouble, and human activity seems to be their number one problem. Many human activities on the beach and along the seacoast are quite harmful to sea turtles.

(...)

Conservation needs for sea turtles are well known. First, every effort should be made to prevent disturbance to the nesting females. Second, do not allow heavy vehicles to be driven over the nests. Third, discourage the removal of eggs. Fourth, prohibit killing of turtles. Fifth, during the nights when hatchlings dig out and scramble to the sea, encourage commercial operators, municipal authorities, and householders to redirect their outside lights or shield them so they don't shine toward the beach. Sixth, control curiosity seekers during egg lying times. In tourist areas, the beaches may be crowded with curious people at night who wish to observe the nesting phenomenon. Their behaviour must be controlled. Seventh, reduce plastic litter going into the sea - hundreds of turtles die each year, their intestinal tracts obstructed by plastics they have ingested. Many more appear to die invisible deaths at sea because of floatable litter such as plastic bags and sheeting, styrofoam, synthetic rope and line, balloons, etc. Eighth, preserve ocean beaches where turtles nest, shoreline development has reduced available nesting beaches in many countries by altering or eliminating nest sites.

Turtle conservation is a complex matter, involving as it does, controlling development and use of coastal beaches. ICAM is a useful approach because it deals simultaneously with a whole variety of coastal issues, protecting turtles while accomplishing many other goals. But regulatory means must also be combined with field conservation activities such as rescuing and protecting turtle eggs where people or natural enemies might harm them.

Source: Clark, J. 1996. *Coastal Zone Management Handbook.* Boca Raton: Lewis Publishers.

BOX 32
Elements of eco-tourism

Eco-tourism is a recent phenomenon. It occupies relatively small share of the world tourism market (not more than 5%). The Ecotourism Society, USA, a professional organisation dedicated to uniting the goals of conservation and travel, defines ecotourism as "responsible travel to natural areas that conserves the environment and sustains the well-being of local people" (1991). It is generally characterised by:

- Travel to a natural area;
- Travel that supports the conservation of biodiversity;
- Travel that brings benefits to local host communities; and
- Travel that leads to greater understanding of the natural or cultural environment visited.

Marine eco-tourism can provide economic and social incentives for promoting conservation of the important ecosystems, mainly the coral reefs. It can benefit conservation in two ways:

- Outside attention on the value of ecosystem resources can spark both local and national interest in protecting it, opening the door for marine protected areas, coastal management plans, and effective management; and

- Revenues generated from tourism can be used to finance conservation projects and management, in the form of monitoring and enforcing regulations, establishing permit systems, constructing mooring buoys, etc.

The inherent problems in ecotourism planning is finding the balance between two seemingly conflicting positions: preservation of natural resources and public use of that same environment. Developing of ecotourism in coastal areas of developing countries requires the evaluation of local conditions and constraints. The preparation of a cost benefit analysis for local communities is a must. There has been too many cases when ecotourism development has rarely enhanced community development. Most income is earned by international tour operators, and little trickles down to local communities. However, with improved participation of local communities eco-tourism could become a very attractive component of sustainable coastal development.

Brown defines the following major factors for eco-tourism planning:
- Preliminary assessment whether eco-tourism is appropriate in an area;
- Evaluation of environmental resources;
- Evaluation of cultural resources;
- Creation of regional strategy for eco-tourism;
- Setting the agenda for local planning and programming;
- Organising of the local participation;
- Identification of existing and potential conflicts;
- Identification of financial considerations;
- Identification of marketing considerations; and
- Preparation of management and protection strategies. (Brown, M. 1993. "Planning for Eco-tourism" in: Environment and Development. American Planning Association, April 1993)

According to data from the World Conservation Monitoring Centre (WCMC), in the ROPME Sea Area countries there are 8 MPAs. These areas contain ecosystems where fishing, turtles, seabirds, and other species are protected. According to the same source, there are more than 100 areas that are proposed to be protected. There are also a number of coastal protected areas many of which include intertidal terrain but have not been included as MPAs because available information suggest that the marine component is relatively minor or incidental. Some countries in the area are making good progress towards the establishment and management of MPAs.

4.4. Instruments for implementation

Once the Integrated Coastal Master Plan has been agreed to and approved by the government, and the individual projects have been evaluated for their environmental consequences, implementation begins. Implementation is carried out with the help of policy instruments. The instruments that can be employed for the implementation of ICAM comprise the whole range of those that are used for environmental, natural resource, agriculture, tourism, transport and energy management, as well as for land use and urban affairs. Two broad classes of instruments are distinguished: regulatory and economic. Sometimes these are supplemented with voluntary agreements between various parties (e.g. industry, tourist enterprises, environmental groups and public authorities) to achieve environmental or conservation objectives.

The guidelines can provide only broad indications for the selection of policy instruments. The instruments should, in the first place, provide strong incentives to reduce pollution and increase conservation of resources. Secondly, they should operate in such a way that the polluter bears the cost of pollution (the "polluter pays" principle) and through this the cost of environmental protection is internalised, i.e. included in the price of the products produced with polluting processes. Polluters or users of resources should in general not be subsidised. Thirdly, these instruments should ensure that users of resources (water, land, forests, fish) pay the appropriate price for them. This could be achieved with the help of user charges and resource pricing.

4.4.1 Regulatory instruments

Regulatory instruments are most widely used in environmental management and in other fields of governmental activities where the market mechanism is absent or ineffective. They reflect the "command and control" philosophy of management and until recently were practically the sole instruments of environmental management. The range of issues covered by regulatory instruments includes land-use planning, building regulations, construction guidelines for the coastline, conservation regulations, oil exploitation regulations, standards for anti- fouling paints for boats, fishing quotas, marine transport regulations, aquaculture requirements and licensing of various other activities.

Land-use planning, zoning and building regulations, when properly implemented, define the shape and nature of coastal development. Pollution regulations help to maintain environmental quality; other regulations define activities in a way to prevent pollution or aesthetic damage and to manage and conserve resources.

Regulations offer, therefore, a range of instruments of implementation for coastal managers but they have to be employed with two provisions in mind:

- They have to be used in the most cost-effective and environmentally most advantageous way; for every environmental objective there is a choice of instruments and their cost-effectiveness should be the guiding principle; similarly in every sector of policy the instruments available can produce different environmental benefits. In the cases when other criteria are equal, the most environmentally favourable instrument should be chosen.
- Regulatory instruments need an enforcement mechanism. For this purpose managers should be able to make use of: (i) withdrawal of permits to build (e.g. hotels or marinas), (ii) withdrawal of permits to operate (e.g. factories), (iii) imposition of effective fines, (iv) access to courts for imposition of penalties including those for damage to public health or the environment. As part of this enforcement process,

monitoring of compliance is essential to assess the performance of the various actors, e.g. factories, hotels, fishing fleet, ship operators, etc.

Regulatory instruments are particularly useful when quick action is required and rules can be made quite clear to all parties concerned.

4.4.2 Economic instruments

Economic instruments are used in conjunction with regulations to supplement them in areas where economic efficiency is important, where regulations failed and/or where funds need to be raised to implement public policy e.g. for environmental infrastructure. The main classes of economic instruments for coastal management are:

- **Charges** can be used to supplement pollution control regulations: e.g. effluent charges; fees for non-compliance with regulations; administrative charges to cover expenses; user charges imposed on all publicly provided services such as water supply, sewerage, harbour use, etc. to make their use efficient and to cover expenses.
- **Development taxes** are mainly used in conjunction with land-use management, and are generally imposed on highly profitable and environmentally sensitive developments (e.g. coastal tourism). They also provide revenue.
- **Subsidies** can be granted under exceptional circumstances to finance control measures on pollution from public or private activities where such measures are urgently needed e.g. old industries. Unless subsidised, these industries would have to close. In other cases conservation measures need to be subsidised from public funds.
- **Resource pricing** is an important instrument in resource management of coastal land, coastal wetlands, forests and marine resources.

Some examples of economic instruments already in use in coastal areas are:

- water-space rental for aquaculture or boat marinas;
- development fees for oil and gas prospecting/production in coastal waters;
- tourist taxes to fund infrastructure (sewerage, roads, water treatment plants etc.);
- rates for urban services (refuse collection, street cleaning);
- water and sewage charges by households; with developers financing the installation of on-site sewage treatment plants.

Coastal managers would have to use a combination of these economic and environmental instruments to achieve their objectives. The combination will depend on the objective to be attained, on the institutional culture of the country and the region, and on the ability (power) of the manager to impose and enforce these instruments and to retain the money collected for waste collection and disposal in his area. His main task should be to convince local authorities and those providing services to implement policies in an efficient and politically acceptable way by using the right combination of instruments.

4.4.3 Bargaining and negotiation

Bargaining and negotiation with industry can be used in conjunction with either regulatory or economic instruments. This method is becoming ever more frequent in dealing with one particular industry group or with an industrial association on a regional basis.

Specific agreements with industry or other groups, e.g. tourism associations, can be particularly useful instruments in coastal areas where more stringent pollution or

conservation standards might be needed which can be imposed nationally but can be negotiated locally.

4.4.4 Conflict resolution or techniques for consensus building and integration

The high social value associated with coastal areas and the rich private returns provided by past development are likely to generate numerous and severe conflicts in the future. Some of these conflicts are of a "vertical" nature, i.e. they occur between the authorities and interests at various levels (international, national, regional, and local), while others are "horizontal" conflicts between the users and activities at one and the same site or at adjacent sites. Especially important are the conflicts between the interests of individual users of coastal resources and the coastal population at large. A reasonable and just solution to such conflicts is one of the most important objectives of any coastal area management.

In practice, the conflicts are resolved every day within the administrative, legal and social framework of a coastal area. However, the resolution of more important conflicts requires special techniques and it is the task of the government and coastal managers to create the framework, assure access and make use of these techniques, which are basically of two types: arbitration and legal procedures.

Conflict resolution techniques envisage the implementation of the following procedure:

a) Formation of an *ad hoc task force* (commissions, scientific bodies) for resolving a particular problem; this can be implemented at all levels and its efficiency depends on factors such as members selected, set of objectives, level of authority, and funds available. In most cases such bodies propose solutions, while decisions are left to other authorities.

b) Formation of *long-term or permanent bodies* to monitor a particular process, orient it and even resolve the conflicts: interministerial councils, interagency councils, local authorities' councils. Such bodies are often entitled to take decisions and they also carry the public responsibility for those decisions.

c) Generation of a *policy dialogue* through discussion among interested parties in (potential) conflict is often used by moderators or facilitators. The special value of this technique is that it can provide a relatively objective insight into the various interests of the different parties while the possible consequences of the decisions can produce additional information and find the basis for compromise solutions.

d) Nomination by the authorities of *qualified intermediaries* when a dialogue is impossible or has been interrupted. Their role is much more active and responsible than that of facilitators as, in many cases, they propose their own solutions after they have heard all parties and studied all individual interests.

e) Creation of an *arbitration procedure* is used for cases where it is impossible to find a solution through negotiations (environmental mediation). Legal authority or the consent of the interested parties is an essential prerequisite for its application. Decisions of the arbitrators bind all parties and therefore their impartiality and their ability to understand the issues are basic to the arbitration process.

BOX 33

Conflict Resolution Techniques

- direct negotiation
- conciliation
- facilitation
- mediation
- negotiated rule-making

Source: FAO. 1998. *Integrated Coastal Area Management and Agriculture, Forestry and Fisheries.* Rome: FAO.

Solution through legal procedure is used in cases when all other techniques have failed and one of the parties requests legal protection or claims rights he believes he is entitled to. The principal shortcoming of the legal procedure is that it is usually long and expensive and that sometimes it is not capable of using highly complex technical information in an appropriate manner.

In certain cases involving international issues international arbitration is required which might be pursued with the help of a mutually accepted arbitrator or through the courts.

4.5. Education and capacity building for ICAM

Education for ICAM is essential pre-condition for its effective implementation. In the Chapter 17 of the Agenda 21 a particular importance is placed upon the education of coastal managers (points 17.15 and 17.16). It must be said that formal educational programmes are just emerging, particularly in developing countries. Education and capacity building for ICAM must emphasise the knowledge and skills required by the practice of coastal management. An example of a capacity building programme is given in Table 5.

Education and capacity building for ICAM could be carried out through the following:

- **training courses** planned as a combination of lectures on basic issues of ICAM and practical exercises, usually using case studies which have been evaluated as success stories, and carrying out the practical exercise using the information from the area for which the coastal profile or ICAM programme will be prepared;
- **on-the-job training** where local and national experts are trained during the work on the given case;
- **public participation and raising of public awareness** on coastal issues;
- **undergraduate university programmes** as standard courses in the curricula of the regional universities.
- **postgraduate courses** aimed at educating coastal managers with different educational backgrounds;
- **doctoral studies** where the subjects relevant for regional ICAM are studied in greater detail.

Capacity-building group	Example tools
Human capacity	• Education • Training • Professional development
Institutional capacity	• Policy development • Legislative change • Restructuring • Communication • Marketing • Education • Training • Information dissemination • Database management
Research	• Data collection and analysis • Database management • Results dissemination

Table 4: Example components of a capacity-building programme

Source: Kay, R. and Alder, J. 1999. *Coastal Planning and Management*. London: E&FN Spoon.

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