Intergovernmental Oceanographic Commission

Workshop Report No. 90

IOC Seminar on Integrated Coastal Management

New Orleans, Louisiana, USA
17-18 July 1993

UNESCO

IOC Workshop Reports

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9	IOC/CMG/SCOR Second International Workshop on Marine Geoscience, Mauritius, 9-13 August 1976	E, F, S, R
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11 Suppl	Collected contributions of invited lecturers and authors to the IOC/FAO/UNEP International Workshop on Marine Pollution in the Caribbean and Adjacent Regions; Port of Spain, Trinidad, 13-17 December 1976.	E (out of stock), S
12	Report of the IOCARIBE Interdisciplinary Workshop on Scientific Programmes in Support of Fisheries Projects; Fort-de-France, Martinique, 28 November-2 December 1977.	E, F, S
13	Report of the IOCARIBE Workshop on Environmental Geology of the Caribbean Coastal Area; Port of Spain, Trinidad, 16-18 January 1978.	E, S
14	IOC/FAO/WHO/UNEP International Workshop on Marine Pollution in the Gulf of Guinea and Adjacent Areas; Abidjan, Côte d'Ivoire, 2-9 May 1978	E, F
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17	Joint IOC/WMO Workshop on Oceanographic Products and the IGOSS Data Processing and Services System (IOPSS); Moscow, 9-11 April 1979.	E
17 Suppl	Papers submitted to the Joint IOC/WMO Seminar on Oceanographic Products and the IGOSS Data Processing and Services System; Moscow, 2-6 April 1979.	E
18	IOC/UNESCO Workshop on Syllabus for Training Marine Technicians, Miami, 22-26 May 1978 (UNESCO reports in marine sciences, No 4 published by the Division of Marine Sciences, UNESCO).	E (out of stock), F, S (out of stock), R
19	IOC Workshop on Marine Science Syllabus for Secondary Schools, Llanfwrl Mayor, Wales, U.K., 5-9 June 1978 (UNESCO reports in marine sciences, No. 5, published by the Division of Marine Sciences, UNESCO)	E (out of stock), E, S, R, Ar
20	Second CCOP-IOC Workshop on IDOE Studies of East Asia Tectonics and Resources, Bandung, Indonesia, 17-21 October 1978	E
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22	Third IOC/WMO Workshop on Marine Pollution Monitoring, New Delhi, 11-15 February 1980	E, F, S, R
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26	IOC Workshop on Coastal Area Management in the Caribbean Region, Mexico City, 24 September-5 October 1979	E, S
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30	International Workshop on Marine Pollution in the South West Atlantic, Montevideo, 10-14 November 1980	E (out of stock) S
31	Third International Workshop on Marine Geoscience, Heidelberg, 19-24 July 1982.	E, F, S
32	UNU/IOC/UNESCO Workshop on International Co-operation in the Development of Marine Science and the Transfer of Technology in the context of the New Ocean Regime, Paris, 27 September-1 October 1982	E, F, S
32 Suppl	Papers submitted to the UNU/IOC/UNESCO Workshop on International Co-operation in the Development of Marine Science and the Transfer of Technology in the Context of the New Ocean Regime; Paris, 27 September-1 October 1982.	E
33	Workshop on the IREP Component of the IOC Programme on Ocean Science in Relation to Living Resources (OSLR), Halifax, 26-30 September 1983.	E
34	IOC Workshop on Regional Co-operation in Marine Science in the Central Eastern Atlantic (Western Africa); Tenerife, 12-17 December 1983.	E, F, S
35	CCOP/SOPAC-IOC-UNU Workshop on Basic Geo-scientific Marine Research Required for Assessment of Minerals and Hydrocarbons in the South Pacific, Suva, Fiji, 3-7 October 1983.	E
36	IOC/FAO Workshop on the Improved Uses of Research Vessels, Lisbon, 28 May-2 June 1984	E
36 Suppl	Papers submitted to the IOC/FAO Workshop on the Improved Uses of Research Vessels, Lisbon, 28 May-2 June 1984.	E
37	IOC/UNESCO Workshop on Regional Co-operation in Marine Science in the Central Indian Ocean and Adjacent Seas and Gulfs, Colombo, 8-13 July 1985	E
38	IOC/ROPME/UNEP Symposium on Fate and Fluxes of Oil Pollutants in the Kuwait Action Plan Region, Basrah, Iraq, 8-12 January 1984	E
39	CCOP (SOPAC)-IOC IFREMER ORSTOM Workshop on the Uses of Submersibles and Remotely Operated Vehicles in the South Pacific, Suva, Fiji, 24-29 September 1985	E
40	IOC Workshop on the Technical Aspects of Tsunami Analysis, Prediction and Communications, Sidney, B.C., Canada, 29-31 July 1985	E
40 Suppl	IOC Workshop on the Technical Aspects of Tsunami Analysis, Prediction and Communications, *Submitted Papers*, Sidney, B.C., Canada, 29-31 July 1985	E
41	First Workshop of Participants in the Joint FAO/IOC/WHO/IAEA/UNEP Project on Monitoring of Pollution in the Marine Environment of the West and Central African Region (WACAF/2), Dakar, Senegal, 28 October-1 November 1985	E
43	IOC Workshop on the Results of MEDALPEX and Future Oceanographic Programmes in the Western Mediterranean, Venice, Italy, 23-25 October 1985.	E
44	IOC FAO Workshop on Recruitment in Tropical Coastal Demersal Communities, Ciudad del Carmen, Campeche, Mexico, 21-25 April 1986	E (out of stock) S
44 Suppl	IOC FAO Workshop on Recruitment in Tropical Coastal Demersal Communities, *Submitted Papers*, Ciudad del Carmen, Campeche, Mexico, 21-25 April 1986	E
45	IOCARIBE Workshop on Physical Oceanography and Climate, Cartagena, Colombia, 19-22 August 1986	E
46	Reunión de Trabajo para Desarrollo del Programa "Ciencia Oceánica en Relación a los Recursos No Vivos en la Región del Atlántico Sud-occidental"; Porto Alegre, Brazil, 7-11 de abril de 1986	S ,
47	IOC Symposium on Marine Science in the Western Pacific The Indo-Pacific Convergence; Townsville, 1-6 December 1986.	E
48	IOCARIBE Mini-Symposium for the Regional Development of the IOC-UN (OETB) Programme on Ocean Science in Relation to Non Living Resources (OSNLR); Havana, Cuba, 4-7 December 1986.	E, S
49	AGU-IOC-WMO-CPPS Chapman Conference: An International Symposium on 'El Niño', Guayaquil, Ecuador, 27-31 October 1986.	E
50	CCALR IOC Scientific Seminar on Antarctic Ocean Variability and its Influence on Marine Living Resources, particularly Krill (organized in collaboration with SCAR and SCOR), Paris, France, 2-6 June 1987.	E
51	CCOP/SOPAC-IOC Workshop on Coastal Processes in the South Pacific Island Nations; Lae, Papua-New Guinea, 1-8 October 1987.	E

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1. INTRODUCTION

The purpose of the Seminar was to give participants from developing countries an orientation to integrated coastal zone management. It was sponsored by the Intergovernmental Oceanographic Commission of UNESCO and conducted by NOAA and the University of Rhode Island's Coastal Resources Center, the USAID Coastal Resources Management Programme and the International Coastal and Ocean Organization of the University of Massachusetts.

Ben Mieremet, International Affairs Specialist, NOAA, opened the seminar. Muriel Cole welcomed the participants on behalf of the Intergovernmental Oceanographic Commission, noting the criticality of the role of science in managing coastal areas. Orville Magoon, head of the Coastal Zone Foundation, also welcomed the group and briefly described the Eighth Symposium on Ocean and Coastal Management [Coastal Zone (CZ) '93] to be held the following week. He told the group that the basic purpose of the biennial CZ events is to meet people and to come together to find solutions. CZ 95 will be held in Florida. He welcomed interest in preparing new volumes of the "*Coastlines of the World*" series and offered a set of the present volumes to each participant for the libraries of their institutions.

The Agenda for the Seminar is given in Annex I. A total of 54 participants from 30 countries attended the Seminar. A List of Participants is given in Annex II.

2. IMPLEMENTATION OF AGENDA 21

Brian Needham, Outreach Co-ordinator for the Coastal Resources Center (CRC) at the University of Rhode Island (URI), moderated the initial session where experts addressed the follow-up of UNCED, particularly Chapter 17 of Agenda 21.

Biliana Cicin-Sain, Co-Director of the Center for the Study of Marine Policy, University of Delaware and Editor, Ocean & Coastal Management Journal, presented the challenges now faced in implementing Integrated Coastal Management (ICM). She indicated that this concept needs to be further defined and the concepts put into operational practice. She reviewed major environmental stresses and their causes and effects in terms of North vs. South. Steps to be taken by governments and non-governmental organizations need to be identified. She reviewed the UNCED recommendations on oceans and coasts and discussed the meaning of ICM. These recommendations reflect a change in paradigm in addressing environment and development as well as addressing North vs. South issues. Concepts of interdependence and integration are key aspects. Problems are global and local but all threaten our quality of life. All are linked to patterns of economic development. We can no longer think in compartmentalized ways.

The concepts of sustainable development and integration were not fully defined by UNCED. Sustainable development has a number of dimensions including:

(i) Economic development to improve the quality of life of people;
(ii) Environmentally appropriate development;
(iii) Equitable development;
  (a) intra-societal equity;
  (b) inter-generational equity;
  (c) international equity.

Chapter 17 is the longest and most complex chapter of Agenda 21. It emphasizes the opportunity for development, the need for integration, the need for a precautionary and anticipatory approach, ties to Law of the Sea, public participation and capacity building. The mandates are far-reaching, ambitious, forward-looking but not self-implementing. The challenges include deciding on institutions and processes, finding funding, synthesizing available theory and practice in ICM, and tailoring models to various national settings having different conditions. Integration means to unify, to put parts into a whole, i.e., constituent elements are brought together. There are several dimensions of integration in this context:

(i) Among sectors;
(ii) Between coastal land and coastal waters;
(iii) Among levels of government;
(iv) Between nations;
(v) Among disciplines.

However, not every interaction between different sectors is problematic and therefore in need of management. Integrated management does not generally replace sectoral management, but instead supplements it. Policy integration is often best performed at a higher bureaucratic level than sectoral management, and the costs of policy integration should be kept in mind.

Integration is a continuous process:

Fragmented Approach→ Communication→ Co-ordination→ Harmonization→ Integration

<------- Less Integrated ---------- More Integrated ----->

The nature of property and government interests and institutions in coastal/ocean areas can be categorized as follows:

Coastal/Ocean Spectrum

	Inland Areas	Coastal Lands	Coastal	Offshore Waters	High Waters	Seas
Nature of Property	Private	Private/ Public		Predominantly Public		
Nature of Gov't Interests	Local/ Provincial	Mix of Local/Provincial/National			Mainly Nat'l	Mainly Int'l
Nature of Gov't Agencies		< Multiple-Purpose > Agencies		< Single-Purpose > Agencies		

The speaker recommended further development of a synthesis model of ICM which addresses questions such as: (i) what is it, (ii) what are its goals, (iii) what is being managed, (iv) where, (v) how (principles, strategies), (vi) who should do it, and (vii) what capacity in the sense of Agenda 21 is needed . She also recommended an area approach with an area-based planning function, arbiter-harmonization function, stewardship function, promotion function, and public safety function. Approaches must be tailored differently in different countries depending on development goals, political systems, etc. However, lessons can be drawn from comparing experiences among areas and countries.

Steve Olsen, Director of the CRC, presented strategies for constituency building. He stressed the need to define the problem properly. Current trends of ecosystem change indicate the need for a systems approach. The degradation in coastal regions reduces the long-term capacity to provide people with an adequate quality of life and ability to produce renewable wealth. We do not now have this systems approach. The question is one of people. With a greater and greater portion of the world's people living in poverty, issues of equity will be more intense, conflicts will increase. In coastal areas sectoral management will not work. Conceptually this can be recognized but the question remains as to how to do it in a practical sense. What is possible? We must carefully look at existing experience. US and UK experiences can teach us a lot. We can study the consequences of mistakes and expense of restoration. There is also a considerable body of experience in tropical countries e.g., Sri Lanka, Costa Rica, Philippines, Ecuador. If one looks at this body, one sees that effective management is not achieved by a good technical analysis of problems and an intelligent selection of tools; success is based on a governance process of modifying entrenched patterns of behavior and values, a paradigm shift, a radical change. Effective implementation requires that the society agrees. The idea that a change in behavior is needed is not being conveyed. ICM is sustainable only with constituencies for this idea. The example of Ecuador was cited. Extensive shrimp mariculture resulted in destruction of the mangroves; although good information is available on the consequences of that degradation and an abundance of laws, the pace of mangrove loss has increased. Another example cited was Thailand where there is a great deal of information on ecosystem degradation. Those at high levels of government acknowledge it and laws exist. But fishing practices continue that are detrimental.

He listed four attributes of sustainable development:

(i) Optimal long-term utilization of ecosystems;
(ii) equity in distribution of resources;
(iii) participation by those affected by management strategies;
(iv) an open, fair decision-making process.

and steps toward the above goals:

(i) identify and analyze environmental and social issues;
(ii) select programme focus, define institutional structure and strategies;
(iii) formal adoption and funding of the programme;
(iv) implementation through new methods of development;

and guidelines for a process that fosters effective implementation:

(i) adopt an incremental approach to the design, funding and implementation of programmes;

(ii) require an overt experimental design;

(iii) adopt a two-track strategy: develop tangible specific plans to be implemented in small places while getting approval of the central level of government;

(iv) work to build constituencies for improved resource management at all levels;

(v) build a policy-relevant research agenda into the fabric of programmes;

(vi) build capacity for effective management at all levels.

A panel responded to the above presentations with the various perspectives of a developed country, a developing country, a non-governmental organization, and a university with ICM experience.

Francesco Bandarin, Professor and Environmental Planner from Venice, Italy, stressed the importance of the principles which were developed by UNCED and their international acceptance. The style of implementation in both the developed and the developing world is now crucial.

Lorenzo Gomez-Morin, Professor at the University of Baja California, pointed to the need for public education and sound knowledge as well as the need to consider financial capacities.

John Pernetta, representative of the International Union for the Conservation of Nature, indicated that non-governmental organizations are advocacy groups but are heterogeneous. In general, the human and the environmental perspectives need to be better incorporated into the concept of sustainable development. Ecosystem processes and the natural and unnatural changes that occur also need to be taken into account.

Jens Sorensen, Senior Fellow, University of Massachusetts, acknowledged that we need to know more about coastal systems. There are inherent impediments in the practice of environmental planning:

(i) the size, complexity, and interrelatedness of environmental and public service systems;

(ii) the quantification and social relevance of costs and benefits;

(iii) the time differential between costs and benefits (i.e., no immediate benefits from environmental management- only immediate costs);

(iv) the distribution of costs and benefits.

Additional impediments are commonly encountered in developing countries including a low priority given to environmental planning and an inadequate data base for impact assessment. There are 218 sovereign states in the world, 177 of which are coastal sovereign states. There are also 40 coastal semi-sovereign states, for a total of 217. Of these, 75 are island sovereign and semi-sovereign states. There are 140 ICM efforts underway in 50 sovereign or semi-sovereign states. Ten to twenty international donor organizations will support ICM. He is developing a roster of the efforts underway.

Questions raised by the participants concerned the definition of natural vs. non-natural change, the economic handicap faced by developing countries, and the existing financial limitations. The Panel expressed the view that, because of the dependence of developing countries on natural resources, the effects of degradation are especially severe; ICM is therefore a cost-effective approach.

3. FIELD TRIP

Participants travelled by bus to the Louisiana Universities Marine Consortium (LUMCON) in Cocodrie, Louisiana, a research facility for 13 state universities and 4 private universities. John Caruso, Director of University Education, presented an illustrated overview of the facility and the coastal issues under study. Louisiana includes 30-40% of all US wetlands and experiences ten times more sea-level rise than the global average. The major US shrimp and oyster fisheries are also located in this area. LUMCON studies the coastal morphology of southern Louisiana and the associated coastal phenomena. LUMCON graciously provided participants with a 45-minute trip on one of its two research vessels to see wetlands areas near the junction of the Mississippi River with the Gulf of Mexico.

4. DEVELOPING AND IMPLEMENTING INTEGRATED COASTAL MANAGEMENT IN THE UNITED STATES: PROBLEMS AND OPPORTUNITIES

4.1 COASTAL ZONE LEGISLATION IN THE U.S.

Ben Mieremet presented a summary of Coastal Zone Management (CZM) legislation in the US. Problems of overexploitation of US coastal areas resulted in passage of the national Coastal Zone Management Act in 1972. Originally, US$ 7 million was made available to the 35 coastal states as an incentive to begin. Programme requirements included:

(i) Establishing a coastal zone boundary;
(ii) Identifying permissible uses;
(iii) Ientifying areas of particular concern;
(iv) Ientifying areas for preservation;
(v) Identifying priority uses;
(vi) Demonstrating a state's ability to implement a programme;
(vii) Developing an organizational structure;
(viii) Poviding for the siting of facilities in consideration of national interests;

(ix) Providing for public participation (constituency building).

There are now 29 approved state CZM Programmes, a successful voluntary programme. He stressed the importance of consultation and co-ordination among agencies, including those involved in minerals management, fisheries, coastal protection, defense, and transportation. The following categories of action are essential:

(i) Comprehensive Planning;
(ii) Public Education and Information;
(iii) Research and Data Collection;
(iv) Implementation and Enforcement.

The US also has a programme for designating National Marine Sanctuaries and Estuarine Reserves, an example of which is discussed in Section D. below.

4.2 EXPERIENCES AT A STATE LEVEL

Margaret Davidson, Executive Director of the South Carolina Sea Grant Programme, discussed experiences at the state level. The Sea Grant Programme conducts research and spreads information to the public. She emphasized the importance of talking with government managers and regulators and finding out problems. Scientists and government managers do not always communicate easily. Our common problems are human use problems; we are managing people. Land use and economics are important, but we must remember the importance of maintaining social and cultural diversity. She gave the example of sea-level rise as a problem with or without the greenhouse effect. Scientists must work with local communities in the planning of sewers, bridges and roads; location of oil and gas facilities; docking space for large vessels; new waterfront facilities; etc. She used the example of Thailand as having similar multiple use problems with threats to coastal water quality, fisheries concerns, and marine education needs.

4.3 IMPLEMENTATION OF A SMALL ISLAND CZM PLAN

Paul Templet, Associate Professor at Louisiana State University, presented experiences in developing a small island programme in American Samoa. American Samoa, a single island of 56 square miles and 32,000 people, has a communal culture with two parallel authority structures. An education programme was instituted for students to visit reefs and understand the impacts of people on reefs; maps of Samoa and coastal topography photos were made and used in discussions with community leaders. He stressed that management techniques should be compatible with the local traditional way of life and use of resources. Samoa experiences water quality problems and eutrophication with commercial tuna canneries causing additional problems. It was important to obtain the opinions of the communities and deal with technical issues before the more controversial political issues. A series of papers with alternative solutions were prepared for the government.

4.4 EXPERIENCE IN MANAGING A NATIONAL MARINE SANCTUARY

Billy Causey, a former commercial fisherman and Sanctuary Superintendent of the Florida Keys National Marine Sanctuary, described experiences in protecting fragile areas while satisfying demands of users. The example of the Florida Keys can be applied other places. The only coral reefs adjacent to the continental US are located off the Florida Keys. The invention of SCUBA diving as well as fishing practices and ship groundings have had a substantial impact on these coral reef environments. The Keys, an increasingly popular tourist destination, have lost over 6,000 acres of wetlands to campsites, and over one million divers per year now visit the coral reefs found here. Without management, resources would be completely depleted.

In 1972, the National Marine Protection Research and Sanctuaries Act was passed, and in 1975, a 108 sq. mile area was designated as the Key Largo National Marine Sanctuary. Education is a key thrust of the programme with methods instituted to conserve coral such as the installation of mooring buoys to prevent anchor damage to the reefs. The programme includes designing and distributing printed materials, organizing sanctuary excursions, developing curricula and teacher training programmes, and conducting continual local outreach. Much of the enforcement activity is "interpretive enforcement" where brochures are passed out, and the minimum amount of enforcement is used to gain compliance. Applied research is an important component to determine appropriate boundaries, monitor and predict resource and habitat changes, insure that present and future use and development is compatible with the objective of the designation, predict and assess regulatory impacts on resources, and interpret resource values and identify activities that directly or indirectly affect those values.

The Sanctuary in 1990 was considerably expanded to include the entire Florida Keys, a 2,800 sq. mile area. As a result, NOAA is now required to prepare a comprehensive management plan, establish an advisory council, and identify long-term research and monitoring needs. The new designation prohibits oil and gas development and restricts commercial vessel traffic. A national interagency core group sets overall policy and direction and includes local and state partnerships. The advisory council of 23 members including commercial fishermen, environmental groups, fish guides, citizens, the park service, and the dive industry to make recommendations. The issues are sensitive and require extensive collaboration and persistence.

4.5 THE IMPORTANCE OF CONSTITUENCY BUILDING

Richard Delaney, Director of the Harbor and Coastal Center of the University of Massachusetts, discussed the role of citizens and local groups in the State of Massachusetts CZM planning. A critical element in planning is the broad-based and on-going involvement of those who will be affected. In Massachusetts, 70% of the people live within 50 miles of the coastline. A total of 78 towns are on the coast, each with its own series of governing groups and agencies. A state CZM plan was adopted in 1978 after three years of effort. Prior to that time, single mandates existed for one aspect of resources only. The Governor authorized a planning process in response to citizen pressure. A planning office was created at a high level and hundreds of citizens attended hundreds of meetings in all 78 towns. Individual citizen advisory committees in each town debated over a two and a half year period, airing conflicts and tensions but learning from each other. An atlas of resources was created and concerns were documented. Citizens became allies for completing the process and implementing regulations.

In retrospect he indicated that groups were sometimes viewed as adversaries where an effort might have been made to encourage the concept of partnership. Secondly, better scientific baseline information was needed because of the lack of understanding of natural ecosystems and the need to measure progress and demonstrate the value of the investment. The example of sea-level change was used, where adequate historical data does exist in this region, and local decisions that potentially affect shoreline change can be based on this factual data.

In response to the question of how to proceed in poorer countries, it was suggested that a small area be selected as a demonstration project, perhaps one village- e.g., salt flats with fisheries and mangroves. New ways can be sought to work with the resource; seek a small success while addressing political issues. Initially, convening citizen groups was a suggestion that does not take a great deal of funding, for example. A modest success will get local attention and support. Non-governmental organizations can help with political aspects.

The importance of baseline information was stressed. It was pointed out that funding for this effort must sometimes be attached to another project because of the difficulty of convincing officials of the need for adequate data. The research community can be the agent of change by identifying the problem and educating those in responsible positions. Frequently a groundswell of support may be found following an environmental disaster such as an oil spill or hurricane. Scientists should speak up at this time to educate and promote scientific needs. It was suggested that more international funding will become available as post-UNCED activities are identified and global concerns, e.g., sea-level rise, increase.

5. CASE STUDY

In order to consider how to begin to address a coastal zone management issue in an integrated manner, the Coastal Resources Center of the University of Rhode Island conducted a practical exercise, using an example which presently exists. The group was presented with a case study entitled "*The Rio Chone: An Endangered Estuary*" and was given the task of working on it for three hours. Segundo Coello, Mariculture Consultant, Programa de Manejo de Recurcos Costeros, Ecuador, first described the geographic area of concern, which includes 19 small villages and many shrimp farms, 260 sq. kilometers in size, built on mangrove forests and salt flats. The area has deteriorated rapidly in recent years, with 80% of the mangroves cut and surrounding forests removed to create agricultural land, resulting in extensive coastal erosion and sedimentation in the estuary. Most fish have disappeared, and water quality samples show inadequate levels of oxygen and increasing salinity. The problem, as presented to the group, is given in Annex III.

The group was divided into 5 teams who were first asked to determine the priority management issues for the area. Teams identified a number of issues including water resources management, overall management, rapid depletion and degradation of resources causing a threat to economic sustainability, and lack of institutional co-ordination. Lack of baseline information, social conflict because of inadequate and inequitable and appropriate use of resources, and an overdependence on shrimp mariculture were also cited.

The teams then reviewed a checklist of key "stakeholder" groups, i.e., individuals whose economic, social or personal well-being is affected by the outcome of resource management decision-making or who make decisions which affect the well-being of others. They were asked to identify one solution that would involve and/or benefit most of the stakeholders. They also were asked to list steps necessary to carry out the solution and integrate it with solutions proposed for other issues.

Ideas included forming a commission representing all stakeholders to plan a zoning management agency and define the structure and legal framework. In response to the problem of the lack of environmental information, they suggested forming a Rio Chone Environmental Agency to collect data and monitor, advise and disseminate information to stakeholders. Steps for these might include adopting a Presidential decree, forming an advisory committee, collecting synthesizing existing information, disseminating information and educating people in order to overcome ignorance.

In response to the concern of economic sustainability, the resource base needs to be restored and enhanced to improve environmental quality and insure economic diversification. Steps to do this include establishing the institutional framework, establishing education programmes, identifying priorities for development, mobilizing stakeholders and local participants, obtaining financial and personnel resources, and adopting a comprehensive master plan. Key agencies must be identified first.

In response to the problem of overdependence on shrimp mariculture, an estuarine management plan is needed that diversifies economic development and protects the natural resources. Steps include identifying long- and short-term goals and objectives; conducting baseline studies - social, economic, and natural resource; making a development plan which identifies funding sources, institutional structure and strategies, land use mgt, and public education activities; and implementation, evaluation, and monitoring.

Instructors concluded by recommending that each solution be evaluated according to the following criteria: (i) Is it measurable, (ii) Practical, (iii) Feasible (Time, Funding, People), and (iv) Acceptable.

ANNEX I

AGENDA

Saturday 17 July 1993

0800-0900	Registration and Coffee	
0900-0920	Opening Remarks	Ben Mieremet, NOAA Muriel Cole, IOC Orville Magoon, Coastal Zone Foundation
0920-1000	Implementation of Agenda 21- Presentations:	
	Challenges on Implementing UNCED's Policies on ICM	Biliana Cicin-Sain, Univ. of Delaware
	Approaches for ICM, Strategies for Constituency-Building	Steve Olsen, Univ. of Rhode Island
1000-1020	Coffee Break	
1020-1200	Panel Discussion	Francesco Bandarin, Italy Lorenzo Gomez-Morin, Mexico John Pernetta, IUCN Jens Sorensen, University of Massachusetts
1200-1230	Prepare for Field Trip. Obtain box lunch	
1230-1400	Bus ride to Louisiana Universities Marine Consortium	
1400-1430	Orientation to Facilities	
1430-1800	Boat Trips through Wetlands Areas	
1800-2100	Dinner and Return to Hotel	

Sunday 18 July 1993

0800-0900	Coffee	
0900-0930	History of Coastal Zone Management in the U.S.	Ben Mieremet, NOAA
0930-1200	Panel Discussion of Problems and Opportunities in Developing and Implementing ICM in the U.S.	Margaret Davidson, South Carolina Richard Delaney, Massachusetts Billy Causey, Florida
1200-1330	Lunch	
1330-1630	Coastal Resources Center Case Study of the Rio Chone Estuary, Ecuador, with audience participation	Brian Crawford Don Robadue Brian Needham

ANNEX II

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ANNEX III

THE RIO CHONE: AN ENDANGERED ESTUARY

(Presented by the Coastal Resources Centre, University of Rhode Island)

INTRODUCTION

This shrimp-mariculture dominated estuary is located in the central coast of Manabi Province, with an opening to the Pacific Ocean at the city of Bahia de Caráquez and terminating 25km inland at a tide barrier in a small village of Sombocal. The watershed of the Carrizal and Chone Rivers drains 4,200 km^2 of a once forested hilly dry tropical zone now converted into agricultural land. Since the Spanish colonial period the city of Bahia has been a port, reaching its peak in the 1940s with the export of cacao, coffee, rubber and balsa wood. The 1950s was a period of decline for the region as the port of Manta replaced Bahía as the centre for exports, and traditional agricultural products from the region no longer had a market.

The economic stagnation of the region continued until the late 1970s when two new activities, tourism and shrimp mariculture, began to utilize the area's key coastal resources. These include more than 10 km of ocean fronting beaches, 4000 hectares of mangroves and 400 hectares of salt flats. By 1990 some 5000 hectares of shrimp ponds had been constructed utilizing virtually all the mangroves and salt flats as well as some open water on the estuary. Vacation apartments and hotels were being constructed in both Bahía and the tourist village of San Vicente to the north of the mouth of the estuary. Migration of population to the estuary has continued unchecked since the early 1980s. There are now about 35,000 people living in the zone, half in Bahía and San Vicente and the rest in rural areas and the fifteen small, crowded communities around the edges of the estuary.

The relative prosperity of the 1980s has produced a number of equally dramatic problems for the 1990s. The expanding economy attracted many more people than the region could support, and the completely uncontrolled expansion of the shrimp mariculture industry has created enormous stresses on the coastal ecosystem. At a larger scale, the Regional Planning Agency for Manabi Province is aggressively promoting the construction of a large dam to divert fresh water flow of the Carrizal and Chone rivers to other agricultural zones, at the same time that demand for irrigation water is increasing within the watershed.

Large agricultural investments are being made in cotton, poultry and fresh water fish production. There is a significant labour force which is seeking alternate sources of employment.

THE MANAGEMENT CHALLENGE

The Rio Chone was selected in 1989 as one of five sites to prepare and implement coastal resource management plans, primarily due to concern over the future of the shrimp industry. The co-ordinator assigned to lead the planning process has faced a unique challenge. On one hand, this special area zone has the advantage that its boundaries coincide with a single ecosystem. On the other hand, there are three different counties which share responsibility for decision-making, but only one, the Canton Sucre which includes Bahía and San Vicente, has the majority of its population living near the estuary. Local politics in

Canton Sucre is dominated by a few large shrimp pond owners who do not necessarily welcome the national attention which the Rio Chone is now receiving.

Until the creation of the special area management zone by Presidential Decree, the different economic forces at work in the estuary, both rich and poor alike, did not have any means to address the serious problems affecting their livelihoods and did not see how the estuary is a resource they share in common, and for which they therefore have a mutual responsibility.

Existing laws on natural resources management have contributed very little to improving mutual understanding and co-operation. Wealthy businessmen can obtain permission to build new shrimp ponds direct from the capital city, Quito, even after ponds were illegally constructed. Enforcement of rules for licensing pond construction and management, as well as the prohibition against cutting mangroves rarely occurred. Agencies which have direct responsibility for environmental law enforcement include ministries of forestry, fisheries and the Navy.

Enforcement of the shrimp pond owners' prohibition against access by local people to the remaining mangrove areas, on the other hand, is made very effective through the use of guns, dogs and barbed wire fences. The seasonal ban on the capture of shrimp larvae is proving unenforceable. A British Television crew making a documentary on the shrimp mariculture industry arrived during the middle of one ban to find the port captain overwhelmed by the thousands of "larveros" on the beach during a high tide. Effective enforcement of this rule, made in the capital by the same fisheries agency which does not enforce the shrimp pond construction laws, would impose a harsh cost on thousands of people who have no alternative source of income, for reasons which the "laveros" themselves do not understand.

Decisions on the construction of the Carrizal-Chone project, which could rob the estuary of its fresh water will not be made in public nor with the participation of even the wealthy shrimp pond owners who stand to suffer great losses. There is no environmental impact assessment procedures which would require full disclosure and debate of the project, and could enable local residents to recommend project modifications to reduce impacts.

MANGROVES AND CRITICAL NATURAL AREAS

There are 600 hectares of mangroves remaining in the estuary, including Isla Corazon, Isla de la Frigatas, and a small mangrove reserve in the midst of the major concentration of shrimp ponds, as well as fringes of mangroves along most of the other dikes of the shrimp ponds. In the 1950's, this estuary contained mangrove trees up to 30 m tall, with abundant crocodiles and monkeys, as well as fish and shellfish. These virtually have all disappeared. "Laveros" continue to work the remaining canals and discharges of shrimp ponds. Some shrimp pond owners, including the president of the special area planning committee, are replanting their dikes and water supply canals with some mangrove species. Others have diked off open water areas which is causing the death of fringing mangroves, and continue to expand their ponds. Existing untouched mangrove areas and unique habitats do not have formal monitoring, interpretation or protection programmes.

WATER QUALITY AND POLLUTION CONTROL

The water pollution problems in the Rio Chone can be divided into distinct zones. At the mouth of the river, adjacent to the tourist beaches, raw sewage from Bahia flows untreated into the waterfront. The sewage treatment facility built by the municipality of Bahia for its 10,000 inhabitants was supposed to be a series of four oxidation lagoons. Only one was constructed and the land for the other three is currently occupied by squatters. The sewage is pumped into drain pipes which discharge a few hundred metres from a tourist beach. Most of the people living around the Rio Chone have access to potable water only a few hours per day from a pipeline built to serve the tourist zone. Many poor dwellings in the hills and south of the city in Leonidas Plaza have no sanitary facilities, so sewage often finds its way into the open storm drains. On the other side of the river, in San Vicente, ground disposal of waste water is the only technique used. It is only adequate during the dry season, since the soils in the area are quickly saturated in the wet season. The central portion of the estuary is used primarily by artisanal fishermen, and for the future has the potential of recreational boating use. The interior estuary from Portovelo east to the tide barrier at Simbocal, is the area most intensely used by shrimp ponds. Water quality in the interior canals has dropped well below 4 mg/l of dissolved oxygen during certain periods, and salinity has been as high as 50 parts per thousand, considerably saltier than the incoming ocean water. These water quality problems are slowing growth of the shrimp in the ponds. At the same time, the first case of cholera occurred in Ebano, adjacent to the shrimp packing plant.

Primitive sanitary conditions also exist in the other coastal villages surrounding the ponds. On the other side of the tide barrier, at the confluence of the Carrizal and Chone Rivers, the protection of habitat for the large number of migrating birds and fresh water fish production is most important. Plans to convert the large seasonal wetland into pasture will destroy the habitat. No effective waste water collection or treatment exists anywhere in the special area planning zone and all of the small communities suffer from similar problems of water supply, poor sanitation practices and human waste disposal.

FISHERIES

More that 1000 artisanal fishermen were displaced from the Rio Chone by the time shrimp pond construction reached its peak due to a dramatic decline in fish stocks and loss of access to mangrove areas now occupied by ponds. The shrimp larvae fishery continues both on the ocean fronting beaches and throughout the interior of the estuary. Some larveros have proposed the enforcement of an effective ban on catching larvae in the river itself as well as selective closures on the beaches rather than the current comprehensive closure of the fishery.

The impact of larvae fishing inside the estuary upon wild stocks is unknown, as well as the effect of loss of fresh water input and the intensive larvae fishery along the coast. Artisanal larvae grow out ponds are being established to improve the incomes of the larveros. Shrimp larvae hatcheries, which only supply about 15% of larvae to the Rio Chone ponds, are located in the middle of tourist zones, have direct discharges onto beaches and yet depend on good water quality for their operations. Fishing and collection of shellfish continues to be an important activity inside the estuary for members of the small communities, despite conflicts with shrimp pond owners and degraded habitat.

A wealthy group of land owners has promoted the development of a fishing port along the ocean at Punta Bellaca, even though little artisanal or commercial fishing is taking place. A road to the undeveloped small watershed has already been constructed but no development controls or plan has been prepared for the surrounding hillside. A costly system of breakwaters is proposed since the site is subjected to strong wave action, which could trap the sand moving along the shore that is currently replenishing the eroding beach of the town of Bahía.

TOURISM

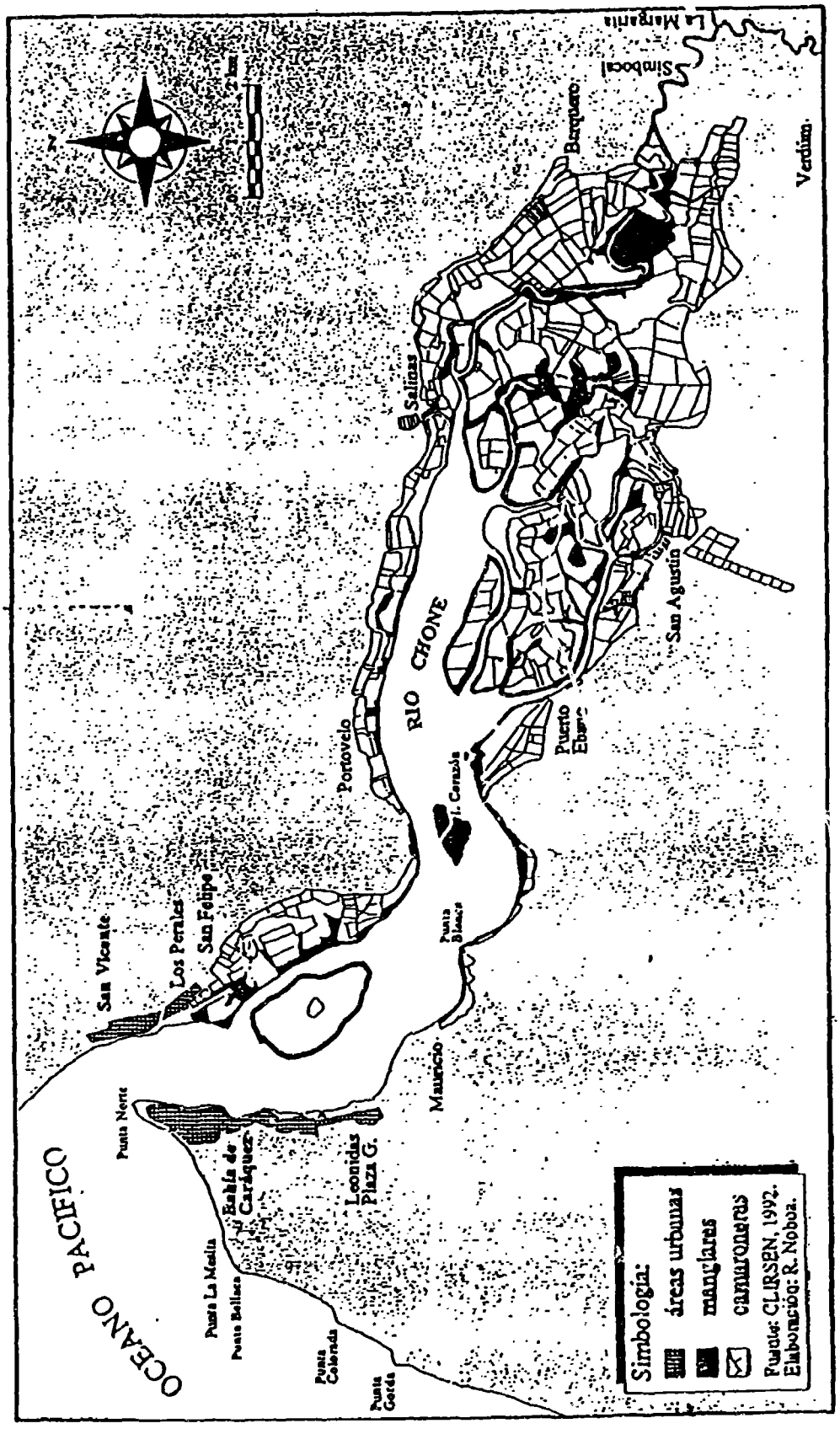
There is considerable untapped development potential for this zone. Several hundred hectares of prime beach front property at Punta Napo, just north of San Vicente, is targeted by the national government for tourism development, with private investors anxious to begin construction. These beaches already attract upper income Ecuadorian and some international tourists, who are spending nearly twice as much per day as the local and regional visitors to most of the other beach areas. The interior of the estuary has colonies of frigate birds and other species which rival in number of the found in the Galapagos Islands, Ecuador's major tourist attraction.

The designated tourism area at Punta Napo is being provided with water supply, roads and other infrastructure in anticipation of major investment projects. The plans for these projects will be approved by the National Tourism Agency, not the local community. There is no public involvement process, and the criteria for the review of projects is not publicly available. Remarkably, the Punta Napo site has not yet been encroached upon by shrimp ponds or larvae growing laboratories, or any of the "invasions" by squatters which have accompanied the construction of new roads and urban facilities elsewhere in the estuary. The shoreline is erosional in sections, and the hills behind the wide coastal plain have not been excavated or damaged. There are few examples in coastal Ecuador of well planned shore development. Buildings are usually located on or near the beach, public access is limited and the surrounding hillsides are typically excavated for construction materials. The village of Canoa, and a major portion of the tourist beach, are occupied by between 1000-2000 artisanal shrimp larvae fishermen.

The potential influx of new, high spending visitors, provides an excellent opportunity for creating a new awareness of the tourism value of the inner sanctuary, as well as to establish water-based recreation, including excursions, sailing and surfing which at present do not exist.

MARICULTURE

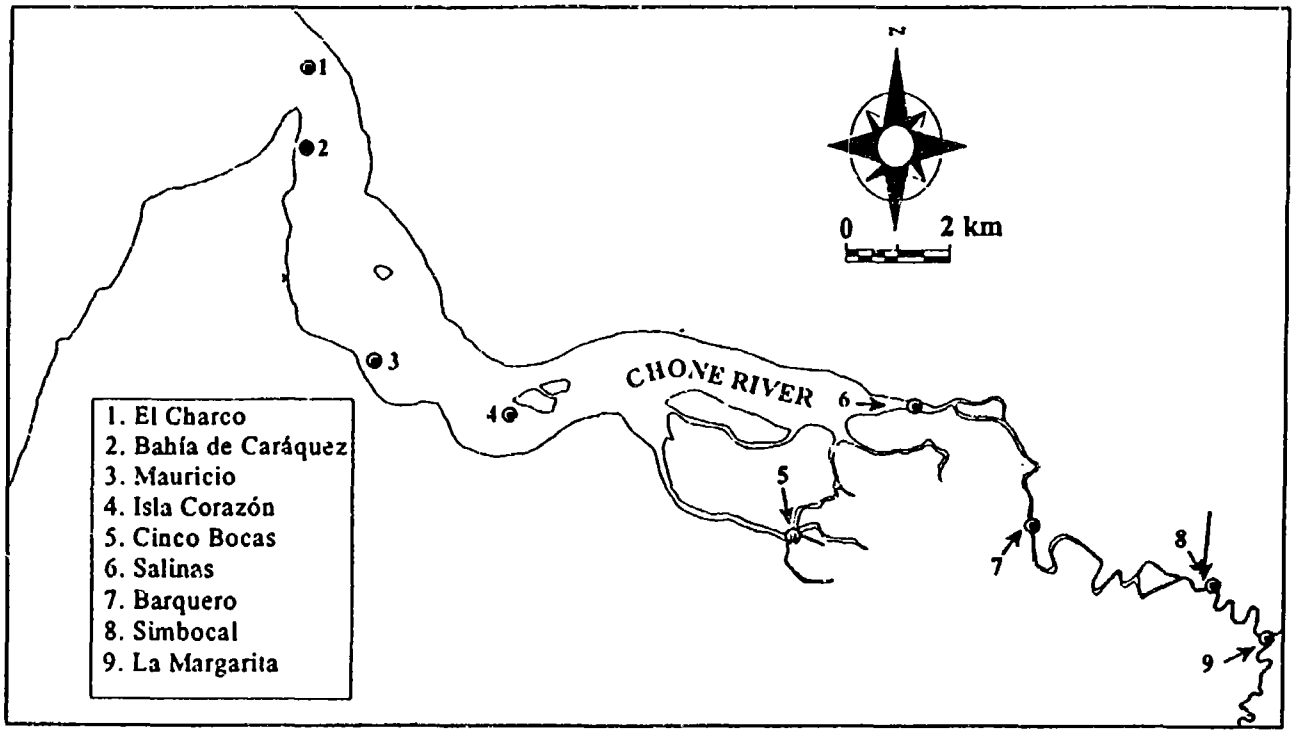
The estuary which has built the fortunes of the 150 or so pond owners is changing because of their activities. The area of the estuary has been reduced dramatically since the ponds walls prevent the natural movement of water. New ponds are now being constructed on mud flats. Sedimentation both from sand entering the estuary, river input and organic matter is continuing to fill both the estuary and the shrimp ponds. The volume of shrimp ponds is about 40 million cubic metres, compared to a low tide volume of the estuary of 68 million cubic metres and a high tide volume of 105 cubic metres. The estuary is producing abut 3000-5000 metric tonnes of shrimp per year. Productivity problems are beginning to appear.



Estuario del Río Chone.

Area (ha) of mangrove forest, salt flats and shrimp ponds in the province of Manabi and the ZEM Bahía de Caraquez - San Vicente - Canoa between 1969 and 1991. Source: CLIRSEN (1992)

YEAR	MANGROVE FOREST		SALT FLATS		SHRIMP PONDS	
	MANABI	ZEM	MANABI	ZEM	MANABI	ZEM
1 969	12 416	3 980	815	584	0	0
1 984	7 992	1 674	164	0	8 377	4 239
1 989	6 401	1 040	164	0	10 238	4 985
1 991	4 547	785	164	0	12 579	5 304



Localities sampled for oxygen and salinity

TASK 1 - SMALL GROUP WORK

1. Read and Review:

   Brief on "The Rio Chone: An Endangered Estuary
   Supporting Data Tables and Figures
   Map of the Rio Chone Estuary.

2. Elect a Group:

   Secretary/Recorder
   Spokesperson/Chairperson.

3. Discuss and Determine the **Priority** Management Issues for the Area
   (List in order of priority, no more than six issues)

You will have **30 minutes** to accomplish the above assignment. At the end of this time, each group spokesperson will be asked to orally present and describe one issue in 1-2 sentences only. These should be clean, crisp statements of findings and conditions which state problem consequences and threats clearly. When called on, present your top issue or the next highest alternative if your top issue has already been listed by a group that presented earlier.

TASK 2 - SMALL GROUP WORK

Your group will be assigned priority one issue to:

(i) identify key stakeholder groups to be consulted who have an interest or concern, or will be affected by any potential solution;

(ii) identify one solution that would involve and/or benefit most of the stakeholders;

(iii) list the steps necessary to carry out the solution and integrate it with solutions proposed for other issues.

You will have **30 minutes** to accomplish the above assignment. At the end of this time, each group spokesperson will be given **5 minutes to present an oral report** on your group output. The group recorder should use a sheet or two of flip chart paper to prepare a report outline to aide in the presentation. If your group has time, for each step you propose, list expected products/outputs or indicators to measure progress, performance and accomplishments.

No.	Title	Languages
52	SCOR-IOC-UNESCO Symposium on Vertical Motion in the Equatorial Upper Ocean and its Effects upon Living Resources and the Atmosphere; Paris, 6-10 May 1985.	E
53	IOC Workshop on the Biological Effects of Pollutants; Oslo, 11-29 August 1986.	E
54	Workshop on Sea-Level Measurements in Hostile Conditions; Bidston, UK, 28-31 March 1988	E
55	IBCCA Workshop on Data Sources and Compilation, Boulder, Colorado, 18-19 July 1988.	E
56	IOC-FAO Workshop on Recruitment of Penaeid Prawns in the Indo-West Pacific Region (PREP); Cleveland, Australia, 24-30 July 1988.	E
57	IOC Workshop on International Co-operation in the Study of Red Tides and Ocean Blooms; Takamatsu, Japan, 16-17 November 1987.	E
58	International Workshop on the Technical Aspects of the Tsunami Warning System; Novosibirsk, USSR, 4-5 August 1989.	E
58 Suppl.	Second International Workshop on the Technical Aspects of Tsunami Warning Systems, Tsunami Analysis, Preparedness, Observation and Instrumentation. *Submitted Papers*; Novosibirsk, USSR, 4-5 August 1989.	E
59	IOC-UNEP Regional Workshop to Review Priorities for Marine Pollution Monitoring Research, Control and Abatement in the Wider Caribbean; San José, Costa Rica, 24-30 August 1989	E, F, S
60	IOC Workshop to Define IOCARIBE-TRODERP proposals; Caracas, Venezuela, 12-16 September 1989.	E
61	Second IOC Workshop on the Biological Effects of Pollutants; Bermuda, 10 September-2 October 1988.	E
62	Second Workshop of Participants in the Joint FAO-IOC-WHO-IAEA-UNEP Project on Monitoring of Pollution in the Marine Environment of the West and Central African Region; Accra, Ghana, 13-17 June 1988.	E
63	IOC/WESTPAC Workshop on Co-operative Study of the Continental Shelf Circulation in the Western Pacific; Bangkok, Thailand, 31 October-3 November 1989.	E
64	Second IOC-FAO Workshop on Recruitment of Penaeid Prawns in the Indo-West Pacific Region (PREP); Phuket, Thailand, 25-31 September 1989.	E
65	Second IOC Workshop on Sardine/Anchovy Recruitment Project (SARP) in the Southwest Atlantic; Montevideo, Uruguay, 21-23 August 1989.	E
66	IOC *ad hoc* Expert Consultation on Sardine/Anchovy Recruitment Programme; La Jolla, California, USA, 1989.	E
67	Interdisciplinary Seminar on Research Problems in the IOCARIBE Region; Caracas, Venezuela, 28 November-1 December 1989.	E (out of stock)
68	International Workshop on Marine Acoustics; Beijing, China, 26-30 March 1990.	E
69	IOC-SCAR Workshop on Sea-Level Measurements in the Antarctica; Leningrad, USSR, 28-31 May 1990.	E
69 Suppl.	IOC-SCAR Workshop on Sea-Level Measurements in the Antarctica; Leningrad, USSR, 28-31 May 1990.	E
70	IOC-SAREC-UNEP-FAO-IAEA-WHO Workshop on Regional Aspects of Marine Pollution; Mauritius, 29 October - 9 November 1990.	E
71	IOC-FAO Workshop on the Identification of Penaeid Prawn Larvae and Postlarvae; Cleveland, Australia, 23-28 September 1990.	E
72	IOC/WESTPAC Scientific Steering Group Meeting on Co-Operative Study of the Continental Shelf Circulation in the Western Pacific; Kuala Lumpur; Malaysia, 9-11 October 1990.	E
73	Expert Consultation for the IOC Programme on Coastal Ocean Advanced Science and Technology Study; Liège, Belgium, 11-13 May 1991.	E
74	IOC-UNEP Review Meeting on Oceanographic Processes of Transport and Distribution of Pollutants in the Sea. Zagreb, Yugoslavia, 15-18 May 1989.	E
75	IOC-SCOR Workshop on Global Ocean Ecosystem Dynamics; Solomons, Maryland, USA, 29 April-2 May 1991.	E
76	IOC/WESTPAC Scientific Symposium on Marine Science and Management of Marine Areas of the Western Pacific; Penang, Malaysia, 2-6 December 1991.	E
77	IOC-SAREC-KMFRI Regional Workshop on Causes and Consequences of Sea-Level Changes on the Western Indian Ocean Coasts and Islands; Mombasa, Kenya, 24-28 June 1991.	E
78	IOC-CEC-ICES-WMO-ICSU Ocean Climate Data Workshop Goddard Space Flight Center; Greenbelt, Maryland, USA, 18-21 February 1992.	E
79	IOC/WESTPAC Workshop on River Inputs of Nutrients to the Marine Environment in the WESTPAC Region; Penang, Malaysia, 26-29 November 1991.	E
80	IOC-SCOR Workshop on Programme Development for Harmful Algae Blooms; Newport, USA, 2-3 November 1991.	E
81	Joint IAPSO-IOC Workshop on Sea Level Measurements and Quality Control Paris, 12-13 October 1992.	E
82	BORDOMER 92. International Convention on Rational Use of Coastal Zones A Preparatory Meeting for the Organization of an International Conference on Coastal Change. Bordeaux, France, 30 September-2 October 1992.	E
83	IOC Workshop on Donor Collaboration in the Development of Marine Scientific Research Capabilities in the Western Indian Ocean Region. Brussels, Belgium, 12-13 October 1992.	E
84	Workshop on Atlantic Ocean Climate Variability. Moscow, Russian Federation, 13-17 July 1992.	E
85	Special Workshop on Coastal Oceanography in Relation to Coastal Zone Management	(In preparation)
86	International Workshop on the Black Sea.Varna, Bulgaria 30 September - 4 October 1991	E
87	Taller de trabajo sobre efectos biologicos del fenomeno «El Niño» in ecosystemas costeros del Pacifico Sudeste. Santa Cruz, Galapagos, Ecuador, 5-14 de octubre de 1989.	S only (Summary in E, F, S)