UNESCO PROGRAMME ACTIVITIES IN THE COASTAL ZONE

M. Steyaert and D. G. Troost

Division of Marine Sciences, Unesco, Paris, France

ABSTRACT

The spectrum of Unesco's activities as concerns the coastal zone covers a wide range of aspects. These activities are grouped in a number of programmes and projects. Brief descriptions of the main activities, both those funded by Unesco itself and those executed by Unesco but funded from external sources, are presented. Reference is made to the programme on "Management of coastal and island regions" in the Unesco Medium-Term Plan for the period 1984-1989.

KEYWORDS

Unesco; Marine Sciences; Coastal zone development; Mangrove ecosystems; Agricultural and Natural Heritage; Unesco Medium-Term Plan (1984-1989).

INTRODUCTION

In the coastal belt of the continents and islands can be found one of the most acute problems of our time, i.e. rapid upward trend in the world's population.

Between 1950 and 1975 the world population increased from 2,500 million to 4,000 million. In 1975 a report of the United Nations pointed out that about 2/3 of this population was living in the coastal regions, that is about 2,600 million people. Today it is probably around 3,000 million people; but this growth varies from one region of the world to another. The increase in the population is much greater in what are presently termed the developing countries. There should be great concern about the urgent need to acquire more scientific knowledge on the systems and ecosystems forming the coastal regions. However, even more pressing is the urgent need for proper management of the coastal zone, and therefore we must continue to develop research within the context of management requirements. Such research is all the more needed where coastal engineering works are involved, in view of their impact on the natural environment and related social and economic conditions.

Unesco's coastal zone activities in the fields of natural science are particularly carried out through the Major Inter-regional Project on Research and Training leading to the Integrated Management of Coastal Systems (COMAR): a project of the
Division of Marine Sciences. Specific actions are also undertaken by: the Division of Ecological Sciences through its Man and the Biosphere Programme (MAB), and the World Heritage Convention; the Division of Water Sciences through its International Hydrological Programme (IHP); the Division of Earth Sciences through the International Geological Correlation Programme (IGCP); and by the Intergovernmental Oceanographic Commission (IOC). Social science activities related to the coastal zone are carried out by the Division of Human Settlement and socio-cultural Environment. Brief descriptions of the main activities are given below:

**DIVISION OF MARINE SCIENCES**

The Major Inter-regional Project on Research and Training leading to the Integrated Management of Coastal Systems (COMAR) has been the main vehicle through which Unesco's Division of Marine Sciences has been executing its programme activities dealing with the coastal environment. COMAR was formally established at the 21st session of the Unesco General Conference in 1980. This Major Project puts the emphasis on: improving the scientific understanding of the coastal systems; the integration of scientific research, training and management; and providing information to decision-makers and the public. The foundations of the Major Project have been established through extensive cooperation with the international scientific community. The development strategy is to couple the formulation of pilot research projects to the development of manpower and facilities, particularly in developing countries, and to provide a framework for expansion through extra-budgetary funding. The Project is inter-disciplinary oriented and has been developed in the various regions of the world taking into account the specificity of each region. Available knowledge has been assessed and project objectives and priorities identified at several inter-regional and regional meetings. These dealt with individual ecosystems, e.g. lagoons, mangroves, coral reefs, estuaries, seagrasses; with the interactions between them; and with the relations between them and the offshore waters and the land.

The following symposia and field workshops convened during the last five years can be cited as examples for the various regions and subjects: on coastal lagoons at Duke University (USA) and the University of Bordeaux (France); on mangroves at Dacca (Bangladesh) and at Kuala Lumpur (Malaysia); on coastal ecosystems of West Africa at Dakar (Senegal); on coastal ecosystems of the Southern Mediterranean at Tunis (Tunisia); on the interactions between mangroves, seagrass beds and coral reefs at St. Croix (USA); on coral reefs at Manila (Philippines) and Phuket (Thailand); and on ecological aspects of coastal zone management in the Pacific at Port Moresby (Papua New Guinea).

An example of a resulting major field project is the Unesco/UNDP project for "training and research on the mangrove ecosystems in Asia and the Pacific". The interdisciplinary project activities include surveys, research, seminars and training (linking, in particular, advanced training with field research activities) on a wide variety of aspects of the mangrove ecosystems in the various participating countries, such as productivity, geomorphology, human impact, ecology, taxonomy etc. The aim is to provide a scientific basis for the sound management of the mangroves in the region, parts of which have been reclaimed, dammed and converted into fish ponds, often without much scientific information on their functioning, characteristics and value.

A second example is the Unesco/UNEP/UN project on the "control of coastal erosion in West and Central Africa".
Coastal erosion is a problem of primary concern to those involved in coastal development and management in a number of West and Central African countries. It results either from world-wide climatic changes leading to natural changes in the prevailing conditions of sedimentation along the shore, or from human interference with the natural coastal system. The problems of coastal erosion cannot be viewed in isolation, but have to be examined in the context of the whole region since the effects are interrelated. An examination of the history of shoreline changes as well as measurements of erosion-related parameters will be made to help understand the coastal processes at work. The output of the project, in general terms, will be the documentation of the history of shoreline changes and the classification of problems and provision of alternatives for shoreline protection.

Detailed proposals for two other projects have been finalized. One concerns the Lagoon of Venice, which constitutes an excellent and rather unique example of the result of more than a thousand years of human occupation and management of a lagoon, including the acceleration of man-induced changes since the industrial revolution about 100 years ago. Especially since the dramatic flooding of the City of Venice in November 1976, the phenomenon of "high waters" (acqua alta) has become an acute problem for Venice. As a result, the Italian authorities have taken the decision to build new jetties and mobile gates at the three entrances of the lagoon in order to allow temporary closure during the "high waters". In the meantime, a joint working group set up by the Italian authorities and Unesco with the participation of a number of international specialists, has been requested to prepare a comprehensive research project for the study of the Lagoon of Venice. This project is now in its final stage of preparation. Besides considering the consequences of the closure of the gates on the hydrodynamics of the lagoon, the project will also address such basic issues as: (i) the ecology of the lagoon and its various subsystems, like the fish ponds (Valli da Pesca) and salt marshes (barrene); (ii) the different water basins as they relate to the fisheries and aquaculture; and (iii) the different aspects of pollution and eutrophication resulting from urban and industrial developments in the various parts of the Lagoon.

The second proposed project concerns "the coastal ecosystems in Latin America and the Caribbean and their relation with the continental shelf". The proposal includes activities concerning: estuaries, deltas, lagoons, mangroves and wetlands, seagrasses; these systems' distribution, interdependency, relation with on-and off-shore environments; and the human impact on them.

As for the future, COMAR is the main instrument of action for Programme X-5 entitled "Management of coastal and island regions" in the 1984-1989 Medium-Term Plan approved by the Unesco Extraordinary General Conference in 1982. This "new" programme will provide a focus for and strengthen Unesco's contribution to the development and rational management of coastal and island regions and the preservation of their integrity and resources. It will include, besides the COMAR project, the MAB and social sciences activities concerning the coastal zone. Moreover, the programme will be implemented in close cooperation with related programmes in the Medium-Term Plan dealing with "the oceans and its resources", "landuse planning and terrestrial resources" and "water resources".

Finally, from the engineering point of view, it may be noted that at the workshop on advanced university curricula in ocean engineering and related fields, convened by Unesco last year, due regard was given to the need for environmental training. This was reflected in the sample curricula that the meeting produced on, among other things, coastal and nearshore engineering.
The need to conserve nature in coastal areas has long been a preoccupation of Unesco. The Organization is often called upon to provide assistance on an international scale in reconciling the classically conflicting interests of conservation versus agricultural and industrial development. The Convention concerning the protection of the world's cultural and natural heritage, adopted by the Unesco General Conference in 1972, has been involved in several case studies of such situations of conflict. The World Heritage Convention, as it is known, identifies cultural and natural properties throughout the world that are of "outstanding universal value" to mankind and therefore merit particular attention as to their safeguarding and protection. Assistance under the Convention is available for sites included on the World Heritage List out of the World Heritage Fund, a fund made up essentially of the contributions of the adhering nations. Several "natural" world heritage properties are found on the coasts and some are islands. Examples are Aldabra Atoll (Seychelles), Galapagos Islands (Ecuador), Redwood National Park (USA), Great Barrier Reef (Australia) and Lake Ichkeul (Tunisia). One of these, Djoudj National Park in Senegal, exemplifies the problem of the clash between coastal wetland conservation and agricultural development. Located at the Delta of the Senegal River on the fringe of the Atlantic coast, Djoudj National Park is a haven for wild birds, and is an extremely important wintering area for birdlife from Northern Europe. A large agricultural project, incorporating the construction of several dams on the river upstream, threatens to completely change the water regime of the National Park, thus jeopardizing its ecological integrity and future as a World Heritage site.

The World Heritage Committee, made up of 21 of the States adhering to the Convention, has, at the request of the Senegalese Government, financed a technical mission under the World Heritage fund to try to identify a solution to the problem. A plan has been drawn up indicating that, at a relatively low cost in comparison with the overall costs required for the agricultural development scheme, dikes and sluices could be constructed to help maintain an ecologically acceptable water regime for the Park. However, as is often the case, the solution may be too late in arriving; full measures to protect the national park should have been worked into the agricultural development project from the beginning.

Another case of a coastal World Heritage site in danger from various engineering works is that of the Everglades National Park at the tip of the Florida peninsula, USA. Here, urban and agricultural development to the north and upstream of this vast flat wetland area over the years have altered the water regime so much that there have been serious ecological repercussions. For example, it is estimated that less than 10% of the historically known numbers of nesting freshwater wading birds are now found there. In spite of tight controls on the amount and quality of water that is "fed" into the Everglades, this unparalleled World Heritage site will never recuperate its natural wealth of flora and fauna and will forever have to be artificially maintained.

In discussing Unesco's activities in wetland nature conservation, one should not forget the so-called Ramsar Convention, which aims at the international recognition and protection of wetland areas along the complete migratory routes of wildfowl. Unesco is the depository for this convention. Designation of wetland areas as Ramsar sites will help to strengthen the case for protection or the integration of ecological aspects when planning any engineering projects. It is expected that the Ramsar Convention, especially with the recent adoption of additional language versions, will greatly expand in importance in the future.
Unesco programme activities in the coastal zone

Programme on Man and the Biosphere (MAB)

MAB is an international programme of research, training, conservation and information exchange dealing with man's interaction with selected ecosystems of the natural and man-made environments. Theme 5 of the programme is concerned with "the ecological effects of human activities on the value and resources of lakes, marshes, rivers, deltas, estuaries and coastal zones".

Most MAB activities are carried out by and in Member States themselves, within the framework of an international network of research projects. At the end of 1982, twenty-eight projects in eleven countries were involved in aspects of coastal ecology, including such subjects as urban planning in coastal areas, dune ecology, geomorphology, coastal protection and conservation, lagoon ecology, coastal pedology, pollution ecology in coastal areas and mangrove ecology. In the Mediterranean, four countries with major delta's have met on three occasions to coordinate their research activities and have expressed a major interest in problems associated with land-use planning in delta regions.

DIVISION OF EARTH SCIENCES

Under the International Geological Correlation Programme (IGCP), the Sea-level Project (no. 61) dealt with sea-level movements during the current deglacial hemicycle (over the last 15,000 years). It was Dr. A.A. Thiadens, then Director of the Netherlands Geological Survey, who drafted the first proposal for this Project more than ten years ago. One of the aims of the project was to predict future trends of sea-level movements in particular for heavily populated low-lying coastal regions. By identifying the regional variability of sea-level trends, project reports should aid coastal engineers and landuse planners in understanding the regional and temporal settings of their local projects. Moreover, a 5-meter rise of sea-level in the next one or two centuries, caused by the rapid collapse of the West Antarctic ice sheet, is a sobering possibility not to be ignored; it would mean the inundation of all coastal regions by sea-level rising monotonically at a rate of several centimeters per year.

Late Quaternary sea-level changes is the subject of the follow-up IGCP project starting this year (no. 200). It will take into account an essential result of the above-mentioned project, i.e. the recognition of regional and local conditions as key factors for specific sea-level variations.

DIVISION OF WATER SCIENCES

For many years developing countries have been assisted, particularly through extra-budgetary funds, in the establishment of hydraulic laboratories. This has included advice on coastal engineering problems for example in Ezeiza, Argentina, on harbour design. In the Division's regular programme, emphasis is given to freshwater aspects of coastal areas and islands. During 1983 a book will be published on fresh-salt ground water problems in coastal areas. In the programme for 1984-89 coastal water problems will receive increased attention within the framework of the International Hydrological Programme (IHP). The activities concerning the impact of river basin development on coastal areas and coastal seas will be continued, in particular as regards the impact of changes in sediment production and transport.
INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION

Pollution

The first major stage of IOC's Comprehensive Plan for the Global Investigation of Pollution in the Marine Environment (GIPME) is designed to strengthen capabilities for adequately measuring selected pollutants in the marine environment for the establishment of mass-balances for individual contaminants. This approach has already been used for some metals to determine whether evidence exists to support data that suggest that there has been a substantial increase in the oceanic influxes of certain metals as a result of human activity.

The one boundary that is of great importance in mass-balance considerations, and which appears to have been largely neglected, is the river/ocean boundary. The composition of global runoff is poorly understood, and yet rivers are a major contributor to the natural and human inputs of chemical substances to the ocean. The current situation of data on trace constituent composition for rivers, which include the major classes of contaminants, is poor in terms of coverage and, in particular, reliability. An upgraded assessment of pollutant loads carried by rivers, the modes of exchange of these materials between the sources and the regional seas via estuaries, and an estimate of the deposition of the materials in the nearshore environment are required for subsequent construction of regional and global mass-balances.

Within a programme to determine the riverborne contaminant loads to the coastal zones and offshore environment, the IOC is planning an intercalibration workshop to evaluate the methods presently employed for the determination of selected contaminants in fresh waters and estuarine environments. It is envisaged that this should be done along the full salinity gradient of the riverine-estuarine system with the aim of modelling the behaviour of selected contaminants between end-members of the scale. The implications of collection of data in the field will be stressed during the intercalibration and a regional training component included.

Tsunami

The Tsunami is a series of ocean waves of very great length and period generated by impulsive disturbances of the earth's crust. Large earthquakes with epicentres under or near the ocean and with a net vertical displacement of the ocean floor are the cause of the most catastrophic tsunamis when reaching coastal regions. Volcanic eruptions and submarine landslides are also responsible for tsunami generation but their effects are usually localized. The impact of tsunamis on human society can be traced back in history to 1480 BC in the eastern Mediterranean when the Minoan civilization was wiped out by such waves. However, most of the catastrophic tsunamis were recorded in the coastal and island regions of the Pacific, such as in Japan, the Hawaiian islands and the east coast of South America. While most of the destructive tsunamis have occurred in the Pacific Ocean, they have also occurred in the Atlantic and Indian Oceans as well as the Mediterranean Sea. A large tsunami accompanied the earthquakes of Lisbon in 1755, that of Mona Passage off Puerto Rico in 1918 and the Grand Banks of Canada in 1929.

In 1965, the IOC established the International Coordination Group on an International Tsunami Warning System, which now has 22 member countries from the Pacific Ocean. Presently, the System makes use of 24 seismic stations, and 43 tidal stations under the varying control of the Member States. The USA-operated Pacific Tsunami Warning Centre is the operational centre for the System, the objectives of which are: (i) to detect and locate major earthquakes in the Pacific region; (ii) determine whether they have generated tsunamis; and (iii) provide timely and ef-
effective information and warnings to the coastal population of the Pacific region in order to minimize the effects of the hazards on life and property.

In spite of technical improvements, training and dissemination of information during the last two decades, it is still difficult to provide timely warnings to many areas of the Pacific, due among other things to the weakness of communication networks and the lack of rapid processing of the acquired data. This could be alleviated in the near future by utilizing meteorological communication networks, automated observatory systems and computerized data handling. In addition, research should be improved in the fields of instrumentation such as deep-ocean sensors, and of real-time interpretation methods of seismic source parameters. Detailed studies are also necessary to improve our understanding of a tsunami interacting with the coast allowing better land-use management of tsunami-prone areas, and the development of engineering guidelines of critical coastal structures.

DIVISION OF HUMAN SETTLEMENT AND SOCIO-CULTURAL ENVIRONMENT

A case study was developed on a typical Mediterranean coastal area about fifty km along the Northern coast of Sicily where there was a conflictual demand on the available coastal resources by heavy industry, mass tourism, specialized agriculture and urbanization. This was accompanied by the usual abandonment of, and migration from the traditional mountain areas of the hinterland and environmental problems, such as soil erosion, pollution of the shores, etc. Three seminars dedicated to managers of the public sectors of Mediterranean countries were held on this theme. A specific training tool, a micro-computer aided simulation exercise along with appropriate audiovisual material was made available for further training exercises. The use of this exercise is not restricted to Mediterranean coastal areas.

Interdisciplinary studies and exercises on integrated management of smaller Mediterranean islands were conducted in cooperation with the MAB programme in the islands of Skiathos and Skopelos (Greece); Gozo (Malta); Salina (Italy) and Kerkenah (Tunisia). The aim of the project was first to assess the social, economic and environmental conditions for a balanced development of such ecosystems, taking into account their inherent fragility and their marginality in relation to the overall decision-making processes of the countries to which they belong. Providing valid information to local and national decision-makers was the second target of the project.

A computer-based multisectoral model of the island of Gozo was developed and its programming is under way. This software will facilitate the production of alternative scenarios of development, not only for the island of Gozo, but also for other insular situations elsewhere in the world. Training of local decision-makers to use the model will begin in 1984.

Another type of activity stemming from the above project is the establishment, in a certain number of smaller islands, of a network of multidisciplinary experimental stations serving as basic infrastructures. These stations are run by local authorities for the implementation, in the islands, of research or field experiments concerning the development of the islands. Such experiments are to develop appropriate technologies in renewable energy production, specialized agriculture, use and disposal of waste, experiments with small desalinization plants, aquaculture, etc.

The participation of the local population and authorities in the stations' activities are seen as a priority in order to achieve the best results. The research and
experimental projects may be conducted by national or international interested bodies.

EXTRABUDGETARY PROJECTS

Reference has been made above to several so-called extra-budgetary projects which are executed by Unesco but financed by external funds provided by the United Nations, particularly the United Nations Development Programme (UNDP), or by Member States themselves. Several past and present extra-budgetary projects concern activities related to the Symposium subject. For instance, in Uruguay, Unesco assisted the government in the establishment of guidelines to counter beach erosion. This assistance included a scientific study on waves and their interaction with the beaches. In Egypt Unesco executed a study on the stability of the Nile Delta including an evaluation of the impact of the Aswan High Dam on the coastline. A recently-completed UNDP project was executed by Unesco jointly with the Portuguese government; it concerned the environmental status of the Tagus estuary and included mathematical modelling of fresh and salt water movements, sediment transport and pollution. Unesco made global and regional evaluations of the river inputs of fresh water, particulate matter and selected pollutants into the coastal seas. A project to strengthen the oceanographic infrastructure in South Korea included the execution of marine science studies for tidal power developments. Project activities in Cuba concern the investigation and control of marine pollution.

CONCLUSION

The above description is an indication of the attention and importance given in the Unesco programme to activities concerning the coastal zone from the point of view of both natural and societal aspects. A focus for future activities is provided by the programme "Management of coastal and island regions" in the Unesco Medium-Term Plan for the period 1984-1989. This programme is intended to: foster international cooperation for the purpose of gaining a better understanding of the nature and functioning of coastal and island systems; promote effective collaboration between specialists in terrestrial, aquatic and marine environments and sociologists, economists and land-use planners within the framework of concrete field projects; and facilitate the integration of scientific, socio-cultural and economic information for decision-making purposes. Programmes and projects are only tools. The fact remains that these tools must be used successfully to increase scientific knowledge and to promote better management of the environment.

ACKNOWLEDGEMENT

The authors gratefully acknowledge the contributions, used in preparing this paper, provided by colleagues in the various Unesco Divisions and the Secretariat of the Intergovernmental Oceanographic Commission.

SELECTED REFERENCES


