Intergovernmental Oceanographic Commission

Workshop Report No. 105

Conference on Coastal Change

**Jointly Organized by
the Intergovernmental Oceanographic
Commission of UNESCO
and BORDOMER Organization (France)**

Bordeaux, France
10-16 February 1995

UNESCO

IOC Workshop Reports

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No.	Title	Languages
	CCOP-IOC, 1974, Metallogenesis, Hydrocarbons and Tectonic Patterns in Eastern Asia (Report of the IDOE Workshop on); Bangkok, Thailand, 24-29 September 1973 UNDP (CCOP), 138 pp.	E (out of stock)
	CICAR Ichthyoplankton Workshop, Mexico City, 16-27 July 1974 (UNESCO Technical Paper in Marine Sciences, No. 20).	E (out of stock) S (out of stock)
	Report of the IOC/GFCM/ICSEM International Workshop on Marine Pollution in the Mediterranean; Monte Carlo, 9-14 September 1974.	E, F E (out of stock)
	Report of the Workshop on the Phenomenon known as 'El Niño'; Guayaquil, Ecuador, 4-12 December 1974.	E (out of stock) S (out of stock)
	IDOE International Workshop on Marine Geology and Geophysics of the Caribbean Region and its Resources; Kingston, Jamaica, 17-22 February 1975.	E (out of stock) S
	Report of the CCOP/SOPAC-IOC IDOE International Workshop on Geology, Mineral Resources and Geophysics of the South Pacific; Suva, Fiji, 1-6 September 1975.	E
	Report of the Scientific Workshop to Initiate Planning for a Co-operative Investigation in the North and Central Western Indian Ocean, organized within the IDOE under the sponsorship of IOC/FAO (IOFC)/UNESCO/EAC; Nairobi, Kenya, 25 March-2 April 1976.	E, F, S, R
	Joint IOC/FAO (IPFC)/UNEP International Workshop on Marine Pollution in East Asian Waters; Penang, 7-13 April 1976.	E (out of stock)
	IOC/CMG/SCOR Second International Workshop on Marine Geoscience; Mauritius, 9-13 August 1976.	E, F, S, R
	IOC/WMO Second Workshop on Marine Pollution (Petroleum) Monitoring; Monaco, 14-18 June 1976.	E, F E (out of stock) R
	Report of the IOC/FAO/UNEP International Workshop on Marine Pollution in the Caribbean and Adjacent Regions; Port of Spain, Trinidad, 13-17 December 1976.	E, S (out of stock)
xpl.	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
	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
	Report of the IOCARIBE Workshop on Environmental Geology of the Caribbean Coastal Area; Port of Spain, Trinidad, 16-18 January 1978.	E, S
	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
	CPPS/FAO/IOC/UNEP International Workshop on Marine Pollution in the South-East Pacific; Santiago de Chile, 6-10 November 1978.	E (out of stock)
	Workshop on the Western Pacific, Tokyo, 19-20 February 1979.	E, F, R
	Joint IOC/WMO Workshop on Oceanographic Products and the IGOSS Data Processing and Services System (IDPSS); Moscow, 9-11 April 1979.	E
xpl.	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; Llantwit Major, 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
21	Second IDOE Symposium on Turbulence in the Ocean; Liège, Belgium, 7-18 May 1979.	E, F, S, R
22	Third IOC/WMO Workshop on Marine Pollution Monitoring; New Delhi, 11-15 February 1980.	E, F, S, R
23	WESTPAC Workshop on the Marine Geology and Geophysics of the North-West Pacific; Tokyo, 27-31 March 1980.	E, R
24	WESTPAC Workshop on Coastal Transport of Pollutants; Tokyo, 27-31 March 1980.	E (out of stock)
25	Workshop on the Intercalibration of Sampling Procedures of the IOC/ WMO UNEP Pilot Project on Monitoring Background Levels of Selected Pollutants in Open-Ocean Waters; Bermuda, 11-26 January 1980.	E (superseded by IOC Technical Series No. 22)
26	IOC Workshop on Coastal Area Management in the Caribbean Region; Mexico City, 24 September-5 October 1979.	E, S
27	CCOP/SOPAC-IOC Second International Workshop on Geology, Mineral Resources and Geophysics of the South Pacific; Nouméa, New Caledonia, 9-15 October 1980.	E
28	FAO/IOC Workshop on the effects of environmental variation on the survival of larval pelagic fishes. Lima, 20 April-5 May 1980.	E
29	WESTPAC Workshop on Marine Biological Methodology; Tokyo, 9-14 February 1981.	E
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, 9-12 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.	First International Tsunami Workshop on Tsunami Analysis, Prediction and Communications, *Submitted Papers;* Sidney, B.C., Canada, 29 July - 1 August 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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Conference on Coastal Change

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Papers and posters presented at the Coastal Change Conference will be published in *extenso* in a special volume of proceedings being prepared under the joint responsibility of IOC and the local organizer – BORDOMER Organization.

Following the request of the IOC Assembly at its 27th Session, the present report has been prepared with a view to give an advanced summary of the main results and outcomes of the Conference.

EXECUTIVE SUMMARY

Following Resolution XVII.3 adopted at the Seventeenth Session of the IOC Assembly relative to the development of the programme on Ocean Science in Relation to Non-Living Resources (OSNLR), over three hundred scientists and coastal zone managers representing fifty IOC coastal member states and non-governmental organizations (NGOs) met for five days in Bordeaux, France, 6-10 February 1995, to examine the nature, origin and impact assesssment of physical coastal change. One of the major aims of the Conference, within the framework of, and as a follow-up to UNCED, was to facilitate effective communication between scientists and the user community. In particular, the following questions were addressed: what are the various mechanisms and processes responsible for physical coastal changes? What do economists need from science and what response can science offer? How can science be used regarding management and sustainable development of the coastal zone? What are the social and economic implications of coastal change?

The programme included oral presentations, poster sessions and two-days pre and post conference field trips on various case studies relative to the Aquitaine Coastal Zone (SW France). Oral presentations (in total 90 for fourteen sessions) included invited speakers and other contributors. Sixty posters were presented during specific two-day sessions. A daily Press Letter was issued to inform non-specialist participants.

Know-how relative to Integrated Coastal Zone Management is expected to benefit from the results of the Conference. To this end, one of the major outputs of the Conference is the decision to use some selected case studies presented to the Conference to produce a set of practical manuals that will facilitate the assessment of coastal change for use in coastal zone management.

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(ii) INTERNATIONAL ACCOMPANYING SESSIONS
(iii) PRE AND POST CONFERENCE FIELD TRIPS
(iv) DAILY JOURNAL OF THE CONFERENCE
(v) *AD HOC* CONSULTATION OF EXPERTS ON OSNLR

1. BACKGROUND

The Coastal Change 95 is an international conference jointly co-sponsored by the Intergovernmental Oceanographic Commission (IOC) and BORDOMER Organization (France).

As one of the IOC follow-up actions to UNCED the Conference addressed scientific aspects of coastal change leading to impact assessment and the prediction of future changes. UNCED acknowledged that present understanding of interactions between the oceans, the land - especially coastal zone - and the atmosphere is insufficient for adequate forecasting of changes and consequences of human actions. For oceans and seas, the need to address uncertainties and establish a reliable information base, systematic observations and increased knowledge was stressed.

UNCED recommended that each coastal state should consider preparing national guidelines for the integrated management and sustainable development of coastal and marine areas. UNCED emphasized (Chapter 17 of Agenda 21 on *Overall Strategy and Goals)* , that coastal erosion and siltation related to natural or anthropogenic factors are of particular concern and, noted that a precautionary approach is preferable to a relative action to prevent the degradation of the marine environment. In the framework of periodic assessments of coastal area status and trends, one aim should be to predict the effects of all kinds of emergencies and the direct impacts of human activities on existing coastal and physical infrastructures.

UNCED recommended that within the United Nations System, regular intergovernmental reviews and the consideration of environmental and developmental issues with respect to marine and coastal areas should be promoted. It specially commits the Intergovernmental Oceanographic Commission (IOC) to develop fully the strategy for providing training and technical assistance for developing countries. Specific reference to the organization of a global conference to exchange experience in the field of coastal zone management is also given.

The IOC Assembly at its Seventeenth Session (Paris 1993) adopted a plan of action for the implementation of UNCED decisions relevant to IOC. It also endorsed a resolution to include the organization of a conference on Coastal Change in the framework of the development of the OSNLR Programme.

The IOC-UN(DOALOS) Programme of Ocean Science in relation to Non-Living Resources (OSNLR) is concerned with the planning of programmes for the rational management of the potentially valuable non-living resources of the world's ocean. OSNLR is active in developing countries. Recent projects in southeast Asia, Africa and South America are aimed at improving knowledge of the coastal zone and in building up the scientific capacity of countries through national and regional initiatives. OSNLR regards the training of marine geoscientists and technicians as a vital part of these activities.

There is extensive exploitation of marine non-living resources underway in many areas at the present time. The rate of exploitation will accelerate in the future and its impact on the natural environment and the living environment must be assessed to ensure sustainable development. UNCLOS (Article 56) precised that within the 200 miles Exclusive Economic Zone (EEZ) coastal states have "sovereign rights for the purpose of exploring, conserving and managing the natural resources, whether living or non-living, of the waters superjacent of the sea-bed and its subsoil".

Coastal erosion is studied by OSNLR through one of its main projects, namely the project relative to the coastal zone. Most of the world's coastal zones and adjacent areas are in a continuous state of change resulting from natural processes. Some changes are due directly to human activity associated with the exploitation of non-living resources through dredging, coastal development and land reclamation. Some are due indirectly to human activity, for example the anticipated rise of sea level as a result of the greenhouse effect.

Various solutions to the problems of coastal erosion have been tried and increasingly the soft engineered solution is seen as appropriate. Awareness and understanding of the nature and scale of physical changes in the coastal zone are prerequisites for effective environmental policy-making and management.

2. OPENING

The representative of the President of the Aquitaine Region, Professor D. Ducassou, called the session to order at 10.00 a.m. on 6 February 1995 at the Hotel de Region, Bordeaux. He welcomed the participants and emphasized the economic and environmental importance of the coastal zone and recalled the efforts of the Aquitaine Region in favour of research relative to marine environment. He stressed the increasing success of BORDOMER meetings and thanked UNESCO and its Intergovernmental Oceanographic Commission for having chosen Bordeaux to hold this very important conference on coastal change.

Dr. Gunnar Kullenberg, Secretary IOC, expressed his thanks for the offer of the Aquitaine Region to host and to jointly support the conference with IOC. On behalf of the Director-General of UNESCO, unable to attend, he pronounced a keynote address (Annex III) reminding the participants of the role of UNESCO and IOC following the Rio Conference and UNCLOS decisions.

3. ADMINISTRATIVE ARRANGEMENTS, ORGANIZATION OF THE CONFERENCE AND PARTICIPATION

3.1 ADMINISTRATIVE ARRANGEMENTS

The administrative arrangements for the Conference were jointly made by IOC and the Aquitaine Council through its International Co-operation Agency - INTERCO Aquitaine. In addition to the support which came from the Aquitaine Council, IOC contributed in kind and financially to the organization of the Conference and participants' travel. The Scientific Committee on Oceanic Research (SCOR) and the European Communities (EC) gave special support to facilitate the participation of scientists from developing countries and European high-level researchers.

3.2 PROGRAMME AND CONDUCT OF THE CONFERENCE

The Programme of the Conference was defined by the Executive and Scientific Committees during the three pre-conference meetings held in Paris, 6 August 1993, 9 November 1994, and in Bordeaux, 24 March 1994.

In addition to the adopted programme relative to the main topics of the Conference, accompanying sessions were arranged by the local organizing committee on specific items, most of them relative to French or Aquitaine related topics.

Practical organization of the Conference was arranged by the local organizing committee. Several rooms were made available in the Aquitaine Council building to conduct several parallel sessions alternating with plenary sessions, the latter located in the main room (about 300 seats) equipped with simultaneous translation.

3.3 PARTICIPATION

About 600 registrations were received following the despatch of three successive brochures and three announcements of the Conference in the IMS Newsletter of UNESCO. About three hundred and fifty participants from fifty IOC Member States participated fully or partially in the Conference. Among these participants, about two-hundred and fifty invited speakers and other contributors (Annex I) gave oral presentations (ninety despatched in fourteen sessions and/or posters (about 60). The official languages were French and English.

4. SESSION TIMETABLE

In Table 1 below is the Timetable adopted for the Conference:

TABLE 1

Time	Monday 6.02.95	Tuesday 7.02.95	Wednesday 8.02.95	Thursday 9.02.95	Friday 10.02.95
9.00 **10.00** **10.30**	**Opening Session**	**Session III** (Plenary) Regional and National Case Studies	**Session IV** (Parallel) (continued)	**Session VII** (Plenary) Coastal & inshore information systems	**Session X** (Plenary) Conclusive Keynote Address 10.00 **Closing Session** (Plenary)
11.00 12.30	**Session I** (Plenary) Introductory Keynote Lectures	**Session III** (continued)	**Session V** Aquitaine Mediterranean & other European coasts	**Session VII** (Plenary) (continued)	
Lunch					
14.00 16.00	**Session II** (Parallel) Mechanisms & processes (a) Sea level variability & coastal impact (b) Geological framework (c) Physical Oceanography framework	**Session IV** (Parallel) Low tropical coasts (a) Africa-Asia (b) Other coasts	**Session VI** (Parallel) Short term mechanisms, processes & Modelling (a) Mechanism & processes (b) Modelling	**Session VIII** (Parallel) Training, Capacity Building & Management (a) Training (b) Management	
16.30 18.00	**Session II** (Parallel) (continued)	**Poster Sessions**	**Poster Sessions**	**Session VIII** (Parallel) (continued) **Session IX** (Plenary) Presentation of Conference Reports & Discussions	

5. SESSION I (Plenary)

As an introduction to the Conference, two major keynote addresses were presented. The first one (Annex III) was given by Mr. A. Rufenacht, President de l'Association des Elus du Littoral, President du Conseil Regional de Haute Normandie. It aimed to present the administrative and socio-economic context within which the management of the coastal zone has to be considered. The second one, presented by Professor M. Holligan from Southampton University, U.K. (Annex II, abstract) was a scientific global overview of environmental change in coastal zones and the problem of transfer of scientific information to the socio-economic sector.

6. ORAL PRESENTATIONS

List of presentations and repartition in the various sessions are given below. In addition, abstracts of each oral presentation are given in Annex II. These abstracts are presented in the version received from the authors. The only change is that the maximum length has been limited to two pages.

SESSIONS II: MECHANISMS & PROCESSES (Parallel)

IIa Sea Level Variability & Coastal Impact

Co-Chairmen: D. PUGH (UK)
A. SELIVANOV (Russia)
Rapporteur: A. TOLKACHEV (IOC)

Keynote Address:

P. L. WOODWORTH, U.K.	**Monitoring and Predicting Long-Term Sea-Level Changes** Commentator: L. BIJLSMA

Contributors:

O. V. GORELITS, Russia	The Caspian Sea Level Fluctuations & the Features of the Volga Delta Regime
R. J. T. KLEIN, Netherlands	A Preview of the IPCC 1995 Assessment for Coastal Zones of Small Islands
T. S. MURTY, Australia	South Pacific Sea Level & Climate Monitoring Project
P. C. NWILO, U.K.	Monitoring Global Sea Level/Relative Sea Level Rise in a Developing Country - The Nigerian Experience
A. SELIVANOV, Russia	Possible Future Coastal Evolution of the North Black Sea and the Sea of Azov Coasts under Greenhouse-Induced Sea Level Rise
O. I. ZILBERSTEIN, Russia	Methods of Estimations of Main Marine Elements in Coastal Zones

IIb Geological Framework

Co-Chairmen: I. McCAVE (UK) &
M. ERGUN (Turkey)
Rapporteur: R. A. Davis (USA)

Keynote Address:

J. CHAPPEL, Australia	**Coastal Change: Natural Continuance Versus Human Disturbance of Holocene Trends** - Commentator: K. L. NARASIMHARAO, India

Contributors:

J. V. BARRIE, Canada	Evolution of a Near-Shore and Coastal Sand Transport System - Queen Charlotte Islands
M. A. CHOLNJANSKYI, & B. LOPATIN, Russia	New Techniques for Complex Geological & Environmental Studies of Coastal Zones
R. A. DAVIS, USA	Past, Present and Future of the Pinellas Coast, Florida
M. ERGUN, Turkey	Effects of Neotectonics on the Morphology of Sea of Marmara
A. J. LONG, U.K.	Holocene Coastal Evolution of Southeast England: Implications for Coastal Management
K. L. NARASIMHARAO, India	Coastal Change: An Overview of the East Coast of India
Ying WANG, China	Human Impacts on Coastal Evolution Through the River System
C. WEN-JUINN, China	Shoreline Changes at Middle-Western Coast in Taiwan

IIc: Physical Oceanography Framework

Co-Chairmen: M. GLASS (France),
M. WAHIDUZZAMAN (Bangladesh)
Rapporteur: N. P. PSUTY (USA)

Keynote address:

P. KOMAR, USA	**Wave Run-up on Beaches, Models of Cross-Shore Sediment Transport and Analysis of Susceptibilities of Coastal Properties to Erosion** - Commentator: M. GLASS (France)

Contributors:

I. AZUZ-ADEATH, Spain	Predictive Application of the Convolution Method for Time-Dependent Beach Profile Response in one Mexican Bay
C. R. de GOUVEIA SOUZA, Brazil	Sedimentology Applied to Coastal Management of the State of Sao Paulo, Brazil
S. V. JAOSHVILI, Georgia	Sediment Balance of the Sea Coast Zone and Resources of its Structure Regulation (eastern coast of the Black Sea as an example)
J. L. J. MARTI, Cuba	Research and Measures for Beach Preservation: the case of Varadero Beach, Cuba
J. MATHEW, New Zealand	Long-term Changes of Flood Tidal Delta Adjacent Channel, Tauranga Harbour, New Zealand
N. P. PSUTY, USA	Dynamics and Changes in Estuarine Systems
M. WAHIDUZZAMAN, Bangladesh	Study for Improvement of Hydraulic Conditions of Polder Area in the Coastal Region of Bangladesh by Developing a Mathematical Model for Polder Area of this region.

SESSION III: REGIONAL & NATIONAL CASE STUDIES AFRICA/PACIFIC/CARIBBEAN (Plenary)

Co-Chairmen: K. S. ADAM (Benin)
N. NASU (Japan)
Rapporteur: K. S. ADAM (Benin)

Keynote Address:

E. O. ODADA (Kenya)	**Coastal Change: Its Implications for Eastern Africa** - Commentator: J. PINEDA (Spain)

Contributors:

A.G. ABUL-AZM (Egypt)	Coastal Development in the Red Sea, Case Study
K. S. ADAM (Benin)	Coastal & Ecological Changes in the Gulf of Benin Coastal Zone
I. TANAKA (Japan)	Long-Term Shoreline Change in Japan
H. A. OYIEKE (Kenya)	The Impacts of Coastal Change on Biological Resources of Kenyan Coastal Waters
R. ARTHURTON (UK)	Implications of Physical Environmental Change
M. MAHFOUD (Mauritania)	Changements côtièrs en Mauritanie

SESSIONS IV: LOW TROPICAL COASTS (Parallel)

IVa: Africa-Asia

Co-Chairmen: J. ABE (Côte d'Ivoire)
J. K. E. PATTERSON (India)
Rapporteur: J. L. J. MARTI (Cuba)

Keynote Address:

B. E. Priyono (Indonesia)	**Integrated Management Plan in Bengalis District, Riau Province**

Contributors:

J. ABE (Côte d'Ivoire)	Etude comparative de la dynamique sédimentaire aux embouchures des fleuves du littoral ivoirien
K. AJITH JOSEPH (India)	The Role of Natural Coastal Processes at a Tropical Tidal Inlet in
A. N. BALCHAND	Hinterland Development
L. F. AWOSIKA (Kenya)	Coastal Changes in Western Africa; a Case Study
A. KOMORA (Kenya)	Kenyan Experiences on Coastal Zone Evolution; Case Study Tana Delta Wetlands
J.K.E. PATTERSON (India)	Changes in Natural Coasts in the Fulf of Mannar and the Palk Bay, South-Eastern Coast of India with Particular Emphasis on Coral Reef Ecosystem
N. NASU (Japan)	Coastal Change in Japan
B. SIERRA DE LEDO (Brazil)	Evolution des écosystèmes côtiers et occupation humaine dans une ile
A. KLINGEBIEL (France)	subtropicale du Brésil

IVb: Other Coasts

Chairman: R. J. ANGULO (Brazil)
Rapporteur: S. R. PEZESHKI (USA)

Keynote Address:

S. R. PEZESHKI	**Coastal Changes and Wetland Losses in the Mississippi River Deltaic Plain**

Contributors:

R. J. ANGULO (Brazil)	Natural Dynamics and Land Use on the Coast of Parana, Brazil: Background and Prospects
L. MARTIN (France)	Variation of Coastal Dynamics During the last 7000 years along the Central Brazilian Coast
O. MOLLER (France)	Tide and Subtidal Dynamics of Patos Lagoon (Brazil)
G. ROSSI (France) &	Amenagement et Dynamique dans le Golfe du Benin: de la vision aux
G. BLIVI (Togo)	Réalités

T. TRAN-DUC (Vietnam)	Coastal Morphological Changes Concerning the Management of Coastal Zone in Vietnam
N. V. YESIN (Russia)	Dynamics of the Temryuk Bay and the Kerch Strait Coast under an Anthropogenic Impact
Zong SHI (China)	The Morphological Evolution of Salt Marsh Tidal Creek Network in the Dyfi Estuary (Wales)

SESSION V: AQUITAINE, MEDITERRANEAN & OTHER EUROPEAN COASTS (Plenary)

Co-Chairmen: P. BUAT-MENARD (France)
Y. DOLOTOV (Russia)
Rapporteur: C. LATOUCHE (France)

Keynote Address:

P. CASTAING (France)	**Evolution passée et future de la lagune d'Arcachon (France)** Commentator E. H. TABET-AOUL (Algeria)

Contributors:

D. S. BREW (UK)	Coastal Change in Albania - A Case Study from Karavasta
A. CEARRETTA (Spain)	Micropalaeontological Data on Environmental Changes during Holocene from the Eastern Cantabrian Estuaries (Bay of Biscay)
Y. DOLOTOV (Russia)	On Coastal Relief Change Conditioned by Sea Level Oscillations and its Influence to Economic Activity (on example of the Caspian Sea)
J. FAVENNEC (France)	Gestion du Littoral Dunaire Aquitain
I. POSTOLACHE and M. DIACONASEA	Geomorphological and Physical Aspects of the Romanian Coastal Change

SESSIONS VI: SHORT-TERM MECHANISM, PROCESSES & MODELLING (Parallel)

VIa: Mechanisms & Processes

Co-Chairmen: A. HEQUETTE (Canada)
J. C. PERNETTA (LOICZ)
Rapporteur: S. GAO (China/UK)

Keynote Address:

M. COLLINS (UK)	**The High Frequency *in situ* Measurement Coastal Zone Processes -**

Contributors:

J. F. DONOGHUE (USA)	Coastal Sand Transport, Erosion and Deposition, Using Natural Radioactivity in Heavy Minerals
B. S. DRUCKER (USA)	Evaluation of Impacts and Direct Effects of Offshore Dredging Activities on Benthic Organisms
S. GAO (China/UK)	On the Principle of Design with Nature in Coastal Zone Management
A. HEQUETTE (Canada)	The Role of Shoreline Configuration and Coastal Morphology on Near-Shore Sediment Transport under Storm Combined Flows, Canadian Beaufort Sea
V. PESHKOV (Russia)	The Influence of Anthropogenic Factors on the Structure of Nearshore Sea-Deposits
J. CHAPPELL (Australia)	Coastal Ecosystems and Geoscientific Realizations
M. LARCHER (France)	Bluff Base and Beach Protection - The Coastal Cell Method

VIb: Modelling

Co-Chairmen: C. WU (China)
A. Y. LE ROUX (France)
Rapporteur: R. D. KOSYAN (Russia)

Keynote Address:

Shang Yi WANG (China)	**Calculation of Long-Shore Sediment Transport Rate**

Contributors:

R. D. KOS'YAN (Russia)	Anthropogenic Impact on the Russian Black Sea Coast
A. REZZOUG (France)	Prévision des effets de la marée sur la stabilité des pentes intertidales et perspectives de préventions
C. WU (China)	Evolution and Long-Term Response in a Special Type of Estuary
Cai Xing YUN (China)	Coastal Change of Recent Plain in Eastern China
M. AL-SARAWI (Kuwait)	Coastal Zone Development in Kuwait
El Bachir JAAIDI (Morocco)	Evolution du plateau continental marocain
I. LEONT'YEV (Russia)	Three-Dimensional Model of Near-Shore Storm-Generated Morpho-Dynamics

SESSION VII: COASTAL AND INSHORE INFORMATION SYSTEMS (Plenary)

Co-Chairmen: E. VOSKRENSKAYA (Ukrain)
J. Van DER WEIDE (Netherlands)
Rapporteur: J. Van Der WEIDE (Netherlands)

Keynote Address:

M. J. CLARK (UK)	**Designing Information Strategies for Coastal Zone Management**

Contributors:

M. B. COLLINS (UK)	Information and Action: an Integrated Approach to Coastal Zone Management (Pagham Harbour, Southern England)
M. HUET (Monaco)	Use of Hydrographic Offices' Marine Data Bases for Coastal Zone Management Applications
S. SIMON (France)	Mise en place d'un système d'informations géographiques pour la gestion administrative et le suivi environnemental du Bassin d'Arcachon dans le cadre de l'étude intégrée d'IFREMER
N. S. SPERANSKI (Russia)	On Dynamic Margin of Coastal Zone
E. VOSKRESENSKAYA (Ukrain)	Low-Frequency Variability of the Black Sea River Discharge Associated with the Coupled Ocean-Atmosphere Variability in the North Atlantic Ocean
R. J. NICHOLLS (UK)	Assessment of Vulnerability to Climate Change - The IPCC Common Methodology, Results and Synthesis

SESSIONS VIII: TRAINING, CAPACITY BUILDING AND MANAGEMENT (Parallel)

VIIIa: Training

Co-Chairmen: R. A. KENCHINGTON (Australia)
P. C. NWILO (UK)
Rapporteur: A. N. BALCHAND (India)

Keynote Address:

G. GIERMANN (Germany)	**Advanced Training Through International Co-operation within the Framework of TEMA in the Field of Coastal and Nearshore Evolution**

Contributors:

A. N. BALCHAND (India)	Training, Education and Information Services in Developing Countries on Coastal Zone Management
R. A. KENCHINGTON (Australia)	Training Today's Coastal and Marine Managers - a Perspective for Asia and the Pacific
A. E. ONUOHA (UK) and P. C. NWILO (UK)	Coastal Change Management Education in Developing Countries

VIIIb: Management

Chairman: G. FOYO (Cuba)
Rapporteur: E. OKEMWA (Kenya)

Keynote Address:

S. O. OJO (Nigeria)	**Impacts of Climatic Change and Sea Level Rises on Coastal Resources: Implications for Effective Coastal Zone Management Policy in West and Central Africa** - Commentator S. C. MARCOMINI (Argentina)

Contributors:

M. BRAY (UK)	Littoral Cells and Budget Analysis for Sediment Management in West Dorset, UK
N. L. BRINGAS RABAGO (Mexico)	Les effets du tourisme sur la zone côtière: le cas du littoral Tijuana-Ensenada à la frontière nord de Mexique
J. BROOKE (UK)	Coastal Management for the County Durham Coast
R. FOLORUNSHO and L. AWOSIKA (Kenya)	Meteorological Induced Coastal Changes along the Nigerian Coastal and Implications for Integrated Coastal Zone Management
S. C. MARCOMINI (Argentina)	Strategies for the Coastal Zone Management of Villa Gesell, Argentina
A. MARSON (Italy)	Coastal Zone Management in Italy: Planning the CZ vs. Planning CZM
D. MEDIO (UK)	General Background to the Assessment and Management of the Impact of Diving-Related Tourism on a Red Sea Marine Protected Area
R. RODRIGUEZ and R. PEREIRAS (Cuba)	State and Management of Coastal Geosystems in Cuba
A. WILLIAMS & R. MORGAN (UK)	Coastal Zone Management: the Ceredigion Heritage Coast

SESSION IX: PRESENTATION OF CONFERENCE REPORTS AND DISCUSSIONS

E. K. DUURSMA (France)	Summary on Rapporteur Reports
R. ARTHURTON (UK)	IOC Regional Manuals on Coastal Change

SESSION X: CONCLUSIVE KEYNOTE ADDRESS

P. COOK (UK)	Outcome and Implementation

6. POSTER PRESENTATIONS

The list of posters presentated at the Conference is given below:

M. ABED (Egypt)	Raised Beaches in Southern Sinaï with Special Emphasis on their Fossil Content
J. ABREU DE CASTILHOS (Brazil)	Les Plages de l'Ile de Santa Catarina (Brésil); un système sédimentataire évolutif et précaire
E. A. AL-OBAID (Kuwait)	Coastal Geomorphology and Artificial Beach Changes Along the Waterfront Project, Kuwait
R. ASMAH (Kenya)	Sustainable Coastal and Ocean Development in Ghana
C. BAERENS (Germany)	Long-Term Changes of Exceptional Sea Level Events at the German Baltic Coast
P. S. BALSON (UK)	The Importance of the Long-Term Perspective in Coastal Management Issues
R. V. BURNE (Australia)	Coastal Ecosystems and Geoscientific Realizations
Wen-Yan CHIAU (China)	Coastal Change; Its implications for Integrated Coastal Zone Management in Taiwan
S. COSTA (France)	Expected Effects of Sea Level Rise on the Change of the "Low Coasts" along the Normandy and Picardy Coasts
E. C. DARE (Nigeria)	The Effect of Oil Exploration and Related Activities on Coastal /fishery Development in Nigeria
R. A. DAVIS (USA)	- Rapid Rates of Change on a Low-Energy Coast: Examples from Pristine and Developed Areas, Florida, USA - Recent Formation of Barrier Islands - Florida Gulf Coast USA
J. DENIS	Zonation et qualification du littoral par l'analyse multicritère - application au littoral Méditerranéen
P. DE WOLF (Belgium)	A Coastal Zone Management Strategy for a Semi-Enclosed Tidal Marsh (Zwin Reserve, Belgian-Dutch Border)
D. I. DIACONEASA (Roumania)	Short-Term Trends in Beach Stability and Rates of Shoreline Movements
J. C. DUMON (France)	Etude des Facteurs de Sedimentation du Lac d'Hossegor (France)
G. FIALHO (Brazil)	Erosion Problems on the Coast of Pernambuco (Brazil)
K. EL-SAYED (Egypt)	Management and Sustainable Development of the Mediterranean Coastal Zone of Egypt; Implications of Scientific Uncertainties to the Coastal Zone of the Nile Delta
A. L. FOOTE (USA)	Destruction of Coastal Marches by Wetland Grazers: a Sociological and Ecological Conundrum
T. GLUSHKO (Russia)	Coastal Landscapes as Guidelines for Coastal Management
J. C. R. GRE (Brazil)	Evolution Holocène du delta du Tubarao dans le système lagunaire Santo-Imarui-Mirim, Etat de Santa Catarine (Brazil)
I. M. GURGEL (Brazil)	Propositions pour l'aménagement de l'environnement d'un complexe lagunaire urbain
J. HOOKE (UK)	Sediment Transport, Sea Level Rise and Shoreline Management: Advising Decision Makers on the South Coast of England
N. HORN FILHO (Brazil/France)	Evolution Holocène de la Plaine Côtière de l'Etat de Santa Catarina (Brésil); Caractérisation Morphologique et Sédimentologique de la Progradation des Cordons Littoraux
H. HOTTA (Japan)	Technological Development for the Effective Utilization of Coastal Sea in Japan
G. INGRAM (Canada)	Impact of Predicted Global Change on Freshwater Input and the Seasonal Sea Ice Cover on a Subarctic Ecosystem in Hudson Bay, Canada
IOC of UNESCO (prepared by P. Cook)	Ocean Science in Relation to Non-Living Resources (OSNLR)
K. KAIRU (Kenya)	Morphostratigraphic Approach to Assessment of Vulnerability of Coastal Environments to Marine Erosion, Kenya Case Study
T. KAWAKAMI (Japan)	Typical examples of Beach Erosion and Counter Measures in Japan

E. KONTAR (Russia)	Anthropogenic Radionuclides in Sediments from the N.W. Black Sea
K. KUMAGAI (Japan)	Coastal Erosion and Future Responses to it
M. LARCHER (France)	Bluff Base and Beach Protection; the Coastal Cell Method
J. M. LEBIGRE (France)	Le littoral à mangrove d'Alcantara (Maranhao, Brésil), evolution et conséquences relatives à sa gestion
F. R. LIKHT (Mexico)	Sedimentary Cycles as a Reflection of Coastal Changes; Avoidance of Mistakes in Data Interpretation
J. L'YAVANG (France)	Evolution morphologique récente du Bassin d'Arcachon
V. MAENHOUT (Belgium)	Transport Paths of Dumped Dredged Material in the Southern Bight of the North Sea
D. MEDIO (Egypt/UK)	Assessment and Management of the Impact of Diving Tourism on Red Sea Coral Reefs
D. MICHEL (France)	Les changements morphologiques a court terme du littoral aquitain - example de la Salie
Y. MIKHAILICHENKO (Russia)	Coastal Management in Russia: Problems and Prospects
P. MORRISON (UK)	The Northumberland Coast Management Initiative
R. NADYA (Russia)	Coastal Processes in the Moneron Island, Japan Sea
R. J. NICHOLLS (UK)	Assessment of Vulnerability to Climate Change, the IPCC Common Methodology, Results and Synthesis
N. M. NOVIKOVA (Russia)	Water Management for Conservation of Biodiversity at the Disertified Plains of the Aral Sea Basin
H. A. OYIEKE (Kenya)	The Impact of Coastal Changes on Biological Resources of Kenyan Coastal Waters
R. PEREIRAS (Cuba)	The Eastern Beaches of Havana: Evolution, Equilibrium and Prospects
K. RASHEED (India)	Impacts of Harbour Dredging on the Coastal Shoreline Features around Cochin
J. E. REBELO (Portugal)	The Ichthyofauna of the Ria de Aveiro, Portugal; Brief Considerations on its Evolution in the Last 75 Years
W. RITCHIE (UK)	An Assessment of the Limitations of Coastal Geomorphology in Predicting Changes in Coastlines of Economic Importance
L. D. ROZMAN (Ukraine)	Dynamical Processes and their Influence on Ecological Conditions of Coastal Waters of the Black Sea
M. H. RUZ (Canada)	Evolution littorale le long d'une côte en émersion rapide, Baie d'Hudson, Canada
Z. SHI (China)	The Geomorphic Change of Saltmarsh Tidal Creeks in the Dyfi Estuary, Wales
A. SPAANS (Netherlands)	Information and Photographs on the Berosin System for the Protection of Eroded Coastal Zones
A. STEFANON (Italy)	A New Power Supply for High Resolution Microseismic Surveys
E. H. TABET-AOUL (Algerie)	Integrated Coastal Zone Management in Relation with Physical Changes; Mediterranean Basin
I. H. TOWNEND (UK)	Defining Management Units
J. L. VASSALLUCI (France)	L'Observatoire de l'environnement littoral et marin Manche et Sud Mer du Nord
B. L. WELSH (USA)	Importance of Coastal Changes on Coastal Zone Conditions in Long Island Sound, USA: Identifying Associative Parameters for Management Criteria
S. M. WERU (Kenya)	Changes in Community Structure in a Marine Protected Area
A. J. WILLIAMS (UK)	Coastal Zone Management: The Ceredigion Heritage Coast
A. YAROCHEVITCH (Ukraine)	Recherche hydrécologique dans la zone d'embouchure de la côte nord-ouest de la Mer Noire
N. V. YESIN (Russia)	Pollutant Transport in the Coastal Zone of the Kerch Strait and their Influence upon Hydrobionts.

8. CONCLUSIONS

About ninety papers were presented in fourteen separate sessions, for which fourteen rapporteurs were appointed. The rapporteurs would certainly have liked to give their report orally. The problem was, however, time. Twelve speakers would have taken at least one hour of the programme. Therefore it was decided that Professor DUURSMA would summarize their reports in twenty minutes and that Dr. R. ARTHURTON would focus on the requirements for the manuals which have been constantly mentioned during this Conference and possibly have some discussions with the audience. Professor DUURSMA followed the sequences of the sessions starting with Session II-a and ending with Session VIII-b. Some additional remarks were given on the posters.

Finally, Dr. P. J. COOK presented a conclusive keynote address on the outcome and implementation.

8.1 SUMMARY OF RAPPORTEURS REPORTS (E. K. DUURSMA's Report)

8.1.1. Oral Presentations

Many keywords were mentioned by the rapporteurs which can be extracted from the abstracts of the presented papers and posters. They easily come to about thirty to fifty, depending what can be denounced as a keyword e.g., erosion, accretion, sea level rise and fall, hinterland effects, storm surges, ownership, currents, mining, tourism, fishery, mangroves, deltas, estuaries, data acquirement, maps, beach and slope profiles, dredging, aquaculture, land reclamation, coastal zone management, training and capacity building.

Session I: Introduction (see above)

Session II: Mechanism and Processes, divided in three sub-sessions on sea level changes and coastal impact, geological framework and physical oceanographic framework

Session IIa Sea Level Change

This session was not intended to give a worldwide overview on sea level rises as a consequence of potential world climate changes, but only to present some interesting points. There is a need for an assessment of the global, regional and local sea level changes and associated economic impacts. For this purpose the Global Sea Level Monitoring Observing System (GLOSS) has made use of great improvements in tide gauge techniques, satellite radar altmetry and advanced geodesic methods. The present estimates by IPCC (UN Intergovernmental Panel on Climate Change - Second Assessment Report) of sea level rise range between 25 and 70cm towards 2100 i.e., 105 years which is twice the rise of the last 100 years. A point which has been stressed is the global environmental change characterized by the increased frequency of severe and extreme events such as storm surges. One particular case is the large sea level changes in the Caspian Sea which is also reported in another session. It is clear that events observed in one region cannot automatically be extrapolated to other regions. Storm surges in the Baltic might present an indication that climate changes are also felt in changes of the frequency of extreme conditions. In France there has recently been extreme conditions of flooding and the question is whether this is a warning that future extreme conditions will occur more frequently and more excessively. We may be able to learn from the small ice-age in the Middle Ages which caused change of sea levels in the Caspian Sea. The response is related to the larger periods of high pressure in eastern Europe. The question posed is whether mangroves can catch up with sea level rises, since due to peat formation such sea level rises should not extend 10cm/century. It is the same for coastal lagoons. Can they match sea level rise sufficiently to be preserved? Extreme and temporary sea level fluctuations are due to tropical cyclones and the question is posed how this might be developed in the future. IPCC is involved with these problems for small islands.

Session IIb: Geological Framework

Since the Holocene, much can be learned from the natural phenomena of coastal response to sea level changes and land subduction or uprising. Several examples were presented with results on the sediment balance of beach erosion and accretion, with relation to their beach profiles, marsh formation and loss, and delta formations. Risk assessments should be carried out for sensitive regions. It is clear that coastal zones are under the impact of natural processes and these cannot be neglected. Main factors here are also sea level fluctuations since the Holocene, sediment availability, human intervention in the coastal zone and tectonic activity. A good example is the one of the Yellow River in China with its large sediment load and modifications in the delta and

diversion of the main outlet. In some regions human intervention causes both water quality problems and morphological changes in the coastal zone.

IIc: Physical Oceanographic Framework

In this context key parameters are the forcing functions concerning wave action and run-up, current impact, delta ebb and flood channels, turbulent diffusion and long-shore sediment transport. Some interesting points were discussed in this context. They concern theoretical studies, studies on processes and practical means to preserve beaches. To be identified are process-response variables and their variation in a temporal as well as a spacial context. The clue of a predictive model is to provide some measure of retreat with specific frequency of storms and theory offer guidance to the magnitude. Beach preservation and restoration was executed successfully in Georgia by nourishment at low costs. Also polder management modelling in Bangladesh may determine the limits of tidal channel flushing and siltation. Central themes brought out in the discussions were directed towards a better understanding of the natural system before management and the responses to coastal processes.

Session III: Regional Cases

For a major part of African regions and a few Pacific cases, results were presented based on scientific, technological and cultural viewpoints. There were great financial difficulties to improve Coastal Zone Management (CZM). Erosion, loss of wetlands (Benin), mass mortality of mangroves (Colombia) by river canalization, loss of beaches due to sand mining and loss of reefs due to coral mining were reported. In some countries (Egypt) EIA has become mandatory. The case of the Asuwan Dam effects on coastal erosion is almost classic now. Land reclamation (Kenya) is also a cause of coastal erosion. Possibilities for creating stable beaches by special constructions were presented for Japan.

Session IVa: Africa/Asia

Low tropical coasts suffer heavy changes for example: mangroves disappeared for 60% in Nigeria due to the needs for firewood. Examples are given that seawall and breakwater constructions accelerate elsewhere erosion. Coastal aquacultures are in danger (pollution and collection of fingerlings), although being themselves the cause of mangrove destruction. All coasts endure erosion and deposition of sediments, where retreats of the shorelines have been observed of 25 meter/century (Tanzania), affected by monsoons (India). Integrated monitoring is required (USA). In summary, man-made causes are: mining, dams, hard structures at the coastline and exploitation of coral reef. These have again a feedback on the human activities; environment erroneous planning or improperly implemented works are among others the largest impacts.

Session IVb: Other Coasts

Coasts that have been experiencing changes is shown for Brazil for the last 7000-year period. Such natural changes are often accelerated by human impact and questionable engineering (Brazil) at the expense of large costs. Industrial and human impacts accelerate permafrost rock erosion (Russia), lagoons deterioration (Mexico) port-dyke impacts (Morocco) and erosion/deposition and dune changes (Vietnam). Usually no easy solutions could be formulated without a great deal of economical impact in terms of costs. Geological studies will provide a sound basis for the suitable management of the coastal zone and the choice of preventive measures to be further assessed.

Session V: Aquitaine, Mediterranean and Other Coasts

A major paper was the one on the cycling evolution from 1705 to the present of the Arcachon basin where cycles of about 80 years determine the shifts of sand bars and gullies, with additional shifts from west-east to north-south. The use of specialized atlases are proposed, for example of dune sensibility. Coastline preservation is in some cases possible by applying vegetation defence, due to grasses and forest plantation (France). Erosion can be accelerated due to uncontrolled land reclamation (Albania). Micropalaontological data can help understanding erosion and accretion patterns as was shown for the coast of Biscay. Changes in river systems (Rumania, Russia) have great impact on the Black Sea shorelines. In 1978, the unexpected change in the rise and fall of sea level in the Caspian Sea caused problems with coastal sub-soil waters and increased erosion.

Session VI : Short-Term Mechanisms, Processes and Modelling

Session IVa: Mechanisms and Processes

Similar examples have been presented as in the former sessions, with accent on design with nature and the model TOSCA (UK), which consists of current meters, optical back scattering to monitoring sediment movements, effective for high-frequency measurements. Natural radionuclides are useful for sediment sources and deposits for transport. Changes of river mouth effects (Côte d'Ivoire), storm events (Canada), restoration of natural shoreline drift's balance (Georgia), estuarine dynamics (China) and new regulation for Coastal Zone Defense (Russia). An essential point for management (China) are the criteria for understanding the stability of natural systems on which the changes are superimposed. Sometimes proper field measurements are more essential than modelling for solving many problems (Australia). There should be also the application of simple devices to improve beach accretion (France).

Session VIb: Modelling

Some interesting models were given on multi-dimensional challenge (UK), storm-model circulation (Russia), effects of river diversion, canalization for navigation and saltwater intrusion (Mississippi, USA) and the stability of beach front slopes (France). Pr. Wang kindly replaced an absent keynote speaker and calculated longshore sediment transport rates and showed the capacity of estimating sediment transport. The anthropogenic impact, also from the hinterland of the Danube, was shown for the Russian Black Sea coast. But also the installation of numerous groynes (dykes into the sea) provoked abrasion of some areas and required more concrete constructions.

Long-term response of estuaries is an essential part of Chinese research, including data on sediment load of the Yellow River and changes of river tributaries over large distances. In another session this was already mentioned. Cores of Atlantic sediment taken offshore Morocco show heterogeneous profiles which can be related to historical sea level changes. An example of Kuwait showed that rapid development, private ownerships of beaches and illegal dumping create a major threat to the coast line and beach stability.

Session VII: Coastal and Inshore Information Systems and Modelling

There is a need to translate scientific data into information for management use (UK). The application of Landsat Thematic Mapper is proposed (USA), as well as the Electronic Navigational Charts (Monaco). Moreover, the use of models, describing physical and biological processes is also essential (UK); examples of the application of Geographic Information System (GIS) systems were given by USA and France. Research on basic processes such as cross-shore sediment transport and low-frequency hydrometeorological processes (Russia) were presented. Although modellers may have taken this into account, the term Coriolis force has not been heard so far and this is an essential factor for tidal current effects on coastal zone erosion or accretion.

Session VIII: Training, Capacity Building and Management

Session VIIIa: Training

Training and capacity building should be an essential part of Coastal Zone Management (CZM), where India proposes to set-up a centre for S. E. Asia. Training, Education and Mutual Assistance (TEMA) (IOC/Germany) concerns training courses in developing countries for CZM. Some of the information should be given through computer automatization of littoral prognosis and management (Russia). There is a need for proper infrastructure in this context for developing countries (UK); it has already been mentioned that the proposed manuals can play a role and people should be made aware of erosion management (UK). Training and capacity building are vital to advance integrated coastal management. Possibilities through international organizations like IOC-TEMA and bilateral programmes are examples. Germany and Australia were active in this aspect, where the receiving countries take part in the organization, like India and Indonesia. Training occurs also through UNEP. Capacity building will not only increase through training, but also through education, which in the long term may give sustainable impact.

VIII-b: Management

Proper coastal zone management encounters many difficulties, some of them related to the fact that parts of the shoreline are private property (California), there is a large pressure of tourism development (Mexico), a key conflict between policies and practices (Australia), conflicts between the hinterland development and the coastal zone impact (Nigeria), diving tourism and reefs (Egypt), socio-economic risks (Nigeria) and former irrational ecological practices. Government measures are now taken (Cuba). There is a tendency to prepare zonation plans for estuarine systems (Sri Lanka) and the complete coastal zone (Italy). UK stresses that measures are taken **now**, not tomorrow.

8.1.2 Posters

A word of appreciation is necessary for the posters presented. The number was smaller than expected, but the quality was very up to date. As usual, posters present special cases related to phenomena and techniques which was also the case here. Additionally, they created the platform for discussions on a personal basis and many contacts between participants were established in the poster hall. Thanks also to Mr. de Rees for demonstrating the computerized Coastal Zone Management model COSMO of the Noordwijk 1993 Conference.

8.1.3 Personal View

Professor DUURSMA concluded that this summary shows in a nutshell the worldwide worries for preserving or optimizing the continental margins and islands coastal zones. Nevertheless, the total scale in which we have to place the problems is not complete. It looks like we are fighting a withdrawal war in which we try to reduce the damage by almost not knowing where this will end up. There are the following factors which should be taken into account:

Figure 1:

(i) A coastal zone is, in principle, the degrading edge of the continent in contact with the sea. The enormous thick layers of sediment on the shelfs and bordering ocean demonstrate that these edges have been eroded for billions of years and will continue to erode in the future. The forcing functions are **GRAVITY, WAVES, WIND** and **CURRENTS**.

(ii) Only under special conditions of offshore profiles, river sediment supply, wind direction and sand composition, beach and dune formation will compensate erosion.

Figures 2 to 5

(iii) Sea level changes are part of the natural changes between glacial and interglacial climatic changes. At present we are in a post-interglacial, or pre-glacial period, where the tendency to a new glacial period is compensated by the greenhouse effect. The **major** question is **to which extent**. Although the small ice-ages of the last millennium were not repeated in the last centuries, they were indications that a new glacial period was developing. It was only the greenhouse effect that interfered and interferers. Six thousand years ago the reduction of solar insolation started and will cause a new glaciation period (Milankovitch effect, modelled by Berger).

Our fossil fuel reserves are sufficient to serve for about 2-3000 years, when mined at the present rate. However, this does not take into account the increasing exploitation costs in competition with other energy sources (nuclear power by fission and fusion).

The point for the world's coastal zone is **what impact will this have in the near future on the sea level?**

Questions should be asked which zone are at risk in the near 200 years, and which measures should be taken.

The message of our Conference is that there is a need for integrated knowledge, which should be translated into practice, beginning on a small scale with practical manuals as mentioned below.

8.1.4 Summary of a Possible Scenario for the Future

1. Next centuries: sea level rise due to melting Ice cap Greenland (not Antarctica) and ocean expansion due to temperature rise.

2. Larger and more frequent climatic extremes: **STORMS, RAINS AND FLOODING, DRY PERIODS** due to conflicting impacts.

3. Growing possibility of small ice ages due to Gulf stream changes, when greenhouse effect becomes over-reached.

4. Rainfall in desert regions.

5. Changes in El Niño → changes in humid and dry climate.

6. Utmost urgent necessity: **TO UNDERSTAND AND PREDICT NEAR FUTURE CHANGES** (decades to century) **DUE TO CONFLICTING TRENDS.**

7. For regions: **INTEGRATION OF INVESTIGATIONS OF CAUSES OF EXTREME CLIMATIC CONDITIONS, EFFECTS TO BE EXPECTED AND MEASURES TO BE TAKEN.** For example, France, Germany, Belgium and the Netherlands concerning prognosis of extreme flooding and measures in the long run (century).

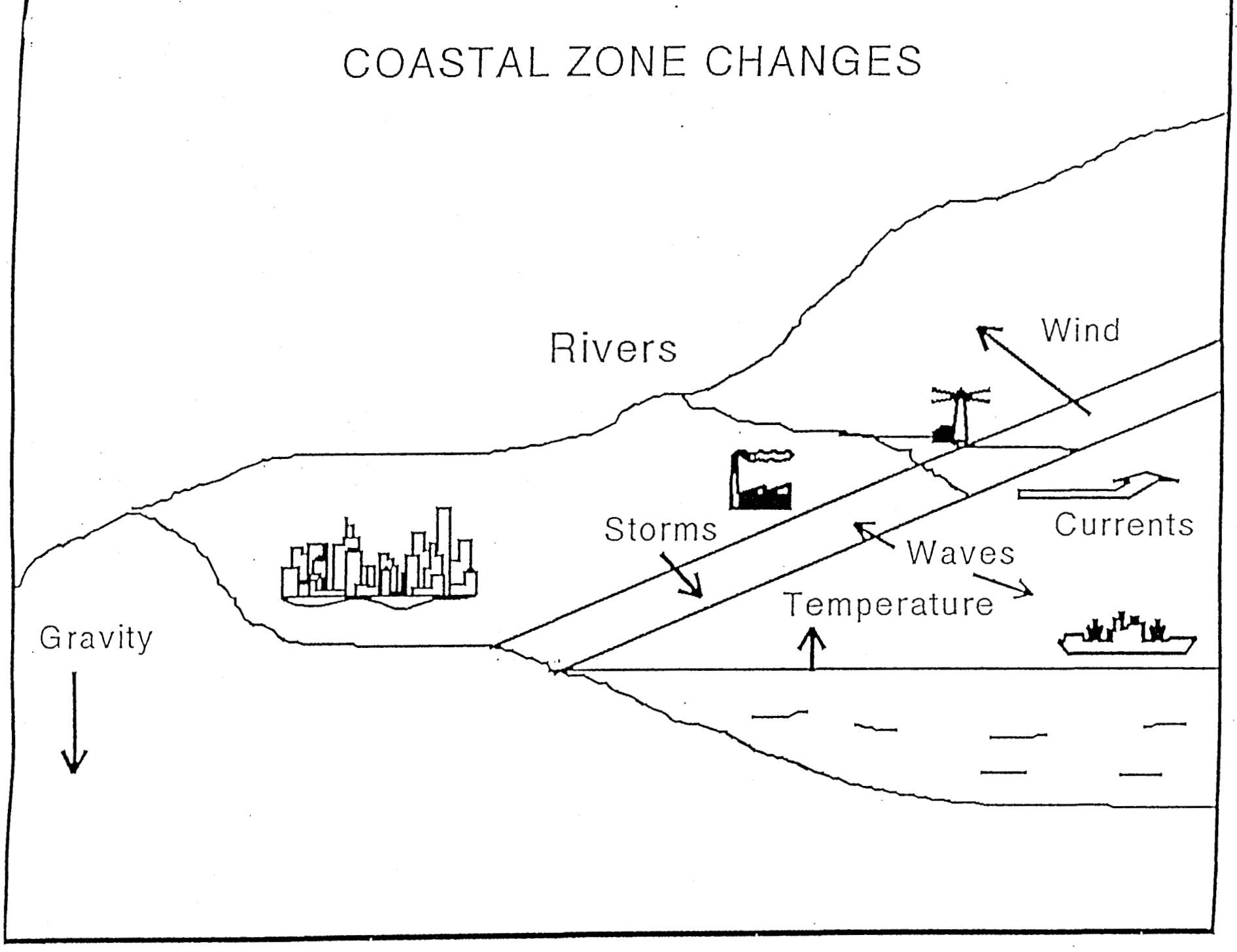
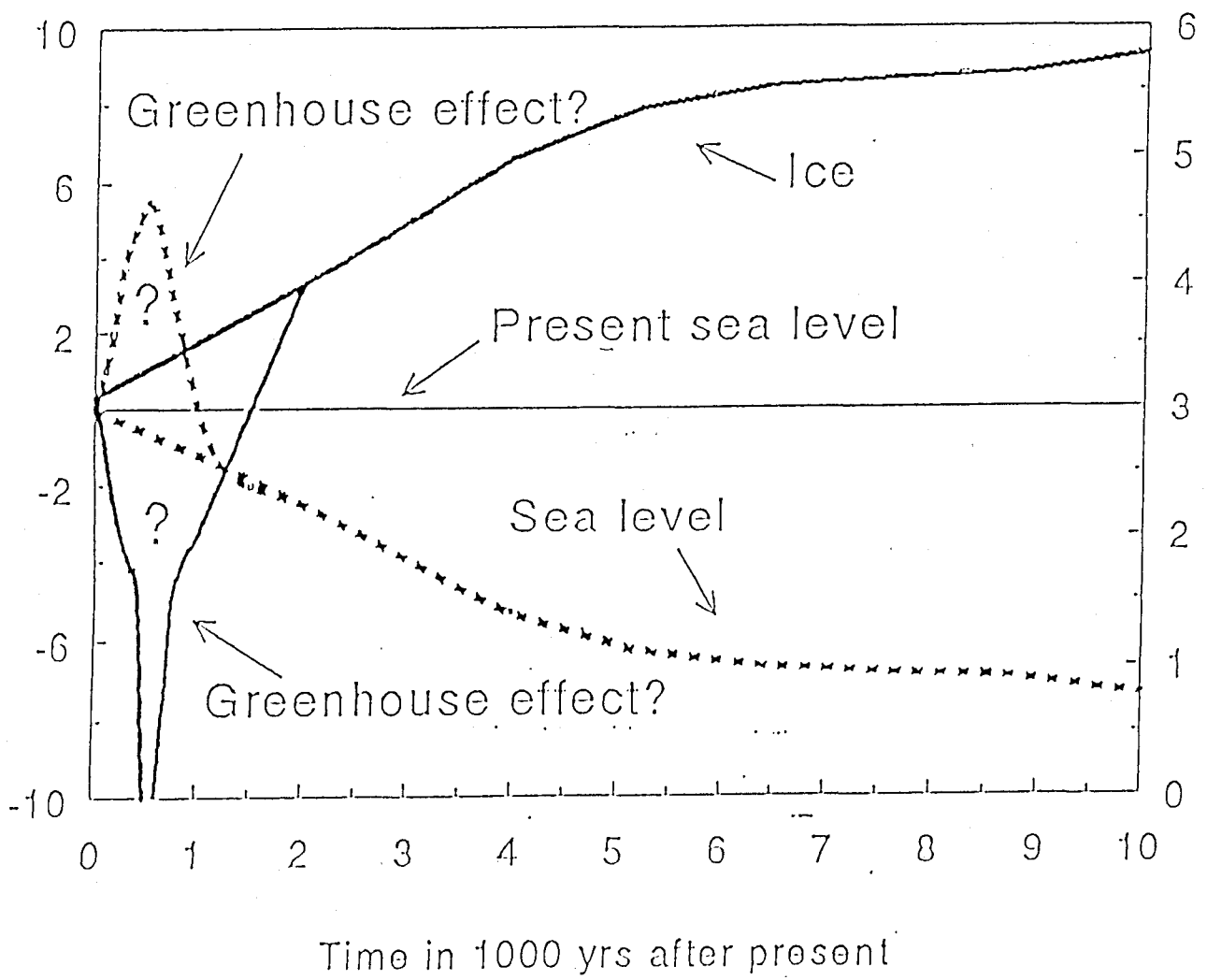

COASTAL ZONE CHANGES
Rivers
Wind
Storms
Currents
Waves
Temperature
Gravity

FIGURE 1


Continental Ice, & sea level rise
10^6 km^3 & meters, resp.
Ice
Sea
I?
S?
Greenhouse effect?
Ice
Present sea level
Sea level
Greenhouse effect?
?
?
SEA LEVEL (M)
CONT. ICE (X10^6 KM^3)
10
6
2
-2
-6
-10
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1
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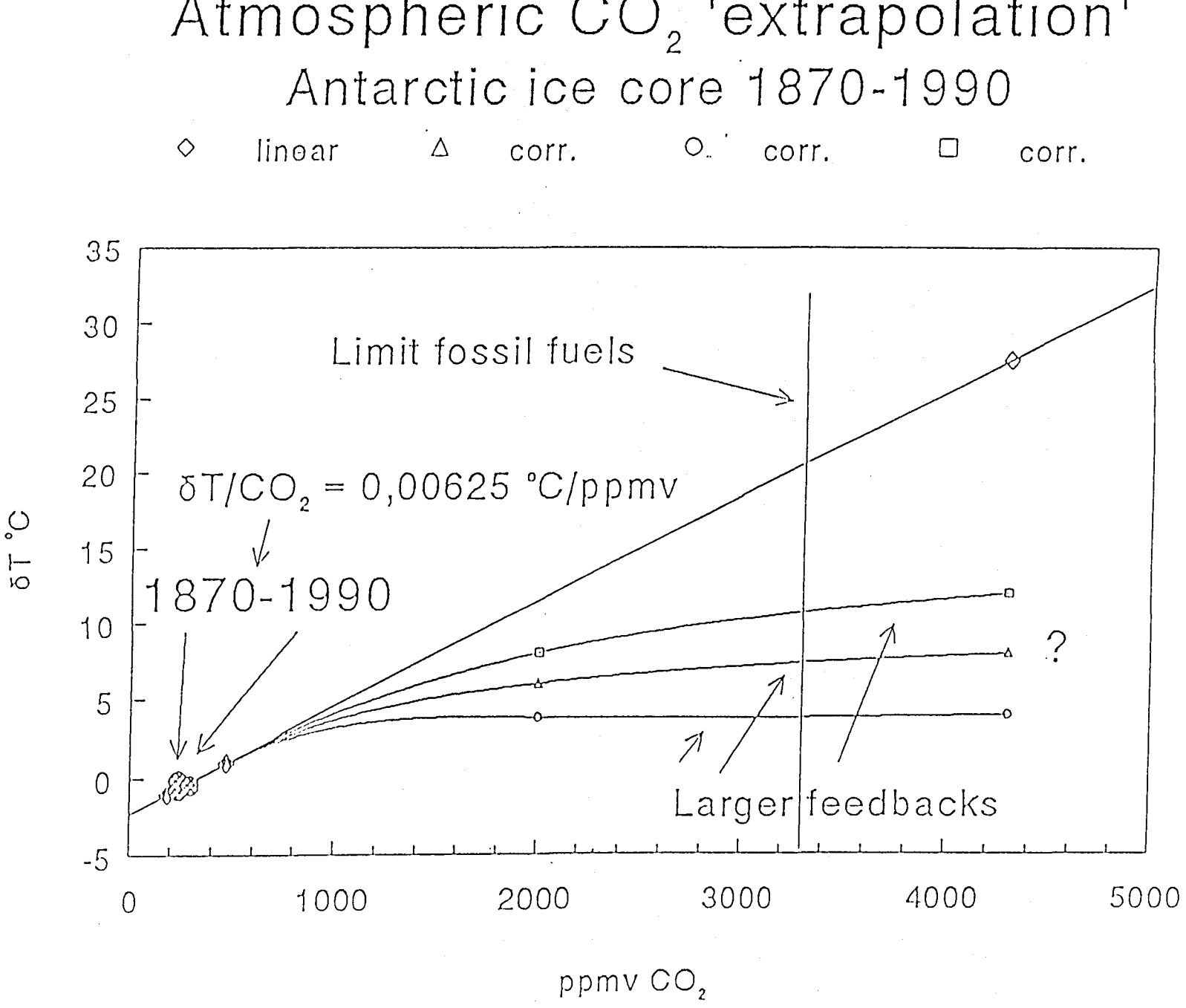
0 1 2 3 4 5 6 7 8 9 10
Time in 1000 yrs after present

FIGURE 2


Atmospheric CO_2 'extrapolation'
Antarctic ice core 1870-1990
◇ linear
△ corr.
○ corr.
□ corr.
Limit fossil fuels
$\delta T/CO_2$ = 0,00625 °C/ppmv
1870-1990
Larger feedbacks
?
δT °C
ppmv CO_2
35
30
25
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15
10
5
0
-5
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1000
2000
3000
4000
5000

FIGURE 3

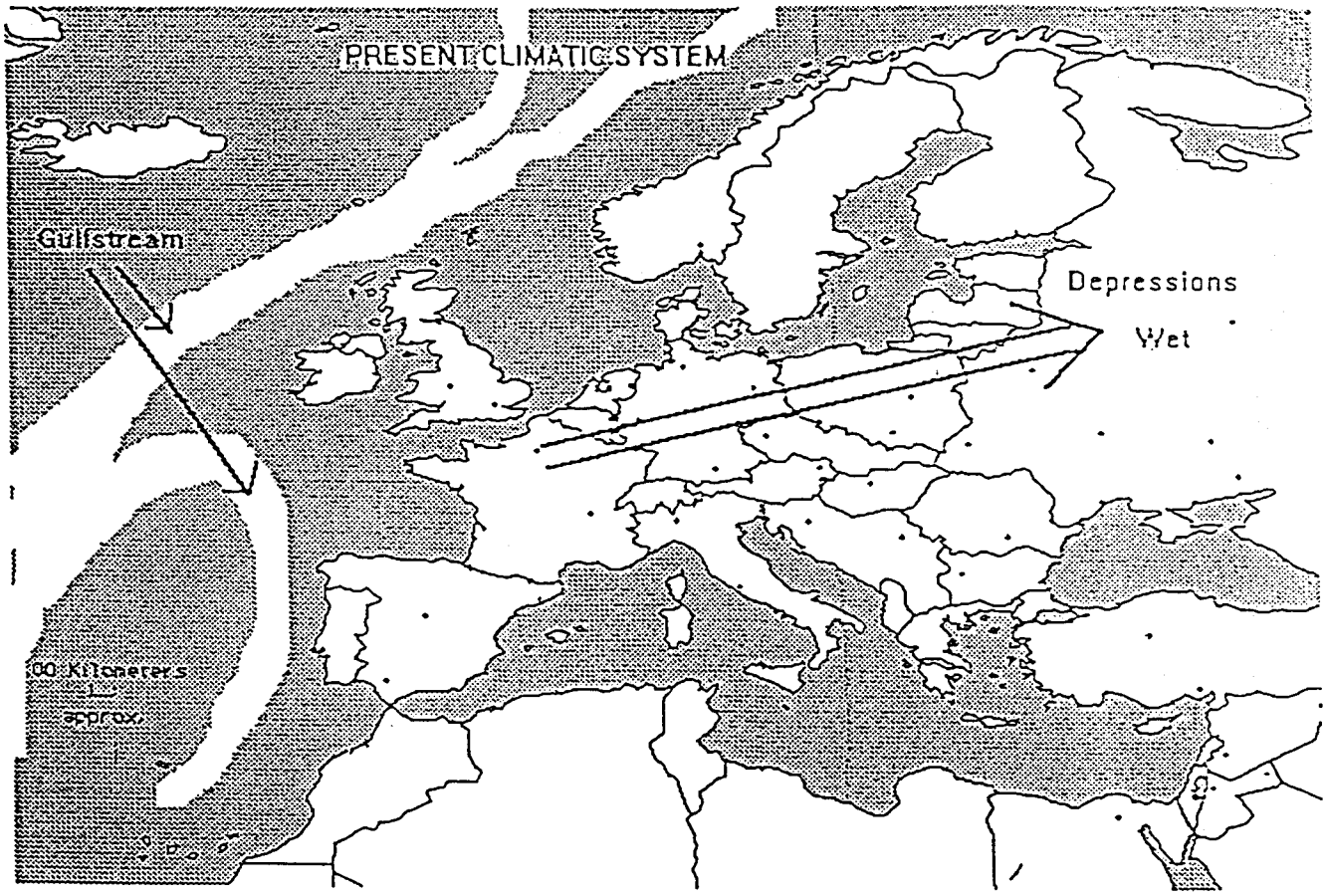
PRESENT CLIMATIC SYSTEM
Gulfstream
Depressions
Wet
00 Kilometers
approx.

FIGURE 4

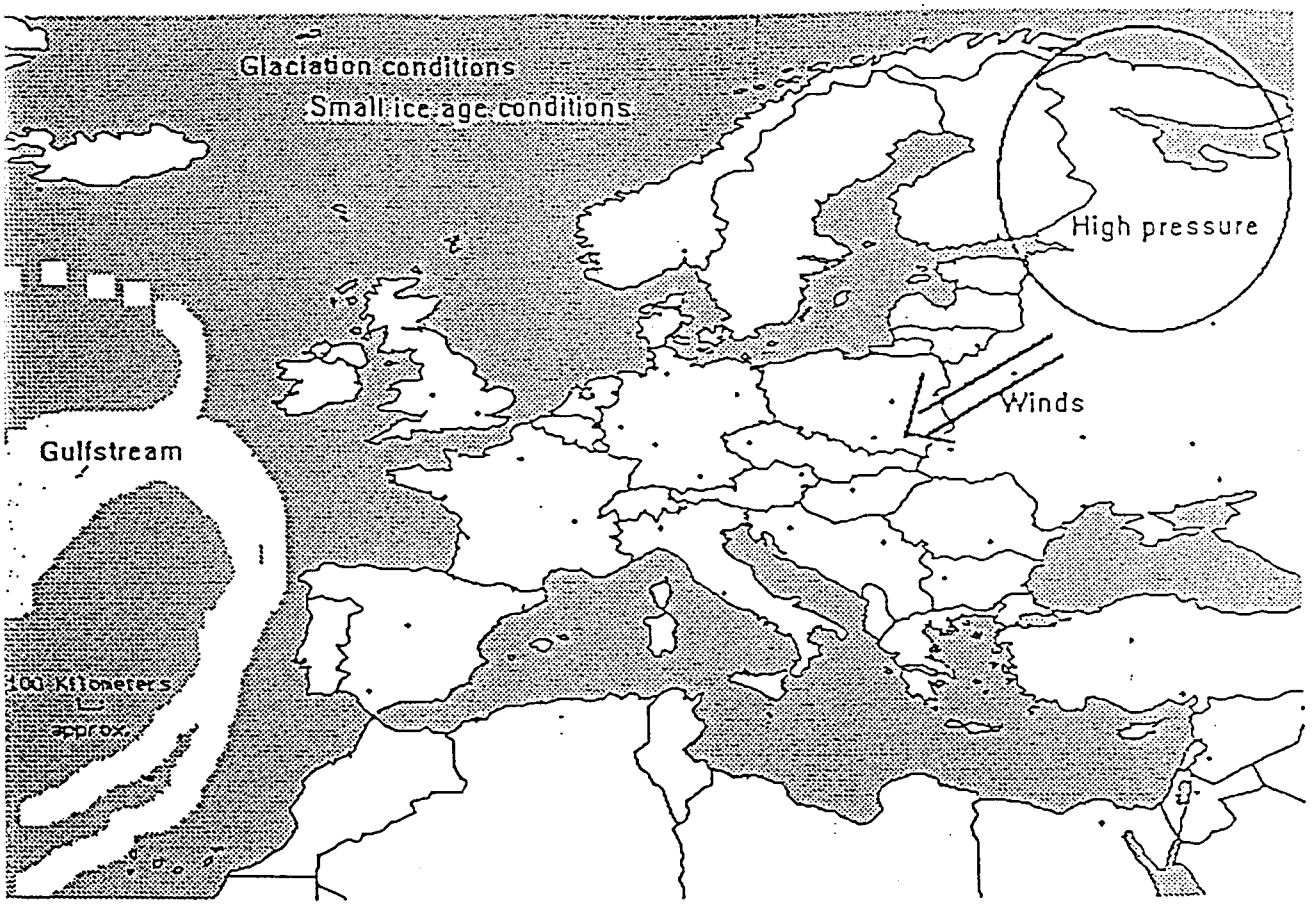
Glaciation conditions
Small ice age conditions
High pressure
Winds
Gulfstream
100 Kilometers
approx.

FIGURE 5

8.2 PROPOSALS ON IOC REGIONAL MANUALS ON COASTAL CHANGE (R. ARTHURTON's Report)

One of the intended later results from the Conference COASTAL CHANGE 95 is a series of manuals that will provide guidelines to coastal scientists on the ways in which they can contribute effectively to Integrated Coastal Zone Management. The guidance aims to cover not only the analysis of coastal change and its prediction but also especially its implications in terms of socio-economics. In addition, it aims to cover aspects of remediation for which ocean and geological science are relevant.

The manuals will aim to take a systematic approach, linking science to management, **illustrated as appropriate with case studies that were presented to the Conference**. They will cover the principle management issues relating to coastal change. They will show how these issues need to be appraised with a knowledge of the geological and sedimentary inventories and an understanding of the physical processes directly or indirectly affecting those inventories. They will consider the evaluation of the coastal resources at risk and stress the need for the effective communication to non-scientists about the problems and their implications. The manuals will review the options for affordable and sustainable solutions.

Definition of the Management Issues

The management issues in low-lying, tropical and sub-tropical coastal zones include catastrophic flooding, the loss of beach sediment and consequent coastal recession, siltation, salinc intrusion in groundwater, the deterioration of coral reefs and mangrove, and the demand for construction aggregates. Many nations have a significant dependence on tourism in the coastal zone and they have a strong vested interest in protecting their tourism investment from coastal change. Conversely, there is a wider need to protect the coastal resource itself from the effects of tourism and other developments. The manuals will present these issues in a regional context, drawing attention to the range of interests which exploit, or have impact upon, the coastal resource.

Inventory and Process - The Scientific Analysis

For the coastal managers and national policy-makers to determine an appropriate course of action in a situation of coastal change, they need an accessible source of advice on the nature and implications, both physical and economical, of coastal change. In order that such advice is available to them, there must be a thorough scientific analysis of the problem. A prime requirement is for the establishment of geological and sedimentary inventories of the site under threat and its environs, carried out by systematic mapping and with reference to remotely sensed data. There is a need to identify and understand the processes of change, linking physical change with its forcing mechanism and appraising the spatial and temporal controls on that forcing. In particular, it is important to distinguish between natural processes and those induced, or affected by, the activities of Man.

The manuals will review the benefits of referring to the historical and geological records to determine the dimensions of physical change, both spatial and over a range of time scales, in order to possibly predict the nature of future change and its dimensions.

On the basis of the information derived from the scientific analysis of the site and its surroundings, and with a knowledge of the value of the coastal resources that are threatened or at risk from change, the coastal scientist is in a position to advise the coastal manager, and to communicate with the wider public, on the implications of change. The manuals will provide guidance on these important steps.

Questions for Management

The coastal manager may require impartial scientific advice on the wisdom of taking remedial action. Such action may be essential, e.g., if high value infrastructure is to be protected; or conversely may be undesirable, e.g., on environmental or conservation grounds. The manager may wish to know whether the factors that are forcing, or otherwise contributing to, change can be controlled or regulated. He will need to know whether a remedial solution is technically feasible.

The manager may need to know about the spatial and temporal perspectives of the problem. If it is simply a local matter, he may have the capability and resources to control it; regulation of beach-sand mining, for example, may be sufficient to alleviate the problem. On the other hand, the causes of the problem may be regional, e.g., due to major engineering or land-use changes in the hinterland, or to regional climatic change,

and thus beyond the power of the manager to control. In such circumstances there is a need to place the issue on the national agenda . On the still wider scale, if the problems are being caused by global change - eustatic sea level rise - then the solution becomes a matter for international co-operation, well beyond the capacity of individual nations to control on their own.

Finally, the coastal manager and the national policy-maker may require scientifically based advice on the logistic and economic suitability of the various options for the remedial solution. The manuals will show the importance of the role of the coastal scientist in the appraisal of the solution, advising perhaps on sources of materials for artificial beach recharge, or the availability of alternative sources of construction aggregates. They will consider on the sustainability of the various options, whether there is a major maintenance commitment, e.g., to cope with extreme storm events. The role of the coastal scientist in ensuring that the chosen solution is environmentally sound in all its implications will also be emphasised.

8.3 OUTCOME AND IMPLEMENTATION - KEYNOTE ADDRESS (P. COOK)

The theme "Coastal Change" was chose for BORDOMER 95 for several reasons. First and foremost was the general recognition that of all the natural environments, it is the coastal zone which is under the greatest pressure from development, pollution, tourism and over-exploitation of resources; in many ways it encapsulates all the problems of planet Earth and it is perhaps the focus of many of those problems. The second reason was the realization that if current trends continue unabated the problems of the coastal zone will be magnified in the twenty-first century, with the added potential changes resulting from global sea-level rise in response to the global warming. The third reason was despite all these concerns and despite the vast amount of coastal zone science that has been done in recent decades there is still much to be done and much to understand. For example, in many areas we do not know the natural rate of coastal change; in some areas we still do not know whether relative sea level rise is rising or falling or at what rate.

A closer look at the geological and historic record in the coastal zone is the key to understanding coastal change in many areas. In some cases it can provide the method of separating natural change from anthropogenic change. It can also provide the base level for past erosion rates, elemental concentration or biodiversity against which future change can be measured. In other words the past can provide us with the key to the future. However, we must also better understand the present through comprehensive programmes of mapping and monitoring. Scientists must play a fuller role in helping to develop wise strategies for sensible and sustainable use of the coastal zone in the future. Objectives must include:

- integrated management of coastal environments including maintenance of biodiversity;
- sustainable harvesting and farming of coastal living resources;
- exploitation of coastal non-living resources in a cost-effective and environmentally acceptable manner;
- assessment and prediction of coastal hazards in order to minimize their impact on human life and the infrastructure;
- evaluation of the capacity of the coastal zone to absorb change;
- building and strengthening the scientific capacity of less-developed countries using the partnership approach and local knowledge to ensure their national coastal needs can be met and they can fully participate in international coastal programmes of relevance to their national priorities and aspirations;
- more effective communication of scientific outcomes to decision-makers and managers to inform their actions in the coastal zone;
- better links between the coastal sciences and society to enhance community involvement and awareness;

In order to obtain these objectives, which will require the combined efforts of all sectors of society, the scientific community will need to undertake a number of specific scientific and operational activities in the coastal zone including:

- systematic base-line mapping, monitoring and analysis against which to measure future changes in the water column, the sea-floor and marine and coastal ecosystems;
- assessment of the potential economic and intrinsic value of marine resources and long-term and continuous monitoring before, during and after any resource exploitation;

development and application of new technologies in measuring, monitoring and modelling, underpinned by continuing and relevant research.

Documentation of economic and other benefits resulting from improved knowledge, forecasting conditions and sustainable development of the oceans and coasts should also be undertaken in order to guide future actions including the careful targeting of coastal research.

The world's coastal zones are of great environmental, cultural, intellectual, nutritional and socio-economic value. The scientific community must play its role to ensure that value is sustained. That community, represented at BORDOMER 95, has the opportunity to recommend the way ahead.

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ANNEX II

ABSTRACTS OF ORAL PRESENTATIONS

ETUDE COMPARATIVE DE LA DYNAMIQUE SEDIMENTAIRE AUX EMBOUCHURES DES FLEUVES DU LITTORAL IVOIRIEN

ABE Jacques

RESUME

La morphologie récente de l'embouchure du fleuve bandama à grand-Lahou connait une dynamique particulière au cours de ces dernières années (de 1965 à 1993) avec migration significative de l'embouchure vers l'ouest de l'ordre de 1,10 mètres par mois. Son débouché en mer situé au point de changement d'orientation de la côte a nécessité des travaux de protection contre l'ensablement. Il s'en est suivi une profonde modification de la morphologie de la plage sous marine dans cette zone. A l'Est du canal la côte subit dans le même temps une sévère érosion évaluée par endroits à 1,5 mètres par an.

La réouverture du canal naturel du fleuve comoé en vue de l'élimination des plantes flottantes envahissantes a modifié considérablement l'environnement hydro-sédimentaire du domaine lagunaire à Grand-Bassam. Ce système demeure fragile par le colmatage saisonnier du canal en étiage.

De 1989 à 1991 de la passe d'Assinie, suivies de relevés de profils d'estran et de mesures hydrologiques ont permis de mettre en évidence les relations entre les régimes hydrologiques et l'ouverture de la passe. Les échanges lagune-mer sont régis principalement par les apports des rivières. Les diffractions de la houle au niveau du delta de jusant gouvernent les différentes positions des bancs sableux des rives Ouest et Est.

Mots clés: morphologie, sédimentologie, hydrologie, passe, Grand-Lahou, Grand-Bassam, Assinie, lagune, Côte d'Ivoire

ABSTRACT

Topographic surveys conducted from 1965 to 1993 show significant migration of the river mouth form east to west. The average migration rate is about 1,1 meter per month. On the other hand, the dredging of the access chanel to the port and protection structures result in trapping sediments coming from littoral drift.

The Bassam inlet was opened in order to revacuate offshore invasive aquatic plants. This has considerably modified the hydro-sedimentary environment of the lagoonal domain at Grand-Bassam. This new system remains fragile, with the seasonal (low river flow) clogging.

From 1989 to 1991 together with beach profiles and hydrological measurements have evidenced the relationships between hydrological regimes and the morphological aspects of the inlet. Hence, the exchange between the lagoon and the ocean only occurs on the surface layers which are mainly fed by the water of continental origin (tanoe and bia rivers). The sediments of the inlet are mainly composed of coarse, fine and very fine sands. These constitute sand banks playing an important role in the stretching of the inlet. Wave diffractions on ebb delta are responsible of the positions and the morphology of sand banks.

Key-Words: morphology, sedimentology, hydrology, inlet, Grand-Lahou, Grand-Bassam, Assinie, lagoon, Cote d'Ivoire

COASTAL DEVELOPMENT IN THE RED SEA, CASE STUDY

by A. G. Abul-Azm [1] and M. A. Baraka[2]

ABSTRACT

In recent years, the Red Sea coast is getting an increased attention for touristic and reconstruction developments. This paper deals with the surveying measurement activities in relation to developing a limited strip on the Egyptian Red Sea coast.

The conducted surveys for this phase of the project were mainly; Bathymetric survey, hydrographic survey and environmental design data collection. A satellite altimetery data was utilized to enhance the collected data.

Altimetery data had proven to be useful in providing a regional solution for the Mean Sea level determination in remote areas. This study has now formed the main baseline data for the case study area in any future development or study such as; Planning of site and the choice of the foundation level, Environmental impact assessment (which is becoming mandatory by the Egyptian rules), design of a marina or jetty and design of the inlets for the required artificial lagoon and circulation inside the lagoon.

Effects of Development pressure on the coastal zone: Examples from Kenya.

by
Pamela Atieno Abuodha,

The object of this paper is to provide information on the effects of development pressure on the Kenyan coastal zone. Critical areas include Malindi, Watamu, Kikambala, Kanamai, Bamburi and Diani. In all these areas the resulting environmental degradation and economic loss is on such a scale as to be alarming.

Human impacts on the Kenyan coast results in degradation of the the shoreline and thus in accelerated erosion. Effects of land-based activities on the beaches include, constructions beyond high -tide mark, sweeping, playing games, beach mining and discharge of waste waters. Management strategies adapted is the construction of stabilizing structures such as seawalls, revetments, breakwaters and groynes.

There are three basic options in response to the erosion problem. No action, relocation of endangered structures and positive corrective measures. There is an urgent need for a coastal zone management system and to enact a legislation which would protect coastal resources and environment for their sustainability.

VULNERABILITY ASSESSMENT AND RESPONSES TO SEA LEVEL RISE IN THE BENIN COASTAL ZONE

by Kolawolé Sikirou ADAM *

Abstract

The Benin coastal zone is espècially critical because of its geographical situation and its dynamics. It is an important maritime front, the most densely populated in the country and contains the hub of economic activity. Accelerated sea-level rise due to overall climatic change (global warming) will bring about important natural, socio-economic and cultural disruptions in the coastal plain. Data suggests that an ASLR will aggravate the existing ecological problems (increased salinisation of ground water and soil, greater influx of diverse pollutants) in the Benin coastal zone and result in serious cultural and economic consequences (misery for the population).

Economic conditions, development priorities, attitudes toward coastal land use, as well as low levels of government and public awareness of accelerated sea-level rise bode poorly for the timely implementation of appropriate response strategies. The findings underscore the necessity of addressing current erosion problems and coastal development pressures, as well as the need for coastal management planning in face of ASLR.

KEYWORDS : Gulf of Benin, Benin, climate change, coastal beaches, coastal erosion, accelerated sea-level rise (ASLR), assessment, impacts, environment, development, management.

THE ROLE OF NATURAL COASTAL PROCESSES AT A TROPICAL TIDAL INLET IN HINTERLAND DEVELOPMENT

K . AJITH JOSEPH, K. RASHEED & A. N. BALCHAND

The management of hinterland areas is often a necessary prerequisite to prevent deterioration of adjacent coastal resources and ensure sustainable development without considerable changes to the regional set-up. The study in this respect at a tropical tidal inlet where natural coastal processes continue to dominate while inland area is susceptible to engineered structural modifications. Andhakaranazhi, a location on the south west coast of India and its adjoining coastal zone have been recent target of large scale developmental activities, a potential site with respect to the influence from natural coastal processes which lead to destabilising conditions. Longshore sediment transport associated with the refracted high energy waves leads to the deposition of beach sands at this tidal inlet

during pre-summer months resulting in a seasonal coastal morphological feature, magnitude of which do change from year to year. This temporal coastal change has resulted in large scale excavation of sand for hinterland development and as well as raw material for quartz industry. However this beneficial utilization, crossing conservative limits have posed a threat to the protection and development of the region and management of the ongoing programmes. Major issues pertain to the erosion of the adjoining beaches, shoreline modification, salt water intrusion into the low lying (paddy) fields and wave action on coastal protective structures, all of which are of adverse nature. Subsequently, this situation may manifest to curtail the proposed port construction, navigational facilities and expansion in fisheries. The paper highlights comprehensive planning and scientific management for this coastal zone which draws a genuine interest towards the right utilization of the coastal resources, especially for a developing country like India, where high percentages of human agglomerations have concentrated on a narrow belt of the coastal zone.

COASTAL ZONE DEVELOPMENT IN KUWAIT

Al-Sarawi, M[1]; Marmoush, Y.R.[2]; and Al-Salem, K.[2]

Abstract

The State of Kuwait is mainly flat desert, and most of its land is restricted to the oil companies where no major development is allowed. Most urban, industrial, commercial and recreational activities are concentrated along the coast. Coastal development in Kuwait started to take place during the early 1950s when there was no proper planning for the best usage of the coast in general. Problems associated with coastal development such as beach erosion, sediment accumulation, cliff retreat and siltation are mainly due to unsupported management and lack of engineering planning and design.

Monitoring of Coast Line and Habitat Changes of Tarut Bay, Saudi Arabia Using Satellite images

Assad A. Al-Thukair; M. Asif Khan and Khattab G. Al-Hinai

Following the oil discovery in the Eastern province of Saudi Arabia in 1930's, major urban development projects have led to the expansion of cities resulting in land reclamation and coastal changes. Landsat images of 1973, 1985, and 1990 were used to detect coast line changes of Tarut Bay, and adjoining coastal areas, North of Dammam city, Saudi Arabia. The analysis of temporal satellite images reveals that 5415.9 and 1049.6 hectares of coastal habitat comprising of coral reefs, sea grass, and mangroves has been reclaimed between 1973-1985, and 1985-1990 respectively. The reclaimed land is being used mainly for urbanization, construction of new port and recreational facilities along the coast. This study focuses on changes in coastal habitats and their effect on biological species.

NATURAL DYNAMICS AND LAND USE ON THE COAST OF PARANÁ, BRAZIL: BACKGROUND AND PROSPECTS

Rodolfo José Angulo

ABSTRACT

The problems brought about by land occupation on the coast of Paran: for ports, sea-side resorts, farming, fishing and environmental protection ar: illustrative of the current situation in Brazil, a developing country where millions o: dollars have been drawn from scarce financial resources over the past decades tc engineering works whose need and effectiveness are, in least, questionable.

Systematic environmental analysis reveals that such structures ofter result inefficiently, for the totality of coastal dynamic factors involved is seldom taker into account in their planning. Also, and more seriously, chain environmental effect: induced by positive feedback lead to unstabilization of large coastal areas and hence. to new works. Many of such problems could have been avoided if simple, sometimes quite obvious prevention steps had been taken.

Yet expeditious process-product geological and geomorphologic studies of ancient and present coastal features through aerial photographs and satellite imagery would suffice for important dynamic factors such as waves, tides and tidal currents to be better known, the scarcity of data is not rarely assumed to justify so called emergency works that are laid down with little environmental background information.

Angulo (1993) presents an overview of the evolution and magnitude of morphodynamic changes over the coast of Paraná. The coast is divided into three different sectors: (a) open sea, with sandy beaches and wave-controlled dynamics; (b) estuarine, with tidal flats mostly covered by mangrooves under tide-controlled dynamics; and (c) river-mouths, with sandy beaches and wave- and tidal current controlled dynamics. Cyclical and unidirectional erosion, sedimentation and threshold phenomena are reported. In several situations, the causes of erosive processes can be identified, and the effectiveness of the engineering works assessed, which would certainly be helpful in land use planning, zoning and regulation, and would also discourage certain types erosion control works.

Guillermo ARAMBURO[2]

"DES CONFLITS SOCIAUX DANS L'AMÉNAGEMENT D'UNE ZONE COTIER: LE CAS DE "LA BUFADORA" DANS LA BASSE CALIFORNIE AU MEXIQUE"

"La Bufadora" est une zone qui possède une attractive touristique très importante dans la ville d'Ensenada, Basse Californie au Mexique. Le nom "La Bufadora" (souffler) devient d'un *geyser* marin, ainsi nommé, qui se trouve sur l'océan pacifique dans le Sud de la ville. Pendant les dix dernières années cette région a connu une croissance extraordinaire dans les flux des

visiteurs. principalement, nord-américaines. Mais les conflits sociaux n'ont pas permis un développement touristique et économique adéquat.

Le conflit le plus important est la dispute pour la propriété de la terre. Il y a plusieurs acteurs sociaux qui réclament le droit sur le même terrain. La loi, -qui a changé radicalement dans les années quatre-vingt-, n'a pas pu résoudre cette dispute et les possibilités d'investissement se sont arrêtés face à ce conflit. Ainsi, l'aménagement de cette région de la côte Nord-Ouest du Mexique est un défit pour le gouvernement local et régional. A ce propos nous avons réalisé une étude pour définir et identifier les divers acteurs sociaux qui possèdent des intérêts économiques ou politiques dans la zone côtière. Ils sont plusieurs et leurs projets ne trouvent pas toujours des coïncidences. Nous avons fait une description de tous les acteurs et de leurs projets pour l'avenir.

STATE AND MANAGEMENT OF COASTAL GEOSYSTEMS IN CUBA - (Miriam I. Arcia Rodriguez and R. Pereiras Perez)

Oceanic and coastal zones such as swamps, estuaries and coral reefs are the habitat of an abundant diversity of animal and vegetable life, and the main food supply sources for a half of the human population of the world, as well as the basic elements for live environments in the planet.

All the existing resources are threatened by irrational ecological practices by which damage of different magnitudes, even complete destruction may occur.

Direct damage is exacerbated by additional effects such the ozone layer depletion, UV radiation which destroys plankton - the basis of the marine food chain - sea-level rise caused by air heating, and the greenhouse effect, etc.

This paper is aimed at showing the present state and management of coastal geosystems in Cuba from their differentiation and delimitation, jointly with those coastal profiles evaluated as in critical condition: eroded zones, particular sensitivity to pollution, different physical and biological processes taking place, among others.

IMPLICATIONS OF PHYSICAL ENVIRONMENTAL CHANGE FOR COASTAL ZONE MANAGEMENT

RUSSELL ARTHURTON

ABSTRACT The effective management of physical environmental change in the coastal zone requires a balanced evaluation of the resources at risk, taking into account the geological and sedimentary inventory, the socio-economic interests at local to regional scale and wider conservation and environmental concerns. The chosen remedial solution should be appropriate both to the value of the threatened resources and to the forecast of future change derived from the scientific analysis and understanding of the processes of change within the coastal zone.

KEYWORDS: Coastal Zone Management, coastal erosion, coastal defence, conservation, natural resources, socio-economics.

COASTAL CHANGES IN WESTERN AFRICA - A CASE STUDY - (L. F. AWOSIKA)

ABSTRACT:

The West African coastal zone with variable width lies predominantly north of latitude 3°N and between longitudes 14°W and 10°E comprising of about 13 coastal states. Geomorphologically, this coastal zone consists of low lying sandy barrier systems, pockets of rocky, cliffed or low lying muddy coastline, mangroves, wetland, lagoons, estuaries, and narrow inner continental shelf. Resources within this coastal zone include fishery resources, oil and gas, non fuel minerals like sand, heavy minerals etc, several species of fauna, floral and wildlife. Conflicting exploitation methods of many of these resources have exerted pressures on coastal resources resulting in changes in the morphology, ecology and socio-economy of the coastal zone. Coastal erosion, sedimentation, construction of harbour protecting structures, deforestation, salinisation of groundwater have resulted in changes coastal systems in the region. Increasing demands for fisheries and bad exploitation methods have led to a drastic decline in the fisheries in the coastal areas. Changes in weather patterns along the coastal zone have also been observed. These adverse changes have led the degradation of coastal areas and quality of living standard of the coastal population. A regional approach to Integrated Coastal Zone Management will ensure the sustainability of coastal resources.

PREDICTIVE APPLICATION OF THE CONVOLUTION METHOD FOR TIME-DEPENDENT BEACH PROFILE RESPONSE IN ONE MEXICAN BAY - (I. AZUZ ADEATH)

The coastal zone is a natural resource. It need to be carefully studied, protected and managed in order to understand and interact with the very important and dynamic processes that take place in the nearshore region. One of the main problems in this area is the profile retreat and the associated erosion as a result of storms.

In the last decades, different methods and models has been developed for the prediction of the beach profile response. Some of them use schematics arguments and propose that short-term, storm-induced erosion can be determinate graphically from the knowledge of pre-and post-storm equilibrium profile forms, and the storm hydrodynamics. (e.g. Edelman, 1968; Dean, 1976; Swart, 1974)

The most important restriction of these methods is the assumption that the erosion potential of the maximum storm surge level is realized instantaneously. (Kriebel and Dean, 1985)

In order to take into account the observation that the beach response to steady-state conditions is approximately exponential in time, some researchers have involved the time response of the profile in more theoretical-orientated models. (e.g. Kriebel and Dean, 1985; Kobayashi, 1987; Kriebel and Dean, 1993)

The "Convolution Method" (Kriebel and Dean, 1993) solve the differential equation that govern the profile response to variation in water level using a convolution integral.

In this study, we use the convolution method for time-dependent beach profile response proposed by Kriebel and Dean, 1993 to obtain predictive maps of the maximum retreat of the profile, in base of some measured profiles, the ideal form of the forcing function and for three diferent breaking deeps (1,2,3 m).

We use the information of four different profiles, measured monthly during 1987-88 in the bay of Santiago in the Pacific coast of Mexico. These profiles were selected because the orientation of this area is completely open to the South, which is the path of tropical storms.

The convolution method was applied for each profile in order to obtain the maximum retreat of the berm, using different hydrodimamics conditions (over-elevations from 1-3 m, storm duration form 10-60 h), for the area composed by the four profiles as a system of uniform response and for three theoretical profiles generated in terms of the average berm height, average slope and average coast line position.

Figure 1 shows the map of maximum retreat for one of the measured profiles.

Figure 2 show the map of maximum retreat for one of the theoretical profiles.

These technical results (maps) can be very usefully for the management of this coastal area because using the information of the profile form in the early state of the storm and the maps, it can be estimated the maximum possible retreat of the profile and, with this information, it can be possible to take protective or reconstructive measures (order of hours) to prevent serious damage.

TRAINING, EDUCATION AND INFORMATION SERVICES IN DEVELOPING COUNTRIES ON COASTAL ZONE MANAGEMENT

A. N. BALCHAND, K. RASHEED & K. AJITH JOSEPH

Abstract

The coastal zone is a distinct region of earth, dynamically tuned by natural processes including man's activities to a large extent. A rich socio-cultural heritage is well signatured in these regions and as on today, management of these areas acquire prime importance in the strategic planning towards a more healthier and sustainable tomorrow. The roles of the developing countries in these enterprises are crucial and the following aspects are comprehensively dealt within the realm of training, education and information services on coastal zone management (CZM):

-- a review of status

-- training programs and related options

-- education and allied matters; practice in profession

-- a futuristic outlook; planned phased development

-- interactive factors in the structural realm of developing countries.

-- a proposal to establish an organization in "Coastal Zone

Management Studies", in Cochin to serve south east Asia

The ultimate challenge though CZM is to find the right approach to maintain at sustainable level the needs and options of present and future generations by well established practices on varying time scales on a regional basis. Local issues, traditional practices, socio-economic status and community attitudes generally dominate short term perspectives but sustainable development under a well codified management scheme shall prevail in the medium and long term planning.

Keywords: COASTAL ZONE MANAGEMENT, TRAINING, EDUCATION, INFORMATION, DEVELOPING COUNTRIES

EVOLUTION OF A NEARSHORE AND COASTAL MACROTIDAL SAND TRANSPORT SYSTEM, QUEEN CHARLOTTE ISLANDS

J. Vaughn Barrie

ABSTRACT

The coast of the Queen Charlotte Islands off the Pacific margin of Canada has been changing constantly since glacial times under the influence of isostasy, tectonics and sediment transport. Grounded piedmont type glaciers inundated and isostatically loaded the troughs which indent the shelf as far west as the shelf edge during the last glaciation, ending by approximately 13,000 years BP. During this period the nearshore area (at least 35 m below present sea-level) adjacent to the Queen Charlotte Islands was subaerial and supported terrestrial environments. At 10,400 years BP relative sea-level was more that 100 m below that of today and large areas of the shelf were exposed. Eustatic sea-level rise, coupled with subsidence of a glacioisostatic forebulge, allowed sea-levels to rise very rapidly (7 to 10 cm/year) and reach the present shoreline on the Queen Charlotte Islands (Haida Gwaii) by about 9,100 years BP. This rise continued until between approximately 9,000 and 7,500 years when sea-level was 15 m above present levels. Sea-levels then fell until about 5,000 to 6,000 years ago after which the rate of fall was greatly reduced.

Presently sea-levels are still falling at very slow rate (1-2 mm/year). This would account for the extensive (40 km) coastal plain which is actively prograding on the north coast of Graham Island. However, the entire 120 km eastern coast of Graham Island is actively eroding. At the junction of these two systems is Rose Spit, which extends northeastward at a point of sediment transport convergence. Rose Spit marks the point where Hecate Strait, a shallow, asymmetric channel lying between the Queen Charlotte Islands and the British Columbia mainland, meets Dixon Entrance, an elongate, east-west orientated strait that separates the Queen Charlotte Islands and the islands of southern Alaska

LITTORAL CELLES AND BUDGET ANALYSIS FOR SEDIMENTS MANAGEMENT IN WEST DORSET, ENGLAND - (M. J. BRAY)

ABSTRACT
This paper illustrates a systems approach to managing littoral sediment for coastal defence. Changes are characterised in terms of inputs, transfers, storage and outputs of sediment within a process unit or littoral cell. It identifies appropriate methods of investigation, data analysis and element coupling needed for quantification of a sediment budget. In the West Dorset study area, complex links have been demonstrated between eroding cliff sediment sources and the beaches that they supply. In particular, the status of Chesil Beach is re-examined. The impacts of past human activities and possible future interventions are assessed using the results produced. Details are provided of the ways in which this information has assisted management.

KEYWORDS cliff, bluff, erosion, shingle, gravel, beach, shoreline, Chesil.

Coastal change in Albania - a case study from Karavasta Lagoon

David S Brew *, Paolo Ciavola *, Franco Mantovani #, and Umberto Simeoni #

Abstract

A study of Karavasta Lagoon, located on the central Albanian coastline, has involved the use of satellite imagery, aerial photographs and fieldwork, to examine the natural and man-made processes that have contributed to coastal change. The coastal sedimentary environment is extremely dynamic and dominated by large amounts of sediment delivered by the adjacent Shkumbini and Semani rivers. Following a long period of accretion, the position of the coastline has, over the last few decades, started to recede. Coastal configurations and morphologies have been readily upset by the shifting of river courses and by human intervention, particularly reclamation. Damage to the biodiversity of this sensitive environment may also be caused by the uncontrolled use of agricultural chemicals which contaminate water courses and lagoons and may cause eutrophication.

Keywords Karavasta Lagoon, geomorphology, beach ridges, erosion, pollution.

LES EFFETS DU TOURISM SUR LA ZONE COTIERE: LE CAS DU LITTORAL TIJUANA-ENSENADA A LA FRONTIERE NORD DE MEXIQUE - Nora L. Bringas)

RESUME

L'objetif du présent travail consiste à présenter un panorama des principaux facteurs qui ont contribué à configurer l'espace littoral entre Tijuana et Ensenada, en présentant les différents impacts du tourisme sur la zone côtière.

Le démarrage de la région littorale a été si rapide et non planifié, ce qui a provoqué une croissance anarchique de la zone. Par conséquent, les problèmes urbains, sociaux et écologiques se sont accentués.

Parmi les principaux problèmes, les effets du tourisme sur l'environnement du littoral ont été néfastes. L'urbanisation du littoral s'est developpée sans frein. Les centres touristiques s'étendent, les résidences secondaires se dispersent sans ordre, entraînant des changements qui dénaturent son paysage.

La fréquentation massive de milliers de touristes sur un espace réduit, qui négligent les richesses naturelles risque de saccager le littoral devenu le noyau d'une concentration humaine démesurée et dangereuse, surtout pendant l'été et les fins de semaines. Autre problème aussi grave est la pollution résultant tant du piétinement des plages que du rejet en mer des eaux usées.

La multiplication d'immeubles de tout type consomme de larges espaces et détruit l'équilibre écologique du littoral et surtout le flux constant de touristes vers le couloir a abîmé de façon irresponsable l'espace littoral. Donc il faut minimiser les coûts écologiques et sociaux du tourisme et de l'urbanisation en créant des mécanismes pour assurer son développement optimum.

Il faut faire, de manière urgente, un plan d'action pour défendre et assurer une protection efficace du littoral à travers une politique nationale. Cette politique doit d'abord définir des objetifs et créer les instruments nécessaires pour son aplication.

Il est nécessaire de protéger, d'aménager et de développer le littoral. Mais il faut faire un plan régulateur prenant en compte la croissance de la région, les usages du sol et une exploitation optimale des ressources pour atteindre un développement soutenu.

DURHAM COASTAL MANAGEMENT PLAN

JAN BROOKE and DICK THOMAS

ABSTRACT

The Durham coastline, in North East England, which naturally consists of limestone cliffs and small sandy coves, was eroding by some 2-3m per year until the turn of the century. From that time, and until the early 1990s, colliery waste was tipped onto the beaches in vast quantities, causing them to advance, in some places by several hundred metres. The tipping has now ceased.

This new situation offers major environmental opportunities and challenges in respect of improvements to the natural and socio-economic enviroment. Any such changes must, however, be carefully managed if different types of environmental degradation are to be avoided.

This paper discusses the preparation of a management plan for the County Durham coast, including the coastal process studies required in order to determine the future behaviour of the tipped colliery waste.

EVOLUTION PASSEE ET FUTURE DE LA LAGUNE D'ARCACHON (FRANCE)

P. Castaing et L. Gassiat

Résumé

La lagune d'Arcachon située en Aquitaine est un vaste plan d'eau de 160 km^2 à pleine mer de vives-eaux qui se réduit à 40 km^2 au moment des basses-mers

Des cartes bathymétriques fiables existent depuis le début du 18e siècle, ce qui a permis d'effectuer des comparaisons et de suivre l'évolution morphosédimentaire de la lagune depuis presque 3 siècles.

On observe un comblement progressif de la partie nord de la lagune associé à une diminution de la compétence hydraulique des chenaux de liaison. Le comblement résulte d'une part des apports sédimentaires par les petits cours d'eau et, d'autre part de l'éloignement progressif de cette zone, de l'océan ouvert au fur et à mesure de l'allongement vers le Sud de la flèche littorale du Cap-Ferret. Ainsi, on démontre que le volume liquide sous étiage à l'intérieur de la lagune fluctue en fonction des avancées et reculs temporaires de la flèche littorale. En période d'avancées vers le Sud de la flèche, le volume liquide subtidal diminue. En période de régression de la flèche vers le Nord, et donc de meilleure communication avec l'océan, le volume liquide augmente.

Sur une longue période de temps (plusieurs siècles), l'allongement de la flèche littorale vers le Sud est continu sous l'action de la dérive littorale toujours orientée du Nord vers le Sud sur la côte aquitaine. Le sable déplacé sous l'action de la dérive (de l'ordre de 500.000 m^3/an) provoque l'instabilité des chenaux d'accès à la lagune. Le chenal principal migre du Nord vers le Sud (de l'extrémité de la flèche du Cap-Ferret à la dune du Pilat) selon un cycle d'évolution d'environ 80 ans. Chaque cycle est composé de 3 stades principaux se succédant dans le temps dans un ordre qui peut varier.

On peut ainsi distinguer :

- un stade A correspondant à la formation de deux chenaux extérieurs d'inégale importance, soudés à leur extrémité nord ou reliés par un chenal intermédiaire ;
- un stade B présentant un seul chenal ;
- un stade C présentant deux chenaux bien individualisés.

La figure 2 présente la succession des stades depuis 1826 avec l'individualisation de deux cycles. Les trois phases s'agencent dans le sens A, B, C, A pour un premier cycle de 79 ans et dans le sens A, C, B, A pour un second cycle de 82 ans.

La morphologie actuelle des chenaux d'accès montre que l'on se situe aujourd'hui à l'amorce d'un nouveau cycle d'évolution. Le développement d'un chenal au Nord limitera la progression de la flèche vers le Sud pendant les prochaines années. On se trouve donc dans une phase de relatif équilibre dont la durée ne peut être précisée. Sur une longue durée (plusieurs siècles), la trangression marine holocène se poursuivant, le destin de la lagune d'Arcachon paraît être inéductable. A terme, la communication avec l'océan sera coupée et la lagune deviendra un lac semblable à celui de Cazaux situé plus au Sud.

Le mécanisme de cette fermeture est simple. Depuis l'amorce de sa formation, vers 2 000 ans BP, la progradation de la flèche du Cap-Ferret vers le Sud s'effectue suivant des cycles d'avancées et de reculs d'une durée moyenne de 250 ans. Mais le bilan net est un allongement progressif vers le Sud. Cette progression provoque l'érosion de la rive sud de la lagune dans la zone de la dune du Pilat, car l'écoulement hydraulique tend à assurer la pérennité de la section mouillée. Dans le même temps, l'exutoire à l'océan qui, au début était orienté Est-Ouest, pivote progressivement vers le Sud, au cours du temps pour s'orienter parallèlement à la côte. Aujourd'hui, la lagune débouche à l'océan par un "conduit", encombré de bancs de sable (bancs d'Arguin, du Toulinguet), large de 3 km et long de 5 km. Dans les prochains siècles, la poursuite du pivotement et l'allongement du chenal d'accès rendront de plus en plus difficile la communication avec l'océan. Finalement, l'ouverture se fermera par diminution de la puissance hydraulique entraînant une réduction progressive de la section mouillée.

La lagune d'Arcachon aura suivi avec quelques siècles de retard la destinée des autres lacs côtiers aquitains. En effet, il y a 3 000 ans, ces lacs aussi étaient des lagunes situées à l'arrière d'un cordon littoral et communiquaient avec l'océan par un chenal permanent.

MICROPALAEONTOLOGICAL DATA ON ENVIRONMENTAL CHANGES DURING THE HOLOCENE FROM THE EASTERN CANTABRIAN ESTUARIES (BAY OF BISCAY)

Alejandro CEARRETA

ABSTRACT

The estuarine sedimentary environments are marginal areas located in the narrow transition zone between the marine and the continental domains. Consequently, they are very sensitive even to small changes in sea level. The Holocene transgressive episode has provoked the deposition of great volumes of well preserved estuarine sediments disposed in complex sequences. Their study will help to understand sea-level and coastal changes during the Holocene.

The Holocene sedimentary infilling of these tidal environments was studied by means of several boreholes drilled along different estuaries. This work includes data from the estuarine deposits of Santoña, Bilbao and Bidasoa. The obtained sedimentary sequences are represented by sands, muddy sands and fine materials containing a high calcareous biogenic content in some parts and abundant vegetal remains in other sections. The analysis of the micropalaeontological content (benthic foraminifera assemblages) associated to these Quaternary deposits results one of the most useful methods to interpret the environmental conditions under which these sediments have been deposited.

Keywords: Benthic foraminifera, Estuarine palaeoenvironments, Sea-level changes, Holocene, Bay of Biscay.

COASTAL CHANGE; NATURAL CONTINUANCE VERSUS HUMAN DISTURBANCE OF HOLOCENE TRENDS - (J. Chappell)

Human impacts upon coast range from the localized results of coastal engineering and development works, through the effects on sediment regimes of agricultural, mining and other land use activities in coastal lands and adjacent river catchments, to future impacts of climatic change and possible sea level rise under enhanced greenhouse conditions. Human impacts are superimposed on natural trends of coastal change that have occurred for hundreds or thousands of years. Coastal responses to changes of boundary conditions are complex and can have relaxation phenomena that are magnitude-dependent or discontinuous, or both. Coastal variability has been established in many instances from coastal monitoring and historical observations but trends can be difficult to identify particularly on wave dominated coasts and regions with short stratigraphic and radiometric dating analysis of shore-face and inshore Holocene sedimentary deposits but variability is more difficult to establish by these methods, except for accurately dateable sequences of storm deposits. Depending on the type of coastal system, numerical models of coastal responses to changes of boundary conditions can be tested either with historical monitoring data or with Holocene morphostratigraphic testing. The paper presents selected deltaic systems from China and Papua New Guinea, tropical and wave dominated coastal and estuarine from Australia and coral reef systems, including examples where Holocene trends have been anthropogenically disturbed.

M.A.Cholmjanskyi, B.G.Lopatin

NEW TECHNIQUES FOR COMPLEX GEOLOGICAL AND ENVIRONMENTAL STUDIES OF COASTAL MARINE ZONES.

Coastal marine zones are of particular interest from scientific and practical points of view, but are rather difficult to study by conventional techniques.

Within the zones most mineral deposits including constructive materials can be obtained. Such phenomenon as physical-chemical barriers, as result of ocean-land interaction can be investigated. These zones are usually rich in biological productivity. Consequently anthropogenic pressure on coastal marine zones is constantly increasing. Environmental problem should be put under control.

The following aspects are to be studied during complex investigations:

- litho stratigraphy of sediment cover;
- bottom relief and coastal topography;
- coastal circulation and sediment transport;
- coastal erosion and siltation related to natural or anthropogenic factors;
- total and elemental pollution of bottom sediments and waters;
- hydrophisical properties (salinity, temperature, pattern of currents and so on);
- prospecting of technical subjects on the bottom.

The authors designed geophysical marine system ("SPRUT-3M") for complex study of coastal marine zones to satisfy the above-mentioned requirements. It is portable digital multychannel recording and processing apparatus system based on module principle. The system consists of bugged container with temperature, pressure and conductivity sensors and changeble line with direct ionoselective electrodes, and onboard recording block and IBM PC. The system carries out continuous magnetic gradientometric and various electrometric measurements (natural electric field, constant electric current), and direct determinations of Hg, Cu, Cd, Pb, S, Ag, Cl, Zn. Recording is carried out on stops for continuous vertical sounding or during vessel movements for continuous profiling. The system is adapted to echosounders and interface type of "centronix".

DESIGNING INFORMATION STRATEGIES FOR COASTAL ZONE MANAGEMENT (M. J. Clark)

Coastal Zone management as an information driver

As coastal zone management matures and takes on an ever broader remit, its demands for information continue to increase. In practice, this demand is often met by providing access to new data sets, but the difference between scientific data and management information remains very great. Strategies are required which provide information rather than data and which are tuned to the specific needs of the manager in a host of diverse tasks such as flood defence or vulnerability to coastal oil spill. Information is thus both a fuel for the development of coastal zone management, and a barrier to it.

Meeting the multi-dimensional challenge

Marine and coastal information systems share many common characteristics and issues with their terrestrial counterparts, but there are some significant attributes which pose particular and unique problems. In spatial information systems, locational information (both relative and absolute) is often spare in the oceans, and the problem of merging data from different spatial sampling frameworks is exacerbated. Terrestrial and marine datum levels may well not coincide, and the vertical dimension in the water column can be of critical importance and real difficulty. Three dimensional data structures are not easily represented in standard databases, especially when the significant vertical attribute may be position relative to some spatially or temporally variant characteristic such as temperature, salinity or turbidity. Finally, the time dimension has to be addressed, including reference to relative time (for example, on a seasonal, diurnal or tidal cycle scale) as well as absolute time.

Aspects of change in coastal zone information handling

Marine scientists and managers share with their terrestrial counterparts a series of very fundamental changes in the way in which they work, or are expected to work. Among these trends, three can be highlighted:

(i) Error and Uncertainty

Error is an inherent property of data, and thus an underlying characteristic of information systems. Strategies for copying with error-prone data are now well established, and the focus of concern is turning towards the equally implicit and inherent properties of uncertainty in data, models and outcomes.

(ii) Analysis and Exploration

Analysis, modelling and simulation are long-standing components of coastal and inshore planning and management, and continue to play a core role. As information requirements become more difficult to adopt, formal numerical techniques *ab initio*, and less formal, but more creative data exploration and visualization come to play a more important part.

(iii) Specialism and Holism

In industry, the professions and science, there tend to be long-term shifts of emphasis between essentially specialist (reductionist) modes and more integrative (holistic) approaches. The current drift in management is quite strongly towards holism, and this poses substantive challenges to coastal zone management.

A management-oriented information strategy for the coastal zone

While no single model for information-handling could suffice to meet all the needs of the coastal and inshore zones, there are good prospects for suggesting a broad information strategy which will serve most managers. This has to take account of political and economic imperatives, the scientific trends mentioned above, inherent technological trends and the external drivers, such as global environmental and attitudinal change. Information systems are fundamental to coastal zone management, but their inter-relationship requires careful and far-sighted manipulation.

INFORMATION AND ACTION: AN INTEGRATED APPROACH TO COASTAL ZONE MANAGEMENT (PAGHAM HARBOUR, SOUTHERN ENGLAND) - (M. J. Clark and M. B. Collins)

Coastal Zone Management in the UK is increasingly being based upon a broad background of integrated coastal environmental science, rather than on fragmented specialist studies. This approach can be particularly effective for high-value, high-vulnerability coasts such as that at Pagham Harbour, Southern England. A Scientific Committee has been established to co-ordinate the planning of the several agencies involved in management of the harbour, including the Local Authority (West Sussex County Council), the National Rivers Authority - Southern Region, and English Nature. A recent comprehensive scientific review of the harbour undertaken for this Committee has established a series of process patterns which have explanatory power, and also offer a basis for designing management options in response to present coastal problems and the scenarios likely to be experiences over the next half century.

In practice, the definition of management response is itself a complex operation, which requires a substantial exercise to "translate" the scientific data into management-relevant information. Consultation is an important part of this process, and again requires creative information presentation. It is also clear that the handling of uncertainty in the scientific models (both present and future) lies close to the hear of the challenge of ensuring a strong link between scientific input and management output. At Pagham, as elsewhere, uncertainty can be approached by developing highly adaptive strategies, and by phasing the programme of responsive action - both of which permit strategy to be retuned in the light of future gains of information.

THE HIGH-FREQUENCY *IN SITU* MEASUREMENT OF COASTAL ZONE PROCESSES - (M. Collins)

The understanding of coastal zone processes has been approached (by oceanographers, geologists and engineers) on a variety of scales, both temporally and spatially. Hence, on the one hand, beach stability constitutes part of an overall sediment transport system incorporating: riverine inputs, sometimes ephemeral; the onshore-offshore transport of material; and the loss of sediment through submarine canyons, intercepting the adjacent continental shelf or shoreline. At the same time, there is a need to understand the response of beach profiles to extreme events such as short-term storm effects. Such process-response mechanisms, on the basis of scale extrapolation, control the evolution and development of the associated coastal morphology.

Sediment transport mechanisms, at various scales, have been investigated using a variety of techniques including field measurements and (1D, 2D and 3D) numerical modelling. In some cases, conventional instrumentation and modelling has been used; in others, specifically designed experimentation or instrumentation has been utilised.

Against a background of the development of regional course-grain (conceptual) sediment transport model for a section of the coastline and inner continental shelf of southern England, a bottom-mounted tripod system (TOSCA) has been developed. The system was designed to examine the movement of shingle, under combined wave and current activity, in water depths of up to 20 m. Hydrodynamic conditions were monitored using electromagnetic meters (currents) and pressure sensors (waves). Movement of the sediment particles was detected using SGN self-generated noise), caused by inter-particle collision. For comparison, regional

patterns of movement were identified on the basis of: sea bed sampling; geophysical (side-scan sonar) surveying; and the numerical modelling of hydrodynamic conditions.

A high-frequency monitoring system, similar to TOSCA, has been used on adjacent sandy beaches. The resuspension of sand has been related here to the presence of 'wave groups' and, in comparable laboratory studies, to pore pressure fluctuations.

Following the description of integrated fieldwork, modelling and laboratory programmes, designed to understand processes and parametise the boundary conditions for models, consideration will be given-to:

(i) the utilisation of site-specific measurements to large-scale sections of the coastline; and

(ii) extrapolation of short-term measurements of extreme events to long-term coastal evolution.

The scientific objectives described affect utilisation of the coastal zone, with particular reference to the artificial replenishment of beaches and dredging activities

PAST, PRESENT AND FUTURE OF THE PINELLAS COAST: THE MOST DENSELY POPULATED COAST OF WEST FLORIDA, U.S.A.

Richard A. Davis, Jr., Director

ABSTRACT

The 60 km long barrier island complex that comprises Pinellas County is situated on the Gulf of Mexico Coast of the Florida peninsula. It includes 10 barrier islands ranging from barrier spits to drumstick barriers, and 10 tidal inlets, from wave-dominated to tide-dominated. This coast is subjected to mean annual wave heights of 0.3 m and a tidal range of 0.7 m. Hurricanes occur infrequently and frontal systems dominate the coastal processes during winter months.

Development of this coast for tourism and recreation began in earnest in the 1920s after construction of the first causeways to the islands and the devastating hurricane of 1921. Since that time this coast has become part of the most densely populated county in Florida and attracts millions of tourists each year in addition to its resident population of hundreds of thousands. It has not experienced a significant hurricane since development began. Most of the coast is lined with seawalls, jetties and groins, however, there are also pristine barriers and inlets. This combination of intensely develop barriers with natural ones provides the ideal setting for investigating the past, the present and predicting the future of the coast.

NOAA's Coastal Change Analysis Program (C-CAP)

Jerome E. Dobson, Senior Research Staff, Oak Ridge National Laboratory

Ford A. Cross, Director, Beaufort Laboratory

The Coastal Change Analysis Program (C-CAP) is developing a nationally standardized database of land cover and land cover change in the coastal regions of the United States. As part of the National Oceanic and Atmospheric Administration (NOAA), Coastal Ocean Program (COP), C-CAP inventories coastal and submerged wetland habitats and adjacent uplands and monitors changes in these habitats on a 1 to 5 year cycle. This type of information and frequency of detection are required to improve scientific understanding of the linkages of coastal and submerged wetland habitats with adjacent uplands and with the distribution, abundance and health of living marine resources. The monitoring cycle will vary according to the rate and magnitude of change in each geographic region. Satellite imagery (primarily Landsat Thematic Mapper), aerial photographs, and field data are interpreted, classified, analyzed, and integrated with other digital data in a geographic information system (GIS). The resulting land cover change databases are disseminated in digital form for use by anyone wishing to conduct geographic analysis in the completed regions.

ON COASTAL RELIEF CHANGE CONDITIONED BY SEA LEVEL OSCILLATIONS AND ITS INFLUENCE TO ECONOMIC ACTIVITY (ON EXAMPLE OF THE CASPIAN SEA)

by Yuri S.Dolotov

Coasts of the Caspian Sea present a natural laboratory for study of coastal evolution under conditions of sea level rise and fall.

During the period of falling sea level from 1929 to beginning of forties the continuous shoreline advance seawards connected with steady sediment accretion and bottom reclamation had been the most characteristic. It had conditioned expansion of assimilating coastal territory and displacement of economic activity in the same direction. Prognosticated further sea level falling had predetermined beginning of works on creation of vast recreational zone in the coasts of Daghestan and Azerbaijan.

In 1978 unexpected sharp change to sea level rise had caused a land flooding and penetration of subsoil waters in low-lying coastal territories, total increased erosional processes and its predominance as a whole. As a result an essential damage had been caused to industrial, habitable, recreational constructions and other units that calls for its urgent transference and radical change in economic plans. Urgent measures are provided for liquidation of negative consequences of sea level rise and for coastal defence. At the same time in some coastal areas sediment accretion and shoreline progradation go on in spite of sea level rise conditions, and it's necessary to use in economic aims.

COASTAL SAND TRANSPORT, EROSION AND DEPOSITION USING NATURAL RADIOACTIVITY IN HEAVY METALS - (J.F. Donoghue, R.J. Meijer, C. Stapel and I.C. Tanczos

ABSTRACT

Research on the properties of naturally radiogenic heavy mineral sands has led to the development of techniques for using such particles as tools for monitoring coastal sand movement over both large and small scales. Additionally, heavy mineral radiometry has proven to be a quite useful indicator of regional sources of detrital sand to the coastal zone. Work on the North Sea coast of the Netherlands, Germany and Denmark, has found radiometric "fingerprinting" to be a reliable method for determining the source of sand to the modern coast. The method has been used to discriminate among sediment sources in the glaciated terranes of Scandinavia, the Elbe River watershed and the Rhine River system. The effects of tidal inlets and prevailing longshore currents on sand movement are also evident in the results. An additional aspect of radiometric analyses of coastal sands is the ability to estimate the relative percentage of heavy minerals in a sand body.

KEY WORDS: sand transport, heavy minerals, shore erosion, longshore transport, barrier islands.

An Evaluation of the Impacts and Direct Effects of Offshore Dredging Activities on Benthic Organisms

Barry S. Drucker

Abstract

In April 1992, the Minerals Management Service's Office of International Activities and Marine Minerals initiated a field study to evaluate the extent of marine benthic organism repopulation in a dredged area. Through coordination with the U.S. Army Corps of Engineers, four dredge sites off the west coast of Florida, south of St. Petersburg, were selected for study. The study's instrumentation and sampling involved box coring, otter trawling, and using a towed sled carrying a video camera and a sidescan sonar device. The baseline collection phase of the study began in mid-July 1992, before the actual dredging of the sites. Subsequent postdredging cruises occurred over a period of 22 months. Preliminary evaluation of the data indicates that repopulation occurred very quickly and that, apart from some dredge holes that are still evident in some areas, there appears to be little overall impact from the dredging operations.

Keywords Marine minerals, dredging, benthic organisms, repopulation

L'UPWELLING LE LONG DU LITTORAL MAURITANIEN; UNE ETUDE PRELIMINAIRE - (Mohamed ould El Mahfoud)

RESUME

La variabilité mensuelle et pluriannuelle de l'upwelling a été étudiée dans la zone mauritanienne, en utilisant les données de température de surface collectées par la flotte industrielle pélagique opérant dans la zone de 1986 à 1989, les données des campagnes océanographiques effectuées entre après 1972 et 1989 et celles collectées dans la zone de Cooperative Investigation of the Northern part of the Eastern Central Atlantic (CINECA) sur cinq ans de 1972 à 1976. La répartition spatiale et temporelle de l'upwelling en particulier son évolution intra-annuelle dans les quatre dernières années a été déterminée. Les résultats mis en évidence confirment l'existence d'un upwelling permanent au niveau de la zone nord de Cap Timiris. En revanche, le sud de ce Cap, est le siège de passage des eaux froides résurgentes et celles chaudes provenant de la Guinée.

EFFECTS OF NEOTECTONICS ON THE MORPHOLOGY OF SEA OF MARMARA (NORHWEST TURKEY)

Mustafa ERGÜN

The Sea of Marmara is an inland sea with the areal extent of about 11,350 square km. It is connected with the straits of Bosphorus and Dardanelles to Black Sea in the north and to the Aegean Sea in south respectively. It has a very large continental shelf area with many islands. The southern shelf area is much larger than the northern one. There are three deep basins of about 1100 m in depth running in the E-W direction. The Sea of Marmara lies along the line of the North Anatolian Fault zone (NAF) which is about 1500 km long, seismically active, right-lateral transform which relative motion between the Anatolian and Black Sea blocks is taken up. The east-west line of the NAF to the east of the Sea of Marmara passes westward into a graben defining İzmit Bay and a zone of deep water within the eastern and central part of the Sea of Marmara. The origin of the circum-Marmara grabens is directly associated with the strike-slip tectonics of the NAF. The right-lateral shear in the Marmara province is associated with the dominant shear component of 24.0 mm/yr of right-lateral displacement across the region, mainly on E-W trending strike-slip faults. The N-S extension of 7.1 mm/yr and E-W contraction of 10.0 mm/yr were calculated with the thinning of seismogenic layer, equivalent to 0.13 mm/yr. The Marmara basin is the extension of the Thrace basin which is a Tertiary basin where the subsidence of basement platform took place during the Middle Eocene. Until the end of Mesozoic a very thick sedimentary sequence (reaching up to 6 km in places) deposited throughout the Cenozoic. This created a wide strait between the Mediterranean and the Black Sea where a delta advanced from northwestern Turkey towards Thrace during the Late Eocene and the marine basin became brackish and smaller in time. The fine-grained sandstone and sandy clay changed to deltaic deposits, with intercalations of coal seams and gravel. The Neogene lateritic deposition are present at the borders of this basin. The effects of neotectonics as well as the eustatic changes on the sedimentation pattern and morphology of this very particular basin will be discussed in the light of available deep and shallow seismic studies and geological samplings.

GESTION PATRIMONIALE DU LITTORAL DUNAIRE AQUITAIN par l'OFFICE NATIONAL DES FORETS

AUTEUR :

Jean FAVENNEC -

Longtemps considérées comme indomptables, les dunes littorales d'Aquitaine furent stabilisées au siècle dernier par reboisement. En bordure de l'océan a été édifiée une "dune bordière" non boisée à pente douce du côté exposé au vent. Les apports et les prélèvements de sable effectués par le vent et la mer modifient sans cesse ce fragile édifice et lui redonnent un grand degré de "naturalité".

L'évolution des mentalités et des besoins (biodiversité, tourisme, paysage, ...) et une meilleure connaissance de la dynamique littorale ont amené l'O.N.F. principal gestionnaire du littoral aquitain à élargir ses objectifs et diversifier ses méthodes.

L'objectif unique du départ s'est complexifié en replaçant les systèmes dunaires dans les processus géomorphologiques et phytoécologiques globaux. Il s'agit tout à la fois de gérer un stock sédimentaire limité, de rechercher une diversité biologique maximale et de conserver des paysages recherchés.

Pour faire des choix entre objectifs parfois contradictoires, il est nécessaire d'affiner les études préalables et d'établir un suivi des actions engagées. Des outils dans ce but ont été élaborés en collaboration avec l'Université de Bordeaux III : cartographie écodynamique à grande échelle, spiocartes ... Des missions photo-aériennes spéciales au 1/5000 sont effectuées régulièrement.

Le degré de contrôle de la dynamique dunaire et les méthodes mises en oeuvre seront variables selon l'intérêt économique des zones à protéger, selon le secteur géographique et pour une même zone selon la phase du cycle sédimentaire.

En phase de répit de l'érosion marine, une assistance légère et ciblée (doublée d'un fort contrôle du piétinement dans les zones d'accueil) assure un équilibre entre la dynamique végétale et l'action érosive du vent. Il en découle un développement optimal de l'écosystème littoral : dune embryonnaire, dune blanche, dune et lette grise, manteau péforestier et frange forestière.

En phase d'érosion marine, l'avant dune est tronquée par une falaise vive, l'équilibre pénestable antérieur est rompu, il n'est temporairement plus possible d'agir sur la partie frontale (la lutte directe contre l'érosion marine est exclue de cette réflexion, elle est très coûteuse et pas toujours souhaitable car génératrice d'effets induits pervers). La compression frontale du vent génère un surcroît de transit sableux qu'il faut contrôler pour permettre aux groupements végétaux une translation vers l'arrière leur assurant la capacité de recolonisation lors de la phase de répit suivante.

Une projection de diapositives illustrera les différentes situations écodynamiques et les techniques de génie écologique mises en oeuvre.

METEOROLOGICALLY INDUCED COASTAL CHANGES ALONG THE NIGERIAN COASTAL ZONE AND IMPLICATIONS FOR INTEGRATED COASTAL ZONE MANAGEMENT PLAN.

BY
Folorunsho, R and Awosika L. F.

ABSTRACT

The narrow, low-lying Nigerian coastal zone is dominated by dense population, socio-economic facilities and varying natural resources. This coastal plain, experiences two types of meteorological conditions. The rainy seasons (May - Sept) when storms, characterised by high winds are more frequent, and a dry season when meteorological conditions are much more subdued. Though coastal changes resulting from coastal erosion, flooding, subsidence and deforestation are caused by other forces, harsh meteorological conditions especially during the months of May - September, help to heighten these coastal hazards. For example, rates of coastal erosion at Victoria beach and the Mahin mud coast peak annually during these months. This paper utilizes the meteorological factors which influence the above coastal hazards. A detailed analysis of wind and other meteorological parameters as they influence wave energy and coastal processes resulting in coastal changes are discussed. Though Nigeria does not have any functional integrated coastal zone management plan, the Federal Environmental Protection Agency in collaboration with other agencies and Institutions have the mandate to formulate and enforce such plan. An effective Integrated coastal zone management plan for Nigeria should include knowledge of the meteorological parameters which exacerbate coastal changes.

STABILITY OF NATURAL SYSTEMS AS A CRITERION IN COASTAL MANAGEMENT - (S. Gao and M. B. Collins)

ABSTRACT

"Design with nature" is one of the principles in coastal management practice. The present study suggests that the stability of natural systems can be used as a criterion in implementing the physical aspects of such a principle. The criterion implies two requirements: (1) for any characteristics associated with equilibrium, human activities should not damage the mechanisms which maintain the equilibrium state: and (2) for the characteristics which change constantly within the coastal system, the rate of changes introducted by artificial activities, in addition to the natural changes, should be of the same order of magnitude as the original, long-term natural rate of evolution. Two examples are described, to demonstrate how these criteria are used. For a quay reconstruction scheme, associated with a tidal inlet system in equilibrium, an analysis shows that the planned changes will not disturb the equilibrium state. For the dredging of sandbanks within an estuarine system, a maximum feasible output for sand extraction on the sandbanks is defined. Thus, intended aggregate outputs should be considered against such limits.

Key words: Coastal management; estuarine sandbanks; tidal inlest; English coasts.

Advanced Training through International Cooperation within the framework of TEMA in the field of coastal and nearshore evolution

by

Günter Giermann*

TEMA is IOC's programme of Training, Education, and Mutual Assistance in the Marine Sciences, outlined in the comprehensive *Plan for a Major Assistance Programme to Enhance the Marine Science Capabilities of Developing Countries.*

The present programme is implemented under the *TEMA Strategy and Action Plan for 1991 - 95.* TEMA serves as a catalyst to initiate bilateral and multilateral aid projects around the world.

The term "mutual assistance" used in TEMA had been redefined at a high-level expert meeting in Bremerhaven, in September 1998, to "partnership".

TEMA components are the IOC Research Fellowship scheme, shipboard training and training courses, donations, the installation of equipment through the IOC Voluntary Cooperative Programme (VCP), education and training of high-level specialists in basic marine sciences.
Since the inception of IOC, Germany has given high priority to TEMA. German Trust Fund contributions have considerably contributed to the implementation of the above-mentioned TEMA components.

Germany always felt that the best way to assist is the conduct of Advanced Training Courses to be held in the region where the programmes take place, with trainees from those countries which most need help, and with high-level instructors who have the know-how and who are able to use a local research vessel as training tool. Trainees from diverse countries are offered the unique opportunity to meet each other, and to establish links of cooperation or even friendships. It is always hoped that communication among all the participants is maintained and information exchanged even when the course is over. These courses are in German view the most promising steps to make joints ventures happen.

Since 1989, Germany gave more and more preference to courses related to coastal and nearshore geological phenomena including sediment dynamics and mineral resources as well as shelf features and structure. This trend was confirmed when the UN Conference on Environment and Development in Rio, in June 1992, highlighted the importance of the coastal zone.

At present, Germany has conducted three regional courses on this subject in 1989 (Quezon City), 1992 (Kuala Lumpur) and 1994 (Karachi) while planning a fourth course in Bandung, Indonesia, in 1996.

A description of these 4 courses provides you with a picture on how the lectures, exercises, laboratory works, geological field trips and research cruises can offer an interesting framework to pass know-how and team spirit to so many trainees from so different types of countries of the Indian Ocean and SE-Asia regions:

THE CASPIAN SEA LEVEL FLUCTUATIONS AND THE FEATURES OF THE VOLGA DELTA WATER REGIME - (Olga V. Gorelits)

SUMMARY

The Caspian Sea level has varied significantly during all its history. Several factors caused these fluctuations: the global climate, the river flow from Caspian drainage basin (mainly the Volga river) and economic activity. The drop of the Caspian Sea level in the 1930s had to do with large-scale climatic anomalies in the Northern Hemisphere: an increase in air temperature and decrease in precipitation over a large part of Europe, including the Volga drainage basin. Hydrological regime of the North Caspian coastal zone - Volga delta and its offshore - is directly influenced by the water flow of the Volga drainage basin. The Volga water volume declined during the 1930s by 50 km^3 per year. The negative anthropogenic influence - the runoff value decrease and regulation, water draw off and diversions, delta reconstruction with the dams and canals. Volga water flow regulation by cascade of large reservoirs led to strong redistribution of the water flow through the year and primarily to changes in spring-flood parameters.

The shallow offshore zone blocked delta from the sea after sea level drop in 1930s, it was overgrown by swamp vegetation and converted into the stagnate water body. Since 1991 (the sea level -27,3m BS) storm surges with range more than 1m became to display into the delta. In 1994 (the sea level -26,7 m BS) the influence of the storm surges is dangerous not only for the Volga delta coastal line, but for all North Caspian coastal zone. With the sea level rise the inundation of the North Caspian coastal zone becomes more and more dangerous.

SEDIMENTOLOGY APPLIED TO COASTAL MANAGEMENT OF THE STATE OF SAO PAULO, BRAZIL - (Celia Regina de Gouveia Souza)

ABSTRACT

Caraguatatuba area was studied with the objective of to determine the local nearshore circulation pattern. Net shore-drift directions and marine circulation were determined by geomorphic and sedimentological characteristics of beaches, sedimentological data and bathymetric configuration of Caraguatatuba Bight, and remote sensing analyses (satellite images and aerial photographs taken during different years and seasons). We concluded that wave systems approach the coast from SE produce a northward longshore current at Massaguaçu beach, southward longshore currents along Martim de Sa and Caraguatatuba beaches, and a southward longitudinal current at the west side of Caraguatatuba Bight. Besides, there is a closed interaction between marine circulation and sedimentation patterns in inner bight and those in the Sao Sebastiàp Channel.

Key Words: net shore-drift, drift cells, longshore currents, nearshore circulation pattern, geomorphic and sedimentological indicators,remote sensing, coastal management.

RESPONSES TO COASTAL CHANGE IMPACTS ON WETLAND PROTECTION ON THE CALIFORNIA COAST

by Peter Grenell

ABSTRACT

This paper briefly describes several projects designed to address urban development, agriculture, tourism, and maritime impacts on California coast and San Francisco Estuary wetlands. These impacts are increasingly felt as population growth, harbor expansion, and human use of coastal natural resources continue. The issues concerned are typical of many wetland and estuarine situations in Europe and elsewhere. They include erosion, sedimentation, flooding, pollution, fresh water diversions, and impacts of public works construction, dredged material disposal and public access. The innovative project methods summarized are applicable outside California, suitably adapted. They are based on recent advances in scientific knowledge of wetland and estuarine ecosystems and hydrological functioning, which have enable much progress in wetland restoration.

THE ROLE OF SHORELINE CONFIGURATION AND COASTAL MORPHOLOGY ON NEARSHORE SEDIMENT TRANSPORT UNDER STORM COMBINED FLOWS, CANADIAN BEAUFORT SEA.

Arnaud Héquette [1], Marc Derosiers[1], and Donald L. Forbes[2]

ABSTRACT: Potential sediment transport during storm surges was estimated at two nearshore sites of the Canadian Beaufort Sea using a numerical model for combined flow conditions (Li and Amos, 1993). The first site is a sandy beach backed by a low bluff, while the second site consists of low-lying sand spits. Several storm surges occurred during the field experiments, leading to a downwelling circulation and offshore sediment transport. Numerical modelling suggests that offshore sediment transport is more significant where the beach is backed by a bluff acting as a natural barrier.

KEYWORDS: Sediment transport, combined flows, storm surges, nearshore zone, Beaufort Sea.

GLOBAL OVERVIEW OF ENVIRONMENTAL CHANGE IN COASTAL ZONES - (P. M. Holligan)

ABSTRACT

Nature of Environmental Change in Coastal Zones. Coastal zones extending from coastal plains across the continental shelves are regions where the land masses, oceans and atmosphere interact. They are characterised by strong gradients in environmental and ecological properties, and provide valuable living and non-living resources which are presently being exploited by humans on a non-sustainable basis. Environmental change is being driven indirectly and directly by human activities. Climate modification, sea level change and changes in land use affect coastal zones globally, whereas the impacts of direct use of coastal resources are usually local or regional. The latter, however, tend to be cumulative and will become increasingly significant at a global scale as the human population continues to grow. The present rates of environmental change in coastal zones are extremely rapid compared to those during recent geological time, and appear to result in a loss of functional integrity and a reduced capacity to retain materials such water, sediment and organic matter at the land-ocean interface.

Uncertainties in Direction, Rate and Causes of Change. Accurate assessment and prediction of changes in coastal zones are limited by a lack of knowledge about the scales and nature of interactions between land, ocean and atmosphere, about the dynamic and complex properties of coastal systems themselves, and about the potential for significant feedback processes which determine large scale biogeochemical and biophysical properties. Examples of such problems which are now being actively investigated are the effects of fresh water use on global sea level, of the modification or destruction of ecosystems on coastal geomorphology, and of the loss of biodiversity and the introduction of non-indigenous species on the functioning of coastal ecosystems. In general, better information is needed on global fluxes of water, sediment, organic matter, nutrients and pollutants between land and ocean, on how such fluxes are varying in time and space, and on the long-term impacts on coastal environments of the exploitation of nearshore physical and biological resources in order to develop scenarios of future conditions in coastal zones.

Research Needed to Reduce Uncertainties. The capacity to predict environmental change in the coastal zone over decadal periods requires new research that adopts an integrated, long-term view of the dynamic functioning of coastal systems. Observational studies must take account of episodic events at a range of scales, and provide data that allow variability and trends to be distinguished and that enable models to be validated. Different types of models - budget, process, system - are needed to define the complex physical, chemical and biological interactions at the land-sea interface and, in particular, to explore the consequences of continuing exploitation of coastal resources by humans. Such work will only be feasible if adequate technological resources are made available for environmental monitoring (including remote sensing), for data archiving and analysis, and for the development of a global typology or classification of coastal systems as the basis for extrapolation in time and space.

Transfer of Scientific Information to the Socio-Economic Sector. Conservation and sustainable use of coastal resources can only be achieved through appropriate management of human activities. Thus, all new research initiatives on the coastal zone should include elements on related socio-economic topics that help define scientific objectives and information needs as well as demonstrate social and economic benefits. The planning and execution of such collaborative research requires new linkages between these two research communities and common methodologies to be established.

SOME ICES ACTIVITIES IN THE COASTAL ZONE; ENVIRONMENTAL IMPACT ASSESSMENTS - (C.C.E. Hopkins)

ABSTRACT

ICES activities encompass most marine science considerations of relevance to the provision of advice on the management of the marine environment and fisheries, especially in the North Atlantic area and adjacent seas. In recent decades an increased use of the coastal zone has resulted in the formation by ICES of Working Groups whose terms of reference have explicitly addressed the coastal environment. The activities of two of these groups, concerned with marine sand and gravel extraction and the environmental impact of mariculture, show our growing understanding of physical, chemical and biological processes in this area and, in particular, the need to manage the coastal environment in an integrated way. ICES is now in a position to provide clearer advice to its Member Countries and to regulatory commissions by means of Codes of Practice and other guidelines, which formulate the issues to be addressed to ensure the minimisation of the impact of anthropogenic activities in the coastal zone.

[Key Words: Sand and Gravel Extraction; Mariculture, Integrated Coastal Zone Management, Codes of Practice; Environmental Impact Assessment]

COASTAL CHANGE AT COASTAL ZONE CANADA '94

H. Brian Nicholls

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ABSTRACT - From September 20-23, 1994, stakeholders in the coastal zone from around the world gathered in Halifax, Nova Scotia, Canada for the international conference *Coastal Zone Canada '94 (CZC '94)*. Over 700 people from 46 countries, representing the full spectrum of coastal zone interests, participated. In keeping with the conference theme, *"Cooperation in the Coastal Zone"*, the entire conference process -- from the make-up of the organizing committee to the representation in the conference sessions -- reflected a unique mix of disciplines, perspectives and experiences. Of particular interest to Coastal Change '95 is the way in which CZC '94 explored the local or community level application of coastal zone management. This paper reviews the conference in general terms and the coastal change thrusts in particular, the latter being considered under the following categories: physical change, biological change, anthropogenic change, climate change, management (institutional) change, and social change. It then outlines examples of issues relevant to coastal change that were developed during the conference and within the context of the central theme of cooperation. Because of the emphasis of the conference on community involvement, these issues focus largely on the human dimension.

Keywords - Coastal zone management, co-management, community, cooperation, indigenous people, social conflict, stakeholders.

TECHNOLOGICAL DEVELOPMENT FOR THE EFFECTIVE UTILIZATION OF COASTAL SEA IN JAPAN - (H. Hotta)

ABSTRACT

Present situation and future direction on conservation and development at coastal sea against the coastal change such as topographical, environmental and economical change in Japan is discussed in this paper. Author believe it is necessary to balance the conservation and the development for "sustainable development." to keep continuous economical development. As some example of the development, general condition of such development at JAMSTEC is introduced.

ACTIVITES DU CONSEIL DE L'EUROPE CONCERNANT LA CONSERVATION DES ZONES COTIERES

Maguelonne Déjeant-Pons

Organisation internationale dont le siège est à Strasbourg, le Conseil de l'Europe se préoccupe depuis de nombreuses années des problèmes liés à la protection de l'environnement. Il constitue, tant de par son champ d'application géographique (33 Etats membres) que de par sa vocation (promouvoir la démocratie et rechercher des solutions aux grands problèmes de société), un forum de réflexion et d'action propice pour traiter de ces questions. Les textes et programmes d'action qu'il adopte et met en place contribuent à orienter les politiques nationales de ses Etats membres vers une meilleure prise en compte de l'environnement naturel.

Les actions entreprises tendent à assurer la protection de la nature, espaces et espèces, ainsi qu'à organiser les activités humaines de manière à ce qu'un "développement durable" intégrant la protection de l'environnement puisse se réaliser. Celles-ci relèvent pour l'essentiel de la coopération intergouvernementale sous l'autorité du Comité des ministres, organe de décision composé des ministres des Affaires étrangères. L'Assemblée parlementaire, composée de 472 membres et suppléants venant des Parlements des Etats membres, ainsi que le Congrès permanent des Pouvoirs Locaux et Régionaux de l'Europe (CPLRE) (auparavant Conférence permanente des Pouvoirs Locaux et Régionaux de l'Europe) qui rassemble des représentants des collectivités locales et régionales des Etats membres, jouent également un rôle décisif en ce qu'ils permettent de promouvoir des initiatives nouvelles et de sensibiliser leurs membres aux problèmes environnementaux.

USE OF HYDROGRAPHIC OFFICES' CHART DATA BASES FOR COASTAL ZONE MANAGEMENT - (M. Huet)

Abstract. An increasing number of Hydrographic Offices (HO) among Member States of the International Hydrographic Organization (IHO) are in the process of establishing marine databases. Such databases are intended for the production of paper charts and/or Electronic Navigational Charts (ENC), the latter being used to operate Electronic Chart Display and Information Systems (ECDIS) onboard ships. Paper charts and ENCs are products for mariners and the content of HOs' data bases is therefore navigation oriented, i.e. they include and describe all features likely to assure the safety of navigation at sea: water depths and contours, buoyage and lights, traffic separation schemes etc... However the great variety of features concerned, makes this data of interest to non-traditional users of chart information. Data such as water depths, currents, tides, seabed nature, submarine cables, caution areas, coastline etc... will very likely be helpful to all those involved in coastal zone management.

SEDIMENT BALANCE OF THE SEA COASTAL ZONE AND THE RESOURCES OF ITS STRUCTURE REGULATION (EASTERN COAST OF THE BLACK SEA AS AN EXAMPLE

Sh. Jaoshvili

The sediment balance of the coastal zones of seas and oceans is made from various components. River sediments are dominant in the balance of alluvial-accumulative coasts. Rock destruction products are transported from the highest to the lowest marks across rivers which are the main agents of the land. The final accumulation of detrital rocks occurs in the seas and oceans. A part of the alluvion lodges in the coastal zone and forms alluvial-accumulative sea coasts.

The coastal zone of the Eastern part of the Black Sea has been formed as a result of rivers drifting over sand, gravel and pebbles, which the waves then spread along the seashore. During this process, river mouths are dominant and the alluvial material at the "river-mouth-sea" barrier is filtered and graded. Consequently, a system "river-mouth-sea" is to be considered as one whole and the coastal zone as a result of their interaction.

The river alluvion that has settled at the seacoast mouth is subject to a mechanical differentiation which simultaneously affects both suspended and bed river loads. It is therefore more reasonable to divide drifts in this zone into beach forming and non-beach forming ones. The latter take part in the current accumulation process of a sediment deep in the sea. The drifts at the sandy and near-deep-water pebble coasts with a lump size of more than 0.1mm. and o.25m respectively, are beach forming drifts.

There are more than 150 small and large rivers flowing into the sea over the 314km coastline of Georgia. They differ by a water amount and regime. About 50 of them bring beach forming materials into the sea. The carried-over alluvion forms eight closed dynamic systems as independent near-coast drifts. The source of these drifts is usually matched to the mouths of large rivers.

Of the total volume of river sediment to the beach forming sediment belong 4.6 million m^3 (that is, about 3.9 million m^3 of sand, 0.25 million m^3 of gravel, 0.45 million m^3 of pebble). Out of this, more than 90% us drifted over by large rivers: Chorokhi (2.5 million m^3), Rioni (1.35 million m^3), Kodori (0.27 million m^3, Bzibi (0.1 million m^3). Of this volume of beach forming sediment, about two million m^3 drifts over into submarine canyons and is hence lost. Even more important. 7.7 million m^3 of fine non beach forming river sediment transits the coastal zone and lodges in the deep-water area of the sea.

Building dams on rivers where a large volume of alluvion is deposited in the water storage, has an unfavourable effect on the sediment balance. For that reason the volume of beach forming sediment is reduced by 92% on the Inguri river, by 35% on the Rioni river, and by 25% on the Gumista river. Removal of sediment from the river-beds for building purposes also interferes with the balance. This factor is particularly demonstrated in the regions of the mouths of the Rioni and Chorokhi rivers. The total volume of the removal of alluvial from river-beds runs to 1.5 million m^3.

Finally, about two million m^3 of beach forming alluvial remains at the coastal zone and takes part in the beach forming process. This volume of sediment is insufficient for a stable balance, especially as the indicated material is distributed very irregularly along the shoreline. For this reason, beaches are eroded in the Georgian coastal zone, bringing financial losses.

For a long time, the coast was protected by various coast-protecting and hydrotechnical structures (walls, dams, piers, breakwaters, etc.), but they made little difference, and were often in need of repair, broke the natural dynamics of the coast, and were very expensive.

Since 1981, when the Scientific-Industrial Association on Sea Coasts Protection and Restoration was established, methods for sea-coast protection have completely changed. Work has been started on the Black Sea of Georgia where the natural balance has been disturbed, to restore a natural structure to the drifts balance within the coastal zone. The volumes of coastal drifts were approximated/estimated ???? to natural ones by inserting beach forming material. Thus the restoration of the natural morphodynamics of the beaches has commenced. The artificial wave-suppressing beaches reliably protect dry land against wash-out and increase the seaside's recreational value by restoration of a near-coast landscape. Therefore, the methods of optimization of river mouths ensure the positive material balance, and methods for the rational use of alluvion were developed.

The introduction of a new procedure of the sea-coast nature restoration has stabilized the coast on about 80 km.long; on land, about 120 ha. have already been restored. Protection of the coast by artificial beaches is twice as cheap than protecting the coast by hydrotechnical constructions.

Thus, if the natural equilibrium of the alluvial-accumulative coast is disturbed, the only way to preserve the coastal zone is to restore the natural dynamics of the sea coast by the artificial elimination of the sediments shortage.

COASTAL CHANGE; AN OVERVIEW OF EAST COAST OF INDIA - (S. T. Jaya Raju, K. L.Narasimha Rao, H. Gossmann)

ABSTRACT

The East Coast of India is the focal point of our study. This fairly broad coast with varying width is an "emergent" one. Very active tectonic movements have been taking place here since the post-Cretaceous period, though it was modified considerably during the Quaternary period. The present study aims at investigating into the configuration of the entire coast and its associated features which have been formed due to dynamic geological, geomorphological, meteorological and biotic processes. It uses topographical maps, aerial photos and satellite data. A certain amount of neotectonic activity is observed resulting in the abnormal meandering of the rivers besides the progradation of the deltas.

Key Words: Quaternary period, Eastern Ghat Orogeny, Emergent Coast, Isostatic subsidence, Tectonic Instability, Transform faults, Ridge crests, Triple junctions, Subduction and Compression of Plates, Neotectonic activity, Strandlines, Littoral Drift.

TRAINING TODAY'S COASTAL AND MARINE MANAGERS: A PERSPECTIVE FOR ASIA AND THE PACIFIC - Richard Kenchington

Abstract

Coastal managers and decision makers come from a wide range of disciplines. Natural science has developed an understanding the issues and constraints relating to human activities and impacts in coastal and marine environments. This is rarely shared by the commercial, economic, engineering, social policy and public administration practicioners who drive the major social and economic decisions of society. An immediate priority is for multi-disciplinary in-service training and education in Asia and the Pacific. Current and future demand is large and urgent. To meet it will require the development of specific materials and approaches addressing the range of social and economic priorities in the regions.

Keywords

coastal, marine, management, training, decision-makers.

NEW TECHNIQUES FOR COMPLEX GEOLOGICAL AND ENVIRONMENTAL STUDIES OF COASTAL MARINE ZONES - (M. A. Kholmjansky, B. G. Lopatin)

ABSTRACT

Coastal marine zones are specific geological-geografical objects and require special approach and complex study. To study the following aspects: litho-stratigrafy of sediments, bottom relief, coastal circulation and sediments transport, coastal erosion and siltation related to natural or anthropogenic factors, elemental and integral pollution of bottom sediments and water, hydrophysical and hydrochemical properties, prospectihg of technical subjects on the bottom, the authors have designed geophysical marine system ("Sprut"). It is portable digital multychannel recording and processing apparatus system based on modulus priciple, which can be installed on a vessel of any class.

Keywords: coastal marine zones, complex geological-environmental study, portable multychannel recording and processing apparatus, modulus principle, litho-stratigrafy, bottom relief, pollution, hydrophysical, hydrochemical properties, buried technical subjects.

A Preview of the IPCC 1995 Assessment for Coastal Zones and Small Islands

Richard J.T. Klein and Luitzen Bijlsma

ABSTRACT

In December 1995 the United Nations Intergovernmental Panel on Climate Change (IPCC) will publish its Second Assessment Report, addressing (i) the causes and effects of human-induced climate change, (ii) potential options to adapt to or mitigate the effects, and (iii) the socio-economic consequences that implementing these options may have. The Second Assessment Report will consist of three volumes, prepared by the three Working Groups that form the IPCC. Working Group II focuses on impact assessment and the formulation of response strategies for both socio-economic sectors (e.g., agriculture, fisheries, and industry) and physiographic systems (e.g., mountain regions, rangelands, oceans and large lakes, and coastal zones and small islands). One of the main goals of the IPCC Second Assessment Report is to assess and present any relevant new information that may either support or challenge the conclusions from the 1990 First Assessment Report and the 1992 Update. Below the Executive Summary of the subfinal second-order draft of the chapter 'Coastal Zones and Small Islands: Impacts and Adaptation' is given. The second-order draft of the chapter will be sent out for Government review in February 1995.

COASTAL PROCESSES AND THE SUSCEPTIBILITIES OF PROPERTIES TO EROSION

Paul D. Komar

ABSTRACT

The erosion of beaches and coastal properties is governed by the extreme run-up of storm waves superimposed on elevated water levels that result from high tides and other factors which affect mean-water elevations. Equally important is the morphology of the beach and its capacity to act as a buffer between the ocean and land. The objective of this paper is to review the ocean processes that are involved directly in coastal erosion, and the models that have been developed to quantitatively analyze the surf-zone processes that play a role in the erosion of foredunes and sea cliffs. These models can be employed in examinations of existing erosion, or in making sound coastal-management decisions.

KEYWORDS: beaches, dunes, erosion, sea cliffs, sea level, waves

KENYAN EXPERIENCES IN COASTAL CHANGE - (A. Y. John Komora)

ABSTRACT

Kenya, often described as the "land of contrasts" is situated on the East Coast of Africa. It covers an area of 500,000 km2 and straddles the equator.

It rises from sea level at the Coast to an altitude of 5,199 metres on Mt. Kenya which explains how one can experience the hot and humid climate of the Coast, the damp moorland climate of the highlands, the bone chilling snow of Mt. Kenya and the scorching desert climate of North Eastern - all in one country.

The changes in altitude create habitats and ecosystems that support a diversity of flora and fauna and unsurpassed elsewhere in Africa.

The Kenyan Coast is approximately 600 kms long beginning from Kiunga in the north to Vanga in the south. About 10% of the Kenyan population is resident along the Coastal region.

A. Coastal zone use in Kenya:

The Coastal zone of Kenya is among the most heavily exploited areas in Kenya and even along the East African Coast. This is because of its diverse and unique natural endowments.

Like any other Coastal zone in the world, the Kenyan Coast provides sites for a wide range of activities including the following:

- Fisheries / aquaculture
- Agriculture
- Human settlement / habitation
- Forestry
- Manufacturing / extracting industries (e.g. sand mining, minerals, etc.)
- Waste disposal / dumping
- Transportation
- Water control and supply projects
- Tourism
- Recreation.

AN ANTHROPOGENIC IMPACT UPON THE BLACK SEA COAST OF RUSSIA

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An anthropogenic impact upon the Black and Azov Sea coasts give evidence in the following. Solid river runoff has reduced after the construction of Tsimlyansk, Krasnodar and several other small water storage basins. As a result of this beaches have declined and erosion of coasts has intensified.

In the northern part of the russian Black sea coast between the town of Anapa and the Iron Horn Cape are sandy coasts which could be the most beneficial for recreational application. They originate from holocene when one of the Kuban river sleeves flowed into the Black Sea. It filled the shallow bay with sand stretching the coast further into the sea having thus formed the sandy beach with approximate length of 50 Km.

At the end of the last century the Kuban sleeve became shallow to such an extent that it vanished. Due to this sandy beach has become exhausted and is now gradually stepping back. Its insufficient renewal occurs only when the North-East wind blows the sand off the dunes into the sea.

In Anapa region wind transport of sand doesn't exist and the beach falls into decay here most quickly. To prevent the process the wavereflected wall was built which played the role of trigger mechanism in beach destruction. This process has intensified and covered large area. At present the problem faces how to save and preserve the beach.

To the south of Anapa the coast is high and abrasive. Here the sea cuts the Caucasian mountains changing the shape of the cliffs which are 100m high or more. In pleistocene when the sea level had been fluctuating and the Caucasian mountain started growing a series of terraces appeared along the coastline.

The rate of coast destruction is small. The protection objectives were used to be solved by wavereflected walls and groins constructing. This is how the damage of the railway between Tuapse and Sochi, running along the coast, is prevented.

As experience shows this way is not the best to cope with the problem facing. The erection of numerous groins on the Black Sea coast has disturbed a natural longitudinal sediment shift and has provoked the intensification of abrasion on some coastal areas and the necessity to protect coast by means of ferro-concrete constructions. The problem of coastal protection has become aggravated. Besides, groins prevent from water exchange and worsen the process of carring out of pollutants coming from land. At present protectability of some coastal areas between Novorossiisk and Tuapse is achieved by free pebble beaches bearing also recreational function.

As survey shows if the greenhouse effect realizes and the level of the world ocean rises the coastal erosion will 2-3 times increase.

BLUFF BASE AND BEACH PROTECTION

LARCHER M. THE COASTAL CELL METHOD

Data for the protection of sedimentary coasts can be organized in the following manner:

There is no even repartition of sand on sandy shorelines and forebeaches. To the contrary there are sand pockets which are often referred to as coastal cells where beach profiles are healthy and keep the wave energy away from bluffs.

Coasts are seen and said to be eroding in between cells.

A cell can be classified according to the length of the coastline which is entrapped within its boundaries: micro-cells (less than 50 meters long), meso-cells (between 50 meters and 1000 meters long), and macro-cells (longer than 1000 meters).

Coastal replenishment is assured by littoral transit. Because of irregular coastal cells, there is no even, parallel spreading of sediments along the coastlines (re. studies by Carter, 1988).

Indeed, the cell morphology determines two kinds of transits: within the cell, and between cells.

There is little or no transit between cells under established wind and sea conditions. In this case the only noticeable transit is within the cell against the cell limits abutment, but there is no escape beyond the cell downstream boundary.

Transit between cells is generated when changes in wind and sea conditions reverse abutments. This frees some sediments from the cell attraction. The problem is that this loose sediment will pass by eroded areas only to accumulate in the next cell.

Action against erosion must thus address this natural uneven sand budget by a coast-smoothing device.

In the best of cases this is achieved by creating artifical coastal cells that will integrate the eroded area with the inter-cell and intra-cell transit.

These artificial coastal cells are obtained from ARTIFICIAL RIPPLE SYSTEMS some of them made out of easily installed hollow modular careens. Those artificial ripples aim at ondulating the beach and forebeach in order to stabilize it and to cause stable sand bumps generating natural sandbank responses.

The service offered by the installer comprises a cartography of existing coastal cells with blimps, prior to deciding whether and where to install patented low profile artificial ripples. The blimp comprises a video-photographic plateform which will allow a specialized team of geologists to monitor the shoreline in real time at low cost with state-of-the art electronic equipement.

A MODEL OF STORM-GENERATED MORPHOLOGICAL RESPONSE IN THE NEAR SHORE ZONE - (I. O. Leont'yev)

ABSTRACT

A numerical model is proposed describing short-term changes in three-dimensional bottom topography caused by storm events. The model structure consists of wave, current, sediment transport and seabed update modules. Comparing with other known models a simpler treatment is adopted using analytical approaches wherever possible. Wave height field is determined from the equation of energy balance. Storm-driven currents are treated in terms of depth-integrated linearized equations of motion and water conservation equation. The undertow velocity is determined using Stive & Wind's (1986) estimation of shear stress at wave-trough level. To evaluate the sediment transport rates the energetic concept of Bagnold (1963) is applied. The bed changes are calculated from the equation of sediment mass conservation, being Lax-Wendroff's numerical scheme is used. The model predictions of morphological response in the near shore environments are compared with field data collected at the Baltic Sea coast.

Can The Past Be The Key To The Future ? Holocene Relative Sea-Level Changes In Southern England.

A. J. Long

Abstract

This paper examines how an understanding of past sea-level change can contribute to our understanding of future coastal change in southern England, United Kingdom. It is suggested that the Holocene sea-level record provides us with important information about crustal movements, which must be accounted for when estimating future net sea-level rise, and also shows us how the coasts of southern England have developed in the past under periods of fast sea-level rise. However, relating the record of past sea-level movements to the future is not a straight-forward exercise, due to the many differences which exist between the current and past coastal environments of this area.

Key words: Sea-level, coasts, southern England, coastal management, Holocene

STRATEGIES FOR THE COASTAL MANAGEMENT OF VILLA GESELL, ARGENTINA - (Silvia C. Marcomini; Ruben A. Lopez)

ABSTRACT

A fast growing population and a lack of an adequate control planning and policy in the management of the coastal areas of Villa Gesell have been modifying the natural ecosystem.
A lack of suitability between human activities and the geomorphological setting, has intensified two problems during the last years: beach erosion, and lose of capacity and pollution of the aquifer.
Recently, an erosive stage is registering because the equilibrium between the dune system and beach has been broken as the buildings spread over the coastal areas.
Several human activities are accelerating the beach erosion. They are: Destruction of coastal dunes, mining working of the sand from beach and dunes, and an inadequate urbanization planning.
Geologic and geomorphologic analyses of this coastal area were developed to evaluate the critical requirements for assessing the effects of the human activities on the environment and for developing management strategies to deal with environmental problems.

COASTAL ZONE MANAGEMENT IN ITALY (and elsewhere): PLANNING THE COASTAL ZONE V PLANNING COASTAL ZONE MANAGEMENT - Anna Marson

Abstract

In the specialized literature the terms Coastal Zone Planning and Management are often taken to be synonymous, or as slightly different with a similar meaning.

But the contrast implicit in these two terms actually reflects two completely opposed ideas of the planning process: the rational-comprehensive approach *v* the incrementalist approach.

A question arises over what methodological issues are at stake when trying to adopt an approach which is both holistic - as required by the emerging concept of the coastal zone - and an effective management of the critical problems.

This paper attempts to address the issue by focusing on some aspects of the Italian situation.

Keywords
coastal zone management; planning methodology; Italy; strategies; incrementalism

RESEARCH AND MEASURES FOR BEACH PRESERVATION; THE CASE OF VARADERO BEACH, CUBA - (J. L. Marti, C. G. Hernandez)

Varadero Beach with an average sand loss of 50,000 m^3/year and estimated erosion rate of 1.2 m/year, could be included into the "Critical Coastal Areas" of the Caribbean Region.

Systematic research work on the erosion in Varadero beach started since 1978 and the basic scientific purpose of this research was directed towards the knowledge of:

(i) geomorphological characterization of the shelf;
(ii) seasonal and spacial morphological variations of beach profiles;
(iii) tendency of sediment transportation;
(iv) composition and distribution of sand.

All evidence obtained during this study suggests that beach erosion is a result of man-made causes, as well as natural cases. The main results of a research programme are presented.

Taking into account the behaviour of natural beach processes, a plan for the preservation of Varadero was elaborated. It includes artificial beach nourishment as the main measure. Supply of sand has been developed since 1987 with a total of 688,000 m^3 until 1992. The affectivity of these actions are evaluated.

The plan also includes regulations for adequate management of all activities related with beach use. In this direction the establishment of "The Coastal Construction Control Line" has been one of the most important measures to preserve and protect dunes from imprudent construction. The criterions to establish this control line are explained.

Experiences and results obtained in the Case of Varadero Beach are also useful to the solution of beach erosion in other tropical islands.

VARIATION OF COASTAL DYNAMICS DURING THE LAST 7000 YEARS ALONG THE CENTRAL BRAZILIAN COAST - (Louis Martin, José Maria L. Dominguez)

ABSTRACT

A submerging coast does not exibit the same morphological features as an emerging coast because the relative sea-level change in part determines coastal sedimentation. This occurs in two ways, by partially controlling the supply of sand and by regulating the geometry of the deposits. Moreover, this shape changes with the direction and intensity of the longshore current. Under conditions of rising sea-level, on a gently sloping sandy coast, barrier island/lagoonal systems are the dominant mode of sedimentation, and beach-ridge plains are virtually absent. In contrast, a sea-level fall creates highly unfavourable conditions for the genesis and maintenance of barrier island/lagoonal systems. Lagoons and bays become emergent and beach-ridge plains rapidly prograde, resulting in regressive sand sheets. A sandy coastal zone has a profile in equilibrium, which is determined by the local hydrodynamics and the grain size of the sediments. The rule of Bruun (1962) states that the equlibrium destroyed by a relative sea-level rise would be re-established by a landward displacement of the beach profile. This results in an accelerated erosion of the beach prism and transfer of eroded sands toward the inner shelf.. Even though this rule was established for a rise in sea-level, it is logical to suppose that a fall in sea-level would also destroy the equilibrium profile. This results in an erosion of the inner shelf bottom and by

LONG-TERM CHANGES OF A FLOOD TIDAL DELTA ADJACENT CHANNEL, TAURANGA HARBOUR, NEW ZEALAND

Joseph Mathew, Willem P. de Lange and Terry Healy

Abstract

Hydrographic surveys of the Tauranga Harbour, New Zealand . dating from 1852 indicate that the harbour has a history of large scale bathymetric and shoreline changes (Davies-Colley, 1976; Dahm, 1983). Growth of the flood tidal delta by deposition from decelerating flood tidal flow resulted in the diversion of flood and ebb tidal flow, and hence affected sediment transport. Dahm (1983) suggested that growth of the flood tidal delta resulted in the closure of the channel path which originally linked the Upper Western and Otumoetai Channels. This led to the formation of the Lower Western Channel as an ebb discharge route, associated with large scale morphological changes to the ebb- and flood-tidal delta and adjacent shoreline.

Analysis of bathymetric survey between 1962 and 1979 by Dahm (1983) shows large scale bathymetric changes occurred in the Lower Western Channel, effected by deposition from decelerating flood tidal currents entering the harbour. This deposition resulted in the formation of a bank on the west side of the channel and major shoreline changes. Analysis of bathymetric data from 1983 to 1994 show the continued deposition of sediments along the Lower Western Channel until 1990. Since then it has been relatively stable with only minor changes. There has also been large scale deposition on the flood tide ramp adjacent to the Lower Western Channel. This deposition was up to 7 m during 1983 - 1991
Deposition on the flood tide ramp continued during the 1991 - 1992 period and was

maximum (5m) compared to that of other years. This deposition was predicted by Dahm (1983) and the numerical studies by Bell (1991) and Healy et al. (1991).

A major dredging programme by the Port involving deepening and widening of the shipping channels occurred during 1990 - 1992. This also affected the hydrodynamics and hence the sedimentation pattern within the harbour and on adjacent beaches. Deposition on the flood ramp continued during November 1992 - August 1993, but was less wide spread and was small (up to 3 m) compared to that of the previous years. During August 1993 to April 1994 the deposition continued almost in a similar manner to the previous year but a further southern extension. A change in the orientation of deposition was evident (from north - south to northwest - southeast) indicating a change in the flow direction. Current measurements before and after the major dredging from this region show a change in magnitude and direction of current between 1991 and 1993..

Assessment and management of diving related tourism in the Ras Mohammed National Park, Red Sea, Egypt

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ABSTRACT

(1) Diving related tourism is an increasingly common cause of damage to coral reefs in tropical tourist resorts. At the same time income from tourism can be important to the local economy and may provide the incentive for government to protect and manage reef areas. The need to strike a balance between tourist activities and reef conservation is particularly demonstrated in the management of the Ras Mohammed National Park.

(2) The Ras Mohammed peninsula and adjacent coastline were first given protection in the 1970s. It was established as a National Park in 1989 and subsequently enlarged to cover 52% of the Egyptian coastline of the Gulf of Aqaba equivalent to 2,000 km2 surface area (marine, coastal and terrestrial). By 1994 the area included 36 hotels (with 8,234 beds) and 26 diving centres attracting an annual total of 220,000 visitors, a seven-fold increase since 1988.

TIDAL AND SUBTIDAL DYNAMICS OF PATOS LAGOON (BRAZIL) - O. Moller Jr., P. Castaing)

L-.The Area

The Patos Lagoon (Fig. 1) situated in southern Brazil about 31° S and 51° W is a typical example of a choked (Kjerfve,1986) waterbody. It has a surface area of 10.360 km^2 being 250 km long, 40 km wide and 5 m deep. It is connected with the South Atlantic Ocean through a 22 km long, 2 km wide and 12 m deep channel. Tides are mixed mainly diurnal with a parameter F (Defant, 1961) equal to 2.42 (Herz, 1977).

The wind pattern shows a dominance throughout the year of the north-easterly (NE) winds. During summer and spring easterly (E) winds are also important in this region indicating a sea breeze signal influence. The importance of south-westerly winds increases during autumn and winter as frontal systems are more frequent over this area. Typical wind speeds are between 10 to 15 km/h (3 to 5 m s^{-1}).

This lagoon drains a hydrographical basin (Fig. 1) of almost 200.000 km^2 formed by rivers which exhibit a typical mid-latitude flow pattern: high discharge in late winter and early spring followed by low to moderate discharge through summer and autumn. They also present a large year-to-year discharge variations. A mean annual value (Bordas et al.,1984) is around 1,000 m^3 s^{-1} with monthly means ranging from 700 m^3 s^{-1} during summer up to 3,000 m^3 s^{-1} in spring. River discharge peaks of 20,000 and 12,000 m^3 s^{-1} have been observed by Rocheford (1958) and Moller Jr. et al. (1991) and respectively.

Early studies carried out during the construction of the 4 km long jetties at the lagoon's entrance (Malaval, 1922) have pointed out the main influence of the wind on the circulation of this lagoon. NE winds favouring seaward flows while southerly winds causing opposite effects. Concerning freshwater discharge effect Costa et al. (1988) have concluded that during periods of high river discharge in winter and spring months only very strong southerly winds (>13 m/s) would be able to force salt water to enter into the lagoon. Moller Jr. et al. (1991) have shown that for river flows in excess of 3,000 m^3 s^{-1} the mixing zone would be transferred to the inner

continental shelf. The inner limit of the salt water penetration is around Ponta da Feitoria region.

The main objective of this paper is to discuss the relative importance of winds, tides and river flow in the barotropic circulation of Patos Lagoon. The propagation of tidal and subtidal frequency oscillations have also been discussed. To achieve these objectives time series analysis techniques have been performed using wind and water level records obtained along the lagoon for the whole year of 1988 and some partial records registered in1984.

II - Conclusions

This study points towards the fundamental importance of Patos Lagoon morphology on the way this system responds to local and non local forcing mechanisms. The southern and the central/northern regions that are separated by the sandy banks off Ponta da Feitoria are submitted to different wind forcing and also react in a different manner concerning river discharge effect.

The time scales of the low frequency circulation of Patos Lagoon are associated with frontal system passages in the time interval between 3 and 20 days. The dynamics of the central/northern area is driven by the local longitudinal wind that forces the setup/setdown mechanism of oscillation. During strong flood periods ($Q > 4{,}000$ m^3/s) the system is river flow dominated. The southern area is mostly influenced by the subtidal oscillations generated offshore through non local wind effect. These oscillations are filtered as they propagate into the estuarine region and are totally attenuated when they reach Ponta da Feitoria. The non local wind effect dominates circulation when river flow is lower than 1,000 m^3/s. Freshwater discharge values higher than 1,500 m^3/s can produce water level oscillations that interfere with those associated with offshore winds. The role of morphology in this process is also discussed.

Concerning tidal frequency oscillations ($f > 0.04$ cph) two types of motions are observed in the lagoon. In the southern area they are of tidal origin, dominated by the O_1 component, and account for 35% of the total variance in the channel area. They are also filtered as they propagate into the lagoon but 20% of the original signal is still present at Ponta da Feitoria. On the other hand in the central/northern region they are associated with breeze effect and are only observed in spring and summer.

PROPOSITION DE MANAGEMENT DE LA REGION COTIERE DU NORTHUMBERLAND - (P. Morrison)

ABSTRACT

Sur le littoral Est du Royaume-Uni, le Northumberland est le comté que se situe le plus au nord géographiquement. La côte du Northumberland qui s'étend sur 120 kms. de la rivière Tyne aux confins de l'Angleterre et de l'Ecosse en fait le comté le plus connu pour ses atouts naturels. Bien qu'elle soit réputée pour sa faune et sa flore naturelles, le paysage côtier est néanmoins soumis à de vastes influences. La proposition de management de la région côtière du Northumberland a été adpotée comme projet du partenariat afin d'explorer les solutions possibles ainsi que de reconnaître les atous nécessaires pour la sauvegarde du littoral.

South Pacific Sea Level and Climate Monitoring Project

T. S. Murty

1. The Project

The South Pacific Sea Level and Climate Monitoring Project is a joint initiative of South Pacific Forum member countries. Drawing on Australian and regional scientific and financial resources, the project will accurately record variation in long-term sea levels in the South Pacific, making this data available for Pacific Islands countries.

The Project aims to help Pacific Island Countries and their governments understand the scale and implications of changing sea level and climate. In the Pacific, the task is difficult since climate is only one part of the problem of changing sea levels. Other include the movements of continental plates, active volcanoes, and earthquakes which are all present in the region.

The South Pacific Sea Level and Climate Monitoring Project was established to:

Set up high resolution monitoring stations in eleven island countries to measure the relative motions of land and sea at each station.

Carry out a geodetic programme to measure movement of the crust with respect to the reference station. dentify changes to sea levels with reference to a similar network of stations in Australia.

Collaborate with on-going international geodetic programmes, which may be incorporating satellite altimetry and radio astronomy to provide measure of regional vertical control, and exchange information and data with international Climate Change organisations.

AN OVERVIEW OF THE EAST COAST OF AFRICA - (K. L. Narasimha Rao, H. Gossman)

The Indian sub-continent has two marginal seas namely, the Bay of Bengal in the east and the Arabian Sea in the west, with a fairly long coastline of about 7,500 kms., including its island territories. The Bay of Bengal coast, which stretches from the river mouth of the Ganges in the north to Cape Camorin in the south is the focal point of our study. This fairly broad coast with varying widths is an "emergent" one, and very active tectonic movements have been taking place since the time of its origin in the post-Cretaceous period, though it was modified considerable during the Quaternary period due to complex physical and anthrophogenic processes.

The objective of the present study is to make an in-depth investigation into the configuration of the entire coast and its associated features which have been due to dynamic processes of geological, geomorphological, meteorological and biotic. The space acquired imagery by virtue of its repetitive (temporal), multispectral and synoptic nature have been extensively used for this study, besides aerial photos and Government of India Toposheets. Information regarding coastal landforms of erosion and deposition, shoreline changes, nearshore bathymetry etc., have been worked out and significant results of these studies are outlined separately.

The shoreline between the rivers Ganges and Krishna except the delta shore, has a conspicuously "emergent" aspect in its geometric straightness, universal development of beach dunes and spits. The tidal flats and mangroves are reducing in extent due to reclamation. The sandpits near Godavari (popularly called Godavari point) and Krishna river mouths are growing gradually in bulk. Besides, the progradation of Godavari and Krishna deltas are leading to expansive protuberances in the general alignment.

ASSESSMENT OF VULNERABILITY TO CLIMATE CHANGE - THE IPCC COMMON METHODOLOGY, RESULTS AND SYNTHESIS - (R. J. Nicholls, L.P.M. Vrees)

ABSTRACT:

The implications of global climate change in general, and sea-level rise in particular have caused much concern in the coastal zones of the world. To better understand both the physical susceptibility and societal vulnerability to these changes the IPCC Common Methodology (CM) was developed and applied in a number of countries around the world to quantify possible impacts of climate change.

The CM includes three scenario variables: global climate change, local development, and response options. It considers national or local development extrapolated 30 years from the present situation. The Common Methodology encourages coastal nations to consider a full range of response options, but at least the extreme options of retreat and total protection. In assessing vulnerability to sea level rise, the Common Methodology considers potential impacts on population, on economic, ecological and social assets, and on agricultural production. It uses the present sea level and global rises of 0.3 and 1.0 metres by the year 2100. These two climate change scenarios approximate the low and high estimates of the IPCC 1990 Scientific Assessment. The CM is intended as a living document which can be adapted as circumstances change and experience is accumulated.

MONITORING GLOBAL SEA LEVEL RISE/RELATIVE SEA LEVEL RISE IN A DEVELOPING COUNTRY - THE NIGERIAN EXPERIENCE - (P. C. Nwilo, Anthonia E. Onuoha, M. Pugh Thomas)

ABSTRACT

Developing nations such as Nigeria with a low lying coastal topography will be adversely affected by the global rise in sea level. Nigeria has only one functioning tide gauge manned by a government establishment. Long term and good quality tidal data are virtually non existent except for the 19 years that was recently collated from one of the oil companies in Nigeria. This was based on local datum. Therefore, indications of subsidence and relative sea level rise could not be obtained but a sea level rise of 1mm per year was observed from the data.

Efforts should be made to establish more tide gauges especially on the Niger Delta. Provision of topographic maps and the setting-up of a coastal zone management are very vital in addressing the problems of sea level rise and the impacts on the Nigerian Coast.

United Nations agencies should help Nigeria and other developing countries in manpower training, attendance at international conferences, and supply of equipment for coastal studies.

Key Words: Developing nations, monitoring, tidal data, sea level rise, subsidence and coastal zone management.

COASTAL CHANGE: IT'S IMPLICATIONS FOR EASTERN AFRICA.

Eric O. Odada

ABSTRACT

The coastal region of East Africa and the Western Indian Ocean encompasses the coastlines of four mainland countries extending from Somalia in the Horn of Africa, through Kenya and Tanzania, to Mozambique in the south, as well as five island nations, including the Seychelles, the Comoros, the Mauritius, Reunion and Madagascar(figure 1).

Together, these countries have 12,000 Kilometres of Coastline and a rapidly growing population of about 55 million (UNEP,1989). The Coastline of East Africa is an area of great physical beauty, rich in living resources. Palm-fringed beaches of white coral sand lead down to tranquil lagoons, enclosed by spectacular coral reefs with their wealth of colourful fish, shells and coral. The coastline has vast Mangrove forest, high cliffs, wide stretch of sand dunes,and numerous offshore and oceanic islands (UNEP,1989).

Along the shorelines of East Africa and the Island states of the Western Indian Ocean, however, Coastal change is a common problem damaging or threatening tourism and communication infrastructure. Coastal change as it occurs in the region, is usually caused by natural changes in the prevailing condition of sedimentation along the shore, or as a result of human interference with Coastal sedimentation systems. The usual causes of Coastal change in the region, include coastal erosion, sediments accretion and Coastal reclamation. The latter is commonly carried out in the Island states, where land is at a premium. This usually involve filling of wetlands, and other lowlands to create new land area for construction. In the Seychelles, for example, this method was used to reclaim large areas where the airport and Port Victoria are built (Odada,1993).

IMPACTS OF CLIMATE CHANGE AND SEA LEVEL RISES ON COASTAL RESOURCES; IMPLICATIONS FOR EFFECTIVE COASTAL ZONE MANAGEMENT POLICY IN WEST AND CENTRAL AFRICA - (O. Ojo)

ABSTRACT

The paper examines aspects of the impacts of climatic variabilities and change, as well as sea level rise on past and present environmental dynamics and coastal change in West and Central Africa with particular reference to such issues as the impacts of coastal erosion and inundation, deforestation, drought and desertification saline intrusion pollution and subsidence. The paper then examines the impacts of climate change and sea level rise on the future of environmental dynamics and coastal change in the region with particular emphasis on (a) land at risk and at loss, (b) socio-economic values at risk and at loss (c) estimated population at risk, (d) estimated population that would be displaced as a result of sea leval rise and (e) possible cost of response measures and (f) the implications of the response measures on environmental dynamics and coastal change. The paper illustrates the characteristics of environmental dynamics and coastal change and their impacts with some detailed discussions of typical vulnerable areas, for example, the Niger and Senegal deltas, as well as the Cross River, Gambia, Guinea Bissau and Saloum estuaries.

The paper finally discusses the implications of these possible impacts of climate change and sea level rise for effective coastal management policy which should be structured and implemented to (a) carry out national policy objectives for coastal management through cooperation and voluntary partnership between Federal, State and Local governments (b) balance competing interests on the coastal zones and land use (c) preserve, protect, develop and where necessary restore and enhance the resources of coastal zone (d) encourage and assit the states and local governments as well as the local communities to develop and implement coastal management programmes to meet specified local and national needs and standards (e) encourage participation and cooperation of the public, national governments and international agencies in achieving the objectives of the coastal management policy (f) create and/or increase public awareness for coastal dynamics and coastal resources conservation (g) promote education and training for effective management policy (h) improve the availability of data and information on the factors and characteristics of coastal dynamics and change (i) promote research activities for better understanding of the factors and characteristics of coastal dynamics and change (j) encourage and assist in the development and implementation of coastal management plans which will minimize losses of lives and property in hazardous areas and (k) bring order to the development process, avoid unnecessary conflicts and losses in environmental quality and encourage sustainable development of coastal and marine areas.

COASTAL CHANGE MANAGEMENT EDUCATION IN DEVELOPING COUNTRIES - (Anthonia E. Onuoha, Peter C. Nwilo, Mike Pugh Thomas)

Abstract

Coastal change management requires a complex array of highly skilled, multidisciplinary, professionals in order to address the issues. An altered coastline is in dynamic equilibrium with natural processes. Increased levels of human activities in coastal areas have resulted in alteration of this equilibrium and consequently have led to changes such as increased wave height and frequency of storm surges, erosion, salinity intrusion, flooding, inundation, and wetland destruction. These changes including sea level rise have generated universal interest.

Developing countries need to establish adequate infra-structural, legislative, and institutional framework for effective management of coastal change. Education and public enlightenment are vital tools which will lead to better understanding and management of coastal change effects.

Finally, the United Nations and her agencies should offer the developing world financial and training assistance for capacity building.

Keywords: Coastal change, management, education and training.

Title: The Impact of Coastal changes on Biological resources of Kenyan Coastal Waters.

Author: Dr. Helida A. Oyieke.

ABSTRACT

The long term coastal ecosystems capacity to provide people with an adequate quality of life and produce renewable resources is being reduced at an alarming rate and the Kenyan situation is no exception. Biological diversity is declining at an accelerated rate as habitats are destroyed or modified either through natural processes or man's undesirable activities.

Kenya's coastal zone is an area of great physical beauty with many different ecosystems and a high biological diversity. Ecosystems consist of communities of individuals of different populations living in a given area together with their non-living physical environment. The species and individuals depend on the non-living physical environment and each other as a food source and hence, taking any component out of the ecosystem creates an imbalance within it.

Among the important ecosystems of the Kenya coast are the coral reefs seagrass/seaweed beds, and the mangrove forests.

The fringing coral reefs run roughly parallel to the Kenyan coast at distances ranging from 500m to 2 km from the shoreline. These reefs are examples of a biologically productive and taxonomically diverse ecosystem. About 140 different species of both hard and soft corals have been identified along the Kenyan reefs. Apart from being very important breeding grounds for fish and other marine life, the coral reefs are one of the major tourist attractions in the country. The reefs also act as barriers against the force of oceanic waves thus protecting lagoons which provide calm and stable environment for marine organisms.

Seagrass beds together with seaweeds found within reef lagoons and creeks form another highly productive ecosystem providing nursery grounds for marine fauna. They also play a significant role in energy transfer within the lagoons, creeks and reefs and they form vital part of many food webs.

Mangrove forests are another significant and distinctive coastal ecosystem. The Kenyan coast has an estimated 530 sq. Km of mangrove forests. The trees have extensive root props which reduce tidal currents and cause considerable deposition of sand and silt, thus forming a stabilizing complex along the shoreline and a natural filter system for the water reaching the sea. The forests yield large amounts of fish, crabs, prawns and oysters and they are valuable sources of fuelwood, timber, tanning and other natural products. Mangrove forests also act as nursery grounds for numerous marine species of commercial and touristical value.

There is documented evidence of environmental changes in the above described valuable coastal ecosystems and the changes are attributable to pressure created by increased growth of human populations and the corresponding land use, as well as industries. Changes caused by natural phenomena such as coastal erosion and deposition and climate change, are also acknowledged though their impacts are not as great as those resulting from human activities.

Kenyan coast has witnessed a continuous growth in numbers of tourists and residents over the last two decades. The natural population is estimated to be around 3.8% per year and besides this there is a large number of people immigrating to the area. These hundreds of thousands of Kenyans and tourists at the coast need to eat, drink and find accommodation. They also need transport to various places. Thus pressure on living and natural resources like land, water, food, building materials and energy is increasing tremendously. On the other hand there is growing pressure on the natural environment through domestic and industrial waste.

CHANGES IN NATURAL COASTAL SYSTEMS IN THE GULF OF MANNAR AND THE PALK BAY, SOUTHEASTERN COAST OF INDIA WITH PARTICULAR EMPHASIS ON CORAL REEF ECOSYSTEM

J.K. Patterson Edward and K. Ayyakkannu

Abstract

Coral reef ecosystem is a habitat extremely conducive to different species, there is an abundance of economically important biological resources like finfishes, shell fishes, seaweeds etc. Coral acts as a natural barrier against sea erosion. There are about 20 coral islands in Gulf of Mannar region of Southeast coast of India, covering about 683 hectares from Mandapam to Tuticorin. This fragile ecosystem is under severe threat due to the indiscriminate anthropogenic effects such as Pollution, Mining, Aquaculture, Fishing and Tourism. Efforts to conserve this ecosystem for proper utilization have already been initiated by various Government and research organizations.

Keywords

Corals, Gulf of Mannar, Palk Bay.

THE INFLUENCE OF THE ANTHROPOGENIC FACTOR ON THE COASTAL-SEA SEDIMENT STRUCTURE - V. Peshkov

ABSTRACT

Certain data on the coastal zone dynamics of the southern-eastern Black Sea are discussed. As a result of an anthropogenic disturbance of the substance and energy fluxes many processes here are proceeding under conditions that differ from natural ones.The accumulative forms and beaches have lost the old sources of the nourishment and are eroded now. The regime of the nearshore-sea sedimentation has changed greatly too. In the surf zone there are observed the outcrops of sedimentary series that has been formed under different geological conditions. Unconsolidated relic ground is eroded rapidly under the influence of waves and streams and of physical and biochemical weathering. Owing to this the rate of the coast retreat increases.

COASTAL CHANGES AND WETLAND LOSSES IN THE MISSISSIPPI RIVER DELTAIC PLAIN, USA - (S. R. Pezeshki, R. D. DeLaune)

ABSTRACT

In wetlands of the lower Mississippi delta, anthropogenic factors (river diversions, navigation canals, land conversion, oil drilling activities, etc.) and natural factors (subsidence, saltwater intrusion) have resulted in considerable changes in physicochemical characteristics of wetland soils. The combination of these changes have resulted in vegetation stress and wetland deterioration of substantial magnitude in many coastal habitats including saltmarshes, brackish and freshwater marshes, and coastal forests. Coastal plant communities are confronted with a continuously more hostile environment than in the past. The consequences are a net loss of these resources. Methods such as introduction of freshwater has the benefit of diluting saltwater thus reducing stress on vegetation, however, the costs involved and the limited areas where this method can be applied to are the major concerns. Methods to prevent saltwater intrusion into inland-freshwater areas are primarily based on creating physical barriers such as levees. The approach often results in alteration in hydrology, reduced siltation, thus posing different types of stresses on plants with resultant reduction in plant productivity. While these changes are occurring rapidly, we have achieved some understanding of these ecosystems' structural and functional responses to these stresses in recent decades. Extensive research has been conducted on various aspects of environmental factors and their interactions with the biological systems unique to each habitat. These data bases should be used to formulate changes in regional and habitat- specific wetland management strategies. Such changes are needed to minimize the adverse effects on abiotic and biotic systems and to preserve these valuable natural resources while addressing the problem by finding solutions which are reasonable and cost effective.

LOW-FREQUENCY CHANGE OF THE BLACK SEA RIVER DISCHARGES ASSOCIATED WITH THE COUPLED OCEAN-ATMOSPHERE VARIABILITY IN THE NORTH ATLANTIC OCEAN
-(A. Polonsky, E. Voskresenskaya, D. Kadeev, A. Kolinko)

ABSTRACT

Interannual and interdecadal variability of discharges of four Black Sea rivers in 1921 to 1992 is examined. It is shown that a typical magnitude of low-frequency fluctuations of these discharges is the same as a typical amplitude of the seasonal cycle. They are mainly due to natural changes in the coupled ocean-atmosphere system. Predictability of the interannual and interdecadal fluctuations of the river discharges associated with sea surface temperature and atmosphere circulation anomalies in the North/Tropical Atlantic is discussed.

KEYWORDS: River discharge, interannual and interdecadal variability, coupled ocean-atmosphere system, sea surface temperature.

GEOMORPHOLOGICAL AND PHYSICAL ASPECTS OF THE ROMANIAN COAST. ASSESSMENT OF COASTAL CHANGE.

Iulian POSTOLACHE,
Danut DIACONEASA

Abstract.

The Romanian Black Sea coastline consists of several geomorphological areas grouped in two great zones:the delta of the Danube,consisting of alluvial sediments with extensive lowlands marshes and lagoons and a higher zone that consists mainly of ground cliffs interrupted by short beaches from place to place.

Excepting a small portion, Romanian Black Sea coast have a general direction from the north to the south. In terms of this feature wind from the north-east-south sector is the most important for wave generation and sediment transport mechanism at the Romanian littoral.

Annual repetead surveys along beach profiles show the extension of the erosion up to 60%-70% of the shore length and increasing erosion rates.

In the coastal zone many activities including industry, tourism, fisheries and agriculture are developed but they are threatened by coastal erosion. A lot of coastal protection works have been built. However it is quite clear that erosion has threatened them further.

KEY WORDS : Romanian Black Sea coast, wind climate, wave climate, shoreline monitoring, erosion, beach sediments, submarine relief, man's impact, coastal protection, coastal management

ABSTRACT :

"INTEGRATED MANAGEMENT PLAN: THE CASE OF RIAU PROVINCE, DISTRICT OF BENGKALIS"

PRIYONO B. E.

District of Bengkalis has a capital in Dumai, located mostly in the shore front of Eastern - Riau province, Sumatra. The district covers several islands which are spread out to Mallacca strait.

The per capita regional GDP including petroleum, gas, agriculture and other economic activities was Rp 4,076,000,- annually in 1989. However, if gas and petroleum excluded from this figures, regional GDP declined to Rp 834,000,- one-fifth from previous figure. That was the figure of income per capita for the farmer and small ccale fishermen living near inshore of Mallacca strait.

Since Dumai is famous as Caltex-Oil Refinery Harbour, while along the Rokan, Kampar and Mandali river the paper/pulp and plywood industries growing bigger these created conflicts among the user group. Degradation of water quality (caused by pollution from offshore drilling and paper/plywood industry) and deterioration of sanctuary natural resources, all of those issues stipulated the policy maker at National or Regional levels to introduced "The Development of Coastal Village (Desa Models) through Integrated Management Plan".

To improve the condition of Desa Models several steps were conducted by the government:

1). Feasibility study for developing Desa Models by the JICA in 1992-93. The study identify four desa models to develop,
- Desa Muntai develop as fishing village with special function as fish marketing center,
- Desa Sei Cingam develop as fishing village,
- Desa Pelantai develop mainly as a model of brackishwater and aquaculture village and,
- Desa Teluk Ketapang develop mainly as a model of fish processing village.

2). These four desa models according to FAO standard considered as poor coastal village (with the characteristic of income per capita of less than Rp 336,000 annually).

3). To avoid conflict among the user group, zoning all the economic activities and providing the Master Plan by the Governor.

4). The Governor coordinates the leading sector (i.e : fisheries activities) and other sectors to support the development of Desa Models in the areas.
- Objective of the activities is building the Center of the Development for enhancing the development of other sectors of the industry,
- Increasing local government income and income per capita of the local community,
- Increasing opportunity of works,
- Supporting the development of other sectors of the industry.

5). Select the development programs for the BLUE BOOK - BAPPENAS. (Bappenas is the National Institute for the Developing Planning). Those very powerfull institution for planning development in the country. Through the Blue Book - the activities is offered to donor country for implementation of the projects.

DYNAMICS AND CHANGES IN ESTUARINE SYSTEMS

Norbert P. Psuty

ABSTRACT

Estuarine systems are extremely dynamic portions of the coastal zone. Receiving inputs from the marine environment and from the continent, the estuaries are mixing zones that incorporate a wide range of temperatures and salinities, therefore a natural variety of ecological communities (Kennedy, 1984). Estuaries also have high economic value because they can support many uses and provide for many exploitative opportunities (Kennish, 1992).

Environmental conditions in estuaries are subject to many intrusions because of the surrounding land use and effluent that may be discharged into the waters. Further, continuing development along estuarine margins is driving a physical modification of the system and producing changes which are not easily accommodated.

Keywords: estuaries; sediments; sediment budget; sea-level rise; wetlands; coastal management; estuarine management

Prévision des effets de la marée sur la stabilité des pentes intertidales et perspectives de préventions

Aïssa REZZOUG Alain ALEXIS Pierre THOMAS

Résumé

Inclus dans le vaste domaine de la mécanique des milieux poreux, l'étude de l'écoulement dans les berges, les massifs et les pentes de rives, soumis à la marée constitue un thème de recherche jusqu'alors très mal connu. Ce thème complexe, marqué par l'importance de ses applications à l'aménagement des rives intertidales, présente un grand intérêt scientifique par son aspect interdisciplinaire à la frontière géotechnique-hydraulique.
Nous proposons une suite de résultats originaux sur ce thème:
• Proposition de premières expérimentations en nature, malgré de nombreuses difficultés liées à des contraintes naturelles ou matérielles, permettant de valider les modèles existant.
• Tester l'adaptation d'un modèle numérique, basé sur la théorie des milieux poreux non saturés, conçu par le Laboratoire Central des Ponts et Chaussées.
• Application de certains résultats obtenus, dans la mise en évidence des effets de la marée sur la stabilité des pentes intertidales.
Cette démarche scientifique interdisciplinaire menant de front expérimentation en nature et modélisation numérique a ainsi permis d'obtenir un ensemble de résultats originaux pouvant présenter un grand intérêt pour la connaissance du comportement des zones intertidales tout en ouvrant de nombreuses perspectives de recherche de préventions pour ces pentes.

Mots clés : sol - stabilité - pente - berge - intertidal - effets de la marée - milieux poreux - écoulement cyclique - modèle numérique - essais en nature - CESAR-LCPC.

Abstract

Included in the vast area of the porous media mechanics, the study of the flow in banks and slopes under tide effects, constitutes a theme of research up until now very poorly known. This complex theme, marked by the importance of its applications to the adjustment of intertidal banks presents a great scientific interest, by its interdisciplinary aspect to the common frontier of geotechnics-hydraulics.
We have been able to propose many original results on this theme :
• First field testing proposal, despite many difficulties linked to natural constraints or material ones, allowing to validate existent models.
• To test the adaptation of a numerical model based on the theory of the non-saturated porous media, conceived by the "Laboratoire Centrale des Ponts et Chaussées".
• Application of some obtained results in order to emphasize the tide effects on the intertidal slopes stability.
This interdisciplinary scientific approach leading experimentation front in nature and modelling, has thus permits to obtain an original results, being able to present a great interest for the knowledge of the behavior of intertidal zones while opening many perspectives of research of preventions for these slopes.

Key words : soil - stability - slope - bank - intertidal - tide effects - porous media - cyclic flow - numerical model - field test - CESAR-LCPC.

DU MODELE AU REEL, LA DIFFICILE GESTION DU LITTORAL DU GOLFE DU BENIN - (G. Rossi, A. Blivi)

RESUME

La côte du Golfe du Bénin, basse et sableuse, soumise à une violente érosion par suite d'une série d'erreurs d'aménagements, a fait l'objet en 1987-1988 d'importants travaux destinés à protéger sur 15 km la ville d'Aného et l'usine de phosphates de Kpémé, principale industrie du pays. La préparation de ces travaux de protection, rendus indispensables par la gravité des enjeux économiques et sociaux, a nécessité des études hydrologiques et sédimentologiques très détaillées, la construction et l'exploitation par un bureau d'étude spécialisé de deux importants modèles physiques (32 x 20 m) et de deux modèles mathématiques destinés à optimiser le dispositif de protection et à déterminer l'évolution du trait de côte sur une période de 25 ans. Dans le même temps, deux études appuyées sur plusieurs modèles mathématiques ont été conduites pour déterminer les impacts de la construction de deux barrages sur le Mono, avec la Volta l'un des deux pôles d'apports en sédiments au littoral.

Un suivi régulier de l'évolution hydrosédimentaire du littoral togolais étant réalisé par l'Université du Bénin depuis 1985, il est possible, aujourd'hui, de faire une première comparaison entre les prévisions des modélisations et l'évolution constatée en milieu naturel. Cette comparaison fait apparaître une bonne correspondance d'ensemble entre les prévisions des modèles et l'évolution en nature du tracé du littoral. Cependant, dans le détail de l'évolution secteur par secteur, se manifestent de sensibles divergences.

POSSIBLE FUTURE COASTAL EVIOLUTION OF THE NORTH BLACK SEA AND THE SEA OF AZOV COASTS UNDER GREENHOUSE-INDUCED SEA-LEVEL RISE: QUANTITATIVE ESTIMATES OF SHORELINE RETREAT AND RISK ASSESSMENT ANALYSIS

Andrei O.SELIVANOV

ABSTRACT

Comprehensive methodology for prediction of shoreline retreat under the sea-level rise according to different scenarios is proposed. The methodology combines the Bruun approach, an inclination-dependent and a rate-dependent model of coastal responses to sea-level changes. An economic risk estimate is expressed as a sum of property value and values of natural and cultural resources in the zone subject to danger due to shoreline retreat or temporary flooding. An assessement of anticipated losses of natural resources includes estimation of natural vulnerability to sea-level rise and value of resources on a per unit area basis. Medium-scaled map for the eastern Sea of Azov in the borders of Russia exemplifies the above approach.

KEYWORDS

Sea-level rise; coastal modifications; shoreline retreat; natural vulnerability; economic losses; response strategies.

THE MORPHOLOGICAL EVOLUTION OF SALTMARSH TIDAL CREEK NETWORKS IN THE DYFI ESTUARY, WALES - (Z. Shi)

ABSTRACT

Tidal creeks are arguably the most distinctive features of a saltmarsh. Numerous researchers have investigated the hydrodynamics within saltmarsh tidal creeks, and suspended sediment transport through a saltmarsh drainage basin. These studies have broadened our understanding of hydrodynamic processes and material exchange within the saltmarsh tidal creeks. The morphological evolution of saltmarsh tidal creek networks through time has received little attention.

The Dyfi Estuary is located on the central Cardigan Bay, Wales (Fig. 1). In the Dyfi, the mean spring tidal range (4.5 m O.D.) and the mean neap tidal range (3.4 m O.D.) are associated with strong tidal currents. The entire area (ca. 17 km^2) of the Dyfi Estuary is inundated at the highest spring high tides. It is funnel-shaped, but is restricted at the mouth by a beach-spit which extends from the southern side of the estuary. Behind the spit is an extensive area of saltmarsh fringing the southern side of the Dyfi, which is traversed by tidal creek networks. Obviously, the Dyfi could provide an example of the morphological evolution of saltmarsh tidal creek networks.

Air photos collected from five sources (Table 1) were used to reconstruct planimetric changes of saltmarsh tidal creek networks in the Dyfi Estuary (Fig. 2). In the Dyfi, there are at least four orders of tidal creeks following the order designation system suggested by Horton (1945). Rates of these changes have been evaluated with reference to creek length and creek density. Creek densities have been increasing during their development, ranging from 8 to 11 km km^{-2}. These suggest that the Dyfi tidal networks have in 24 years increasingly extended into the present saltmarsh study area.

These changes are mainly attributable to the instability of the main Dyfi tidal channel, flood and storm surges, saltmarsh vegetation, elevational differences of the estuarine intertidal zone, and sea level fluctuations. There are also complex interactions among these variables. Other less significant variables include the elevational difference, sediment composition of creek banks, sediment supply and sediment transport. The dispersal of tide and wave energies associated with storm surges is chiefly responsible for the morphological development of the Dyfi tidal creeks. The stage-prism asymmetry hydrodynamic model is applicable to explaining the Dyfi estuarine tidal creek development. A form-process feedback between the vertical growth of the Dyfi saltmarsh surface and the hydrodynamics of its network is also important in governing the Dyfi tidal creek network development. The expansion of the Dyfi saltmarsh tidal creek networks is one symptom of a rising sea-level that is potentially injurious to coastal wetlands. The rapid development of the Dyfi tidal network could result in the loss of the Dyfi estuarine wetlands.

EVOLUTION DES ECOSYSTEMES COTIERS ET OCCUPATION HUMAINE DANS UNE ILE SUBTROPICALE DU BRESIL

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L'île de Santa Catarina (27°37' lat. S.; 48° 27' long. O.; surface totale: 431 Km^2), située dans la région subtropicale du Brésil, et contigue à la côte, se caractérise par de vigoureux reliefs d'inselbergs granitiques qui ont dirigé la formation de petites plaines sédimentaires côtières. Des massifs dunaires occupent 11% de cette surface, des mangroves 14,7 %, et des lacs et des lagunes en connexion avec la mer 6,5%. Le littoral est caractérisé par un étroit plateau; long de 180 Km, il comprend 98 Km de plages (Fig. 1).

Le processus d'urbanisation, dans cette île, est surtout le fruit d'initiatives individuelles. A proximité des plages, l'implantation des infrastructures touristiques a pour résultat un déplacement des communautés de pêcheurs, auxquelles elles se substituent souvent. Actuellement, Florianopolis - capitale de l'Etat de Santa Catarina - héberge environ 300 000 habitants permanents; 60 000 autres résident dans les petits villages de pêcheurs. Le littoral de l'île reçoit en outre une population fluctuante d'environ 500 000 touristes durant les mois d'été (de novembre à mars).

Dans ce contexte, la diminution de l'espace littoral naturel devient critique; l'absence de stratégie locale entraine une modification anarchique de cet espace. Les écosystèmes de la zone côtière subissent des changements affectant aussi bien leurs composantes structurales que leurs processus fonctionnels (SIERRA de LEDO et KLINGEBIEL, 1993). On observe ainsi une diminution de la biomasse et de la biodiversité dans les mangroves et sur des dunes; un remblaiement partiel des baies et des lagunes; l'altération de la qualité des eaux et des sédiments par des pollutions organiques et des métaux lourds déterminant des processus de biomagnification sur certaines espèces de la faune aquatique (QUEIROS et al., 1994). Au cours des cinq dernières décades, on a constaté l'élimination de 76% de la végétation endémique, la suppression de 10 Km2 de dunes et une réduction de 42% de l'aire initialement occupée par les mangroves (SORIANO-SIERRA et al., 1993).

Face à ces aménagements irrationnels, les Institutions gouvernementales élaborent des mesures de règlementation et de police, ainsi que des programmes de restauration de la qualité de l'environnement, complétées par la création d'espaces protégés à vocation de "Réserves biologiques ". Le plan d'Aménagement Urbain du municipe de Florianopolis prend maintenant en compte la composante environnementale et la préservation des écosystèmes côtiers.

En réponse aux besoins de connaissances manifestés par les Pouvoirs publics qui ont la capacité juridique à mettre en oeuvre les moyens d' une gestion rationnelle de ces environnements littoraux et de leurs ressources, une équipe pluridisciplinaire de l'Université Fédérale de Santa Catarina et de l'Université de Bordeaux 1, développe une étude intégrée (SIERRA de LEDO et KLINGEBIEL, 1994) qui est une partie du "Programa Institucional de Estudos de Sistemas Costeiros" (PIESC) et la Communauté Européenne (C.E., Programme de coopération Europe-Amérique Latine).

MISE EN PLACE D'UN SYSTEM D'INFORMATIONS GEOGRAPHIQUES POUR LA GESTION ADMINISTRATIVE ET LE SUIVI ENVIRONNEMENTAL DU BASSIN D'ARCACHON DANS LE CADRE DE L'ETUDE INTEGREE D'IFREMER

RESUME

Le Bassin d'Arcachon est une zone particulièrement complexe d'un point de vue aménagement où cohabitent dans la zone littorale conchyliculture, pêche, plaisance et tourisme d'une manière générale. C'est pour cette raison que la station de l'Institut Français de Recherche pour l'Exploitation de la MER (IFREMER) à Arcachon a reçu la mission d'une *"étude intégrée"* devant réaliser la compilation de l'ensemble des données disponibles, faisant appel à un Système d'Informations Géographiques. Ce système permet un croisement d'informations de natures différentes qui facilite l'analyse des phénomènes et les prises de décisions dans le domaine de l'aménagement du littoral. La nécessité d'une telle gestion est renforcée par la rapide évolution morphologique du bassin qui implique une mise à jour régulière des documents à la source des études techniques et scientifiques portant sur le site d'Arcachon.

ON DYNAMIC MARGIN OF COASTAL ZONE - (Nikolai S. Speranski)

ABSTRACT

This study is an attempt to formulate the definition of coastal zone as dynamic system and to estimate the position of its outer margin on basis of data about the typical processes. The main process considered is the cyclic motion of sediments when sediment particles move alternately as bedload and suspended load. The point where Ursell number is equal to 16 is proved to be outer margin of stable cyclic motion. This point is accepted as margin of coastal zone. Some features of undertow flow are considered to demonstrate that coastal zone defined is a semiclosed system.

Key words

coastal zone, dynamical margin, silt line, wave shoaling, nonlinear effects, high harmonics, Ursell number, undertow flow, bedload transportation, skewness.

Long-term Shoreline Change in Japan

Shigenobu TANAKA

ABSTRACT

In Japan, damages due to beach erosion have increased in recent years. Changes in the coastline of whole Japan were investigated by comparison of topographical maps. It results in that a net loss was 5,059 ha in 70 year period before 1978 but 2,395 ha in 15 year period after 1978. An annual net loss rate had been 72 ha per year before 1978 while it grew 160 ha per year after 1978. Erosion was severe in Hokkaido and along the Japan Sea in both former period and latter one. A comparison of the erosion rates and crustal movements shows that the crustal subsidence in Hokkaido was favorable to the severe erosion while the crustal movement on the Japan Sea coast was of slight uplift and it did not support the erosion. Primary cause of long-term and overall erosion was considered to be a net offshore sand drift.

KEYWORDS: Beach Erosion, Comparison of Topographical Maps, Crustal Movement, Offshore Sand Drift

COASTAL MORPHOLOGICAL CHANGES CONCERNING THE MANAGEMENT OF COASTAL ZONE IN VIETNAM - (Tran Duc Thanh)

ABSTRACT

Some last decades, coastal morphology of Vietnam has been changed deeply by the deposition and erosion processes. It can be distinguished 8 types of coastal morphological changes (CMC). They have been created by the both natural evolution and human activities direct and indirect. Recently, the unusual changes in meteorology, hydrology and sea level rise have taken an important role for CMC. Apart from the increase of the land resource in the deltas, most of CMC has made the negative impact on coastal inhabitants, economy and environment. Linked with CMC there have existed the serious coastal risks such as floods and inundations, erosion and port siltation. CMC is very important for the social-economic development of a developing country as Vietnam.

Key Words: morphological changes, coastal zone, natural evolution, erosion, deposition, human activities, management, environment, risks, floods and inundation, siltation, tropical feature, Vietnam.

LOW-FREQUENCY VARIABILITY OF THE BLACK SEA DIVER DISCHARGE ASSOCIATED WITH THE COUPLES OCEAN-ATMOSPHERE VARIABILITY IN THE NORTH ATLANTIC OCEAN (F. Voskresenskaya, A. Kadeev, A. Kolinko, A. Polonsky)

INTRODUCTION

It is well know that the coupled ocean-atmosphere variability on a globe manifests itself in the regional low-frequency variation of difference hydrometeorological fields (e.g., Polonsky and Sizov, 1991). In particular, year to year and trend like variability of the river discharge is due to the low frequency processes on a globe. The goal of this paper is to study the inter-annual and trend-like variability of the Black Sea river discharge in the 20th century associated with global variability of the coupled ocean-atmosphere system.

DATA AND PROCESSING PROCEDURE

We used monthly river discharges from January 1921 to December 1992 from Hydrometeorological Service (Kadev and Kolinko, 1992), monthly sea/surface temperatures in regular 5 degree grid in the North Atlantic from January 1957 to December 1990 and monthly magnitudes of the North Atlantic Oscillation index in 20th century (Polonsky and Sizov). The river discharges of Dunay, Dnepr, Dnestr and Uzhny Bug will be analyzed below. At first, the average annual cycle of each analyzed parameter and monthly anomalies were calculated. Then, the trends and spectre of all monthly series were estimated. Finally, the correlation of SST anomalies, NAO index and river discharge anomalies for various lags were calculated.

RESULTS AND DISCUSSION

The trends of all rivers (except Dnepr) discharges are positive after the Second World War. We revealed also the SST decreasing in high-latitudes and tropical Atlantic and SST increasing in mid-latitudes. Concurrently, the magnitude of NAO index drops. Thus the trends of the SST and heat fluxes over the North Atlantic damp the low troposphere warming through the negative feedback. They cause also the Black Sea River discharge increasing. Year-to-year variability of all analyzed parameters manifest itself as superposition of both quasi-biannual and 4-6??? fluctuations. This is due partly to ENSO-type variability. However, the own North Atlantic variability occurs as well. It is responsible for about 50% of total year-to-year variance of the NAO index. The correlation coefficient of SST anomalies in the N.W. Tropical Atlantic and mid-latitudes and of river discharges anomalies reach 0.6. Unfortunately, the statistical structure of the time series is unsteady. It means that the simple forecast of river discharge anomaly is next to impossible, in spite of lead of the North Atlantic anomalies.

STUDY FOR IMPROVEMENT OF HYDRAULIC CONDITION OF POLDER AREA IN THE COASTAL REGION OF BANGLADESH BY DEVELOPING A MATHEMATICAL MODEL FOR POLDER AREA OF THIS REGION - (Wahiduzzaman)

ABSTRACT

Hydraulic condition of polder areas in the coastal region of Bangladesh have been changed due to siltation of rivers connected with these polders. Computer based one dimensional mathematical model has been performed for study the improvement of hydraulic condition of the polder areas. The results show the potential of mathematical model for evaluating the impacts of human interferences and other factors on the flow regime of river system along with polder areas. A mathematical model consitutes a useful computational tool for the integrated development, control and utilization of water resources.

CALCULATION OF LONGSHORE SEDIMENT TRANSPORT RATE

Shang-yi Wang ①(M.ASCE, M.AGU)

ABSTRACT

Adopting M.S.Longuet-Higgins and P.D.Komar's research achievements to determine the velocity field and basing on the conception of sediment motion under the wave and current with which the equation of the capacity of sediment transportation was set up. And according to the different composition of the wave and current, the calculation of longshore sediment transport rate is gradually carried on.

Finally, combining the examples to compare with E.W. Bijker's, Xie Shileng-Liu Defu's and the American Coastal Engineering Research Centre (CERC)'s calculation achievements as well as simultaneously according to the field data of Nouakchott coast, Mauritania, Golden Sand Beach of Bulgarian Black Sea and M-P Beach of Shan-Dong Province, China, the preliminary checking verification is carried on and it appears that the theory and the method of calculation of longshore sediment transport rate in this paper is feasible.

PLAIN COAST CHANGES; HUMAN IMPACTS AND RIVER-SEA SYSTEM CONTROL-EXAMPLES FROM CHINA - (Ying Wang)

ABSTRACT

Plain coasts are developed 2,000 km long margining the river delta in China. With 0.9-1.2 billion tons fine sediment supply annually to the coast water, the adjacent coastlines are prograding rapidly to form a gentle coastal slope, and tidal flats are well developed as the wave dynamic is minimal on shore, and the tidal processes are predominant.

Plain rivers shift in the course often, the Yellow River has experienced eight major changes in its lower course since 2278 B.C., discharging either into the Bohai Sea or into the Yellow Sea via the Huai River. The shifted distances between north and south were more than 600 km long. Two major migration were created artificially as a result of military activities.

In 1855, the Yellow River changed its course from the Yellow Sea back to the Bohai Sea. A fan-shaped delta has been formed with coastline as 160 km long, and the total progradation of coast has been 20.5-28.0 km, *i. e.* 23.5 km^2 of land have been accumulated each year. Tidal flats are developed widely along the coast of the Bohai Sea. The abandon Yellow River mouth is in the north Jiangsu along the Yellow Sea. Total of 1,400 km^2 land along 150 km long coastline has been lost since 1855. Mudflats have been eroded, and shell beach ridges (chenier) have been accumulated by break waves along high tide line. Coastal environment and developing trend have been changed completely, as the plain coast shows the dynamic balance between wave dynamic and sediment supply of the coastal zone. Along the coast of China, sediments are mainly from river discharges. The fine material of fine silt and clayey-silt deposited along above plain coasts, were mainly brought by the Yellow River from the loess plateau as a result of soil erosion caused by human activity since historic time.

Short term example such as to divert the Luanhe River water for fresh supply to the larger cities since 1980. As a result, the annual sediment discharges decrease to cause the coastline of Luanhe River delta retreats and the salt water intrusion changing the salinity in the delta area. To solve one side problem causing other even serious problems as the River-Sea is a close related system. People should pay great attention to setting up an harmonic relation between human activity and natural environment.

Shoreline Changes at Middle-Western Coast in Taiwan

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ABSTRACT

Due to destroy from nature and human force, there show that the shoreline of InLin and ChiaEi occurred many erosions. Shorelines of InLin coast were eroded backward about 100 m at some local place from 1904 to 1987; The average change speed of Shorelines at ChiaEi coast, is -18.45 m/year in recent ten years. The sand bars that locate outside the coast of InLin and ChiaEi are unstable and they are eroded by wave and wind gradually, and some sand bar was temporary disappeared or submerged under the mean sea water level, such as HaFon bar and TonSun Bar, etc. A largest and famous bar as WhySunDean bar has a position shifting toward the east-southern direction. The maximum shifting velocity is about 0.65 m/year ~ 1.15 km/year; Maximum sand volume losing is about 4×10^6 m^3.

keyword: shoreline sand bar, wave, erosion, accumulation, submerged, sediment transport

Aspects of Physical and Cultural Parameters Associated with Coastal Zone Management along the Ceredigion Heritage Coast, Wales, UK.

A T Williams
R Morgan

Abstract

The Ceredigion Heritage Coast (CHC), Wales, UK comprises some 34 km of coastline and is a major tourist attraction to the area. Some 45 Heritage Coasts currently exist in England and Wales occupying 34% of the coastal fringe. The prevailing philosophy of such areas is to conserve for posterity beautiful stretches of natural coastlines. This is achieved by low key management approaches incorporating community involvement and the leaving of land in public ownership. Utilisation of the Tanner abc model indicated several 'high and low' beaches together with fifteen sediment cell distributions. Active erosion sites were compared to sites postulated by wave refraction models and a correlation was found. Seven beaches were studied in detail as these form the economic heart that has been part and parcel of the tourism fabric in this sector of Wales. These beaches were Aberporth, Tresaith, Llangranog, New Quay, Cei-Bach, Aberaeron and Aberystwyth. These were all 'high' beaches. In addition 1053 visitors at these beaches were questioned regarding beach visit patterns. Beach visitors came from a wide area (54% outside Wales, with the West Midland region of England being the major component) and infrequent visits - less than 5 times per year - were the rule. The car was the most popular form of transport (79%) and the caravan (trailer) the most popular form of accommodation (47%). People over 40 years of age, tended to stay at the larger towns of Aberystwyth and Aberaeron in hotels and guest houses. Eighteen percent of the visitors were classed as Socio-economic Status group 1, i.e. the professional class. Awareness of the fact that the area was a Heritage Coast was low (40%). This could be a result of the low key management approach and the fact that coastal visitors originated from a wide inland hinterland. Escalating pressures of pollution, fishing, leisure, conservation and farming are all interlinked. Sunbathing, swimming, children's play all take place around the beach fulcrum and it is the stability, cleanliness of the beach, beach facilities, that determines a major part of the economic prosperity of the area. Coastal zone management is vital for this area as it helps resolve conflicting issues associated with the coastal zone. For effective management, information about the natural and cultural processes (e.g. sediment cell circulation and tourism), at work in the region are imperative.

MONITORING AND PREDICTING LONG TERM SEA LEVEL CHANGES - (Philip L. Woodworth)

ABSTRACT

In the last decade, great efforts have been made to put in place a strategic system for monitoring global sea level changes. This system called GLOSS (Global Sea Level Observing System), is co-ordinated by the Intergovernmental Oceanographic Commission and its development has been aided by great improvements in tide gauge techniques. In satellite radar altimetry and in measuring vertical land movements by means of advanced geodetic methods. Some of these recent developments will be reviewed in this presentation.

In parallel, over the last decade it has been realized that there is a need to understand as far as possible the observed rise of global sea level of order 1-2 mm/year during the past century and to be able to make meaningful predictions about global sea level for the next century. A large part of this study is co-ordinated by the Intergovernmental Panel on Climate Change (IPCC) which is at present conducting a updated review for publication in 1995. Recent findings from the IPCC study, so far as they are available by the time of the meeting will be discussed.

EVOLUTION AND LONG TERM MORPHO-DYNAMIC RESPONSE IN A SPECIAL TYPE OF ESTUARY

ABSTRACT Thousands of rocky hills and islands scattered in the Pearl River delta plain and the adjacent coastal waters in South China have been or will be acted as deposition nucleus during the evolution process of the delta. Huangmaohai estuarine complex consists of two of the eight major outlets of the Pearl River system. Since sea level reached the present level approximately 6,000 years ago, especialy in the last 250 years, Huangmaohai estuarine complex has progressed to the sea by filling up the sea inlets formed between these rocky islands and between mainland and islands. This *'filling up'* process left deep imprints on the long-term morpho-dynamic equilibrium in the estuaries. The present paper reveals that the long-term morpho-dynamic relation originated from this *'filling up'* process in Huangmaohai estuarine complex is different from that in many coastal plain estuaries in several aspects: (1)longitudinal variation of estuary width, (2)longitudinal variation of tidal range, (3)unique combination of small scale dynamic structures,(4)bi-directional jet systems, and (5)velocity field and turbidity maximum.

EVOLUTION OF THE SEA OF AZOV EASTERN COAST UNDER THE INFLUENCE OF ANTHROPOGENIC STRESS

Yesin N.V.*, Ivanov A.A.**, Kos'yan R.D.*

Abstract

Recently a man economic activity in the basin of the Sea of Azov results in a sharp change of the conditions of coast evolution. Ancient accumulative forms which were steady for centuries began to destroy. A problem of coast protection from the wave erosion appeared. The main reason of recession of the shores under study lies in decrease of deposits arriving into the coastal zone from the Kerch strait bottom and carried by the alongshore flow from the Kuban river delta. A scheme of the spits rescuing and of its coast protection is suggested on the basis of results of complex study of the eastern coast of the Sea of Azov.

Keywords: anthropogenic impact, beach nourishment, beaches, coast protection, coastline evolution, degradation, ecology, Kuban river delta, sediments, Sea of Azov.

RECENT PLAIN COASTAL CHANGE ON THE EASTERN CHINA - (C. X. Yun)

Abstract

About 1/10 of sediment load entering into the sea ($2x10^{11}$ tons yr^{-1}) resulted from soil erosion in the world comes from the mainland China. Annual sediment load of the Yellow and Changjiang Rivers can reach $1.6x10^{10}$ tons. Over the last several millennia, those sediments have been transported, dispersed and deposited along the east China coasts, resulting in the formation of the extensive estuarine deltaic plain and intertidal mudflat. During the last several hundreds years, especially since the establishment of the New China, the rapid growth of population, the establishment of harbour, city, industry and fishery in the coastal areas, and the increasing rate of reclamation, have caused the dramatic change in the coastal ecological environment.

1. Characteristics of the plain coastal change

(1) Deltaic plain coast: Coastal erosion and accretion are controlled by the shifting of river mouth entering into the sea and the distribution of water and sediment. The former is represented by the Yellow River delta, while the latter is represented by the Changjiang delta. The estuarine sedimentation has played an important role in this type of coast.

(2) Tidal deltaic coast: Its development is based on the abandoned delta and strong tides effects. The predominant factors are the diversion of the large river channel and the building blocking water and sediment loads landward. The geomorphic features are characterised by the radiated tidal inlets and tidal ridges. The development of the radiated sandy shoal in the northern Jiangsu Province and the formation of the estuarine tidal inlets in the Yalu River represent the different stages of the land-ocean interactions along this type of coast.

(3) Embayment muddy coast: Its initial configuration was controlled by the Post-Glacial sea level rise, later by the dispersion of the sediment load from the large rivers entering into the sea nearby coastal waters and the infilling of the sediments from the small rivers within the bay, resulting in the development of the intertidal mudflat. This type of infilled coast is mainly distributed along the Bay of Liaodong, Bay of Hangzhou and coastal areas in the eastern Zhejiang Province.

METHODS FOR THE ESTIMATIONS OF MARINE PARAMETERS IN COASTAL ZONE -
(Oleg I. Zilberstein, Guennady F. Safronov)

ABSTRACT

In the State Oceanographic Institute a complex of models is developed for the estimation of marine environment characteristics of hydrometeorological phenomena including long return period values. Hydrodynamic models and stochastic models are used as core components of the system. The complex is based upon threshold value method alongwith the binary exponential law and Langbein's relationships. Extremal characteristics of surge level and currents as well as total sea level and currents within coastal regions where observations are scarce or lacking completely are calculated by hydrodynamic models for most extreme storms recorded during the period of observations.

The method was applied for some platforms feasibility study on the Sakhalin shelf and in the south-eastern part of the Barents Sea for design of underwater gas pipeline crossing of the Baydaratskaya Guba Bay in the Kara Sea.

Keywords: storm surge, tidal wave, coastal zone, shelf, hydrodynamic modelling, sea level, total current, extremal characteristic long return period.

ANNEX III

OPENING SPEECHES

A: Gunnar Kullenberg, Secretary IOC

Mr. President, Ladies and Gentlemen,

I am pleased and honoured to participate in the opening of the International Conference on Coastal Change here in Bordeaux and to make a few opening remarks. Mr. Badran, The Assistant Director-General for Science, has asked me to express his regrets that he is unable to be present.

First of all, I would like to thank the Region d'Aquitaine for its support to the Conference. I know that for a very long time Bordeaux has been oriented towards the sea and coastal problems. Indeed, it is a coastal town. The Aquitaine coast represent a particularly interesting model of a coastal zone, offering a lot of diversified and changing littoral systems. This is probably one excellent reason to explain the specific efforts which have been carried out during the last twenty years to provide support to oceanographic research and to initiate and develop BORDOMER meetings. BORDOMER is now a very well known event within the oceanographic community and I know that the last meeting - BORDOMER 92 - was very successful. I am sure that BORDOMER 95 will be equally successful. We have here an example of co-operation between a national, regional body (Aquitaine) and an intergovernmental, global body (IOC), sharing experiences.

Two years ago, taking advantage of this interesting background, The City of Bordeaux proposed to IOC of UNESCO to support and to co-organize the International Conference on Coastal Change that the IOC Assembly decided to organize as a follow-up to UNCED, within the framework of the IOC programme on OSNLR. Information about OSNLR and other IOC programmes/projects is provided in the poster exhibition organized here.

Why then do we have this Conference? An improved knowledge of coastal/ocean ecosystems is a pre-requisite for more effective decision-making and sustainable development of coastal zones. This was clearly stated in the UNCED proceedings, the Integrated Coastal Area Management Programme (ICAM) needs to be based on a more complete understanding of how the marine systems function, an ability to predict how the systems will respond to various activities and some idea of the probable effectiveness of alternative management techniques. This need for action in the face of an inadequate information base is an increasing source of conflict between scientists and managers. Coastal systems are highly variable, evolutive and complex including from the scientific point of view. It would be unsatisfactory to over-simplify them. The manager, for his part, needs straightforward advice on how to improve fisheries stocks, where to construct a port facility, on efforts of pollution control or how to reduce pollution, which should be given on a scientific basis. Oceanography can now provide management tools in the form of systematic observations, data assimilation and modelling for analyses of management options. The coastal module of GOOS is aiming at this.

If the scientific input is to become an integral component of ICAM, a compromise is in order. Managers must clearly state their needs and objectives, define funding and time limitation. Scientists, on their part, must recognize that detailed scientific studies will not always be practicable as a precursor to most coastal management decisions. Thus we need to increase and strengthen the dialogue between science (natural and social), management and decision-making.

Also, coastal zones, rich in natural and cultural resources play an important role in the lives of the people. Nowadays, over 60 percent of the world's population live on the coasts, and the natural habitat of these zones have been under stress due to human activities. The resulting environmental detriment is becoming obvious to the flora and fauna of this narrow band of land where the ocean meets the continent. The damage taking place in the shallow waters and on the shore is in some instances irreversible. It is here on the coastal zone that we need the inputs of social scientists and natural scientists, as well as economists to address the interaction of man with nature and develop a management model to overcome the pressure and the stress caused by the various users of the coastal zones.

One obvious result of the UNCED Conference (Rio de Janeiro 1992) has been an increased awareness of the importance of the coastal marine environment and its socio-economic significance. In this context, it has been recognized that international organizations, and particularly UNESCO and the Intergovernmental Oceanographic Commission, play a critical role in the development of scientific knowledge concerning the coastal zone and its resources. Furthermore, UNCED underlined that coastal erosion and siltation are of particular concern for coastal states. In this context I wish to refer to GLOSS - Global Sea Level Observing System - providing sea level observations and interpretations for applications.

Therefore, as part of the follow-up to UNCED, UNESCO has decided to launch in the next biennium, 1996-1997, a new Interdisciplinary Project which has been included in the Medium Term Strategy for 1996-2001. This Interdisciplinary Project on Coastal Regions and Small Islands will provide a framework for co-operative activities on coastal zones and small islands between the International Geological Correlation Programme (IGCP), the International Hydrological Programme (IHP), the Intergovernmental Oceanographic Commission (IOC), and the Man and the Biosphere Programme (MAB) as recommended in the Joint Statement of the Chairpersons of these four intergovernmental undertakings to the 27th session of the General Conference. The social sciences will be integrated in the Project through the Programme on Management of Social Transformations (MOST). Moreover, the Project will take into account the experience obtained during the last decade of the Coastal Marine Project and associated activities. In addition, the Project will take advantage in its activities of UNESCO's specific position at the interface of education, natural and social sciences, culture and communication, using a holistic approach to address sustainable development of coastal regions, as recommended in Chapter 17 of Agenda 21 (UNCED 1992) and in the Programme of Action of Sustainable Development of Small Island Developing States (Barbados 1994). Another important development of IOC, WMO, UNEP and ICSU concerns the establishment of the Global Ocean Observing System, also as a response to UNCED.

The Project aims at enabling Member States of UNESCO and IOC to introduce integrated coastal zone planning and management as a means towards sustainable development. To this end, the Project will collaborate with relevant organizations of the United Nations system, governmental agencies, competent non-governmental organizations, municipalities, local authorities, and will follow a participatory approach that will also involve concerned local populations. In the UN system there is a special body on oceans and coastal areas involving all relevant UN-related bodies

UNCED invited coastal states to co-operate in the preparation of international guidelines for integrated coastal zone management and development and, moreover, recommended that a global conference to exchange experience in this field could be held before 1994.

The IOC Assembly decided to organize this Conference in co-operation with BORDOMER as a response to UNCED, and the activity is seen as one of a series of actions of IOC in a follow-up to UNCED.

The present Conference will provide a valuable opportunity for scientists and managers to exchange information and experience and to offer advice on how the assessment and control of the evolution of the coastal zone might be improved and made more easily available. As the action plan to organize the Conference was formulated at the request of the IOC Assembly, I am pleased to see that this plan was successful. I invite you all, during the coming week, to ensure the final success of this plan.

Thank you for your attention.

B: Antoine Rufenacht, Président de l'Association des Elus du Littoral (ANEL), Président du Conseil Régional de Haute-Normandie, (Résumé de l'allocution de M. Rufenacht)

L'Association Nationale des Elus du Littoral a été créée pour répondre au besoin de définition d'une politique nationale à la fois globale et spécifique de gestion du littoral. Cette action rejoint celles de grands organismes internationaux comme l'UNESCO ou l'OCDE visant à une développement économique durable de la zone côtière. Historiquement, l'imbrication de l'économie maritime avec son hinterland côtier a eu des conséquences déterminantes sur le destin des nations. Au plan géographique les océans couvrent 70% de la surface du globe et bordent les trois quarts des Etats Membres de l'ONU. Au plan économique, 80% du commerce mondial emprunte la voie maritime. Corrélativement, les zones côtières connaissent une pression démographique croissante. La France n'échappe pas à ce constat; même si le phénomène est moins sensible qu'ailleurs, la densité de population à la côte y est 2,5 fois supérieure à celle de la moyenne nationale.

1. UNE ECONOMIE EN MUTATION

Pêche, construction navale, transports maritimes et entreprises de services et de transformation ont longtemps constitué les domaines d'activité du littoral français. Depuis les années 60, l'économie touristique est venue compenser les difficultés rencontrées par ces activités traditionnelles. Des statistiques récentes indiquent qu'au total 670.000 emplois sont générés directement par les activités maritimes.

Les mutations de la pêche, du transport maritime, de la construction navale ont entrainé des mouvements sociaux importants. Du fait de la forte pression démographique qui règne dans les régions cotières, les conséquences sont préoccupantes pour les collectivités du littoral. Les ports français représentent un enjeu économique majeur puisque 50% du commerce extérieur national transite par les ports. Ceux-ci sont des lieux d'implantation privilégiés d'industries de transformation et d'aires de stockage en vue de la distribution des marchandises. Ils sont par ailleurs créateurs de 250.000 emplois directs ou indirects.

Les ports ont subi des difficultés d'adaptation nombreuses et qui ont nécessité une réforme de l'organisation de l'emploi. Par ailleurs, l'intégration de la notion d'hinterland par les pouvoirs locaux et nationaux permet de mieux répondre à la demande de transport combiné et de faciliter le raccord des ports aux grandes voies de communication reliant entre elles les villes industrielles européennes.

L'évolution inquiétante du **transport maritime** sous pavillon français (divisé par trois, alors que les échanges maritimes ont globalement augmenté de 60% depuis dix ans) a entrainé une diminution de moitié du nombre de marins français et une réduction de 2,4% à 0,9% la proportion de la flotte française dans le contexte mondial. Corrélativement, la **construction navale civile** vit une crise profonde.

La **pêche maritime** se trouve marginalisée, les effectifs de marins embarqués passant de 18.000 en 1986 à 14.000 maintenant et, encore, dans des conditions précaires.

Au total, ces exemples montrent à l'évidence que l'économie littorale souffre d'un manque de politique volontaire et surtout que les effets négatifs s'étendent à l'ensemble du tissu économique qui innerve les communautés des zones côtières. Le développement d'une économie touristique vigoureuse ne compense qu'en partie les régressions énumérées ci-dessus et créent par ailleurs des contraintes de plus en plus lourdes à supporter au niveau des dépenses publiques et privées.

Conscients de la dimension de la tâche, les pouvoirs publics et les collectivités territoriales se sont mobilisés pour imaginer des politiques adaptées à la variété des problèmes et à l'enjeu géopolitique.

2. UNE POLITIQUE D'AMENAGEMENT QUI SE CHERCHE

Le rapport Piquard, premier document français de synthèse concernant le littoral (1973), a conduit à l'élaboration des Schémas d'Amémagement du Littoral et des Schémas d'Aptitude et d'Utilisation de la Mer puis, récemment, au Schéma de Mise en Valeur de la Mer (SMUM). L'idée maitresse était de définir un territoire littoral géographiquement pertinent pour y pratiquer une étude approfondie des activités devant se répartir dans l'espace considéré. L'objectif à atteindre était d'éviter les conflits dans l'utilisation de l'interface terre/mer partagé entre différentes activités parfois antagonistes.

Ces schémas ne préparant pas à une vision d'aménagement d'ensemble à l'échelle d'une façade maritime, le Législateur a adopté en janvier 1986 la loi LITTORAL dont certains **effets pervers** sont apparus par la suite. La philosophie de cette loi était d'affirmer un nécessaire équilibre entre les impératifs d'un développement économique souhaitable pour l'homme et une protection efficace des écosystèmes littoraux. En fait, la jurisprudence des tribunaux administratifs a, par la suite, presque systématiquement privilégié l'aspect protection au détriment du développement économique.

Les acteurs économiques telles les collectivités locales de dimension régionale allant du nord d'Angleterre au sud du Portugal, se sont mobilisés et ont créé **l'Arc Atlantique**. Le but est de contrebalancer le poids de l'Axe dit LOTHARINGIEN passant de Londres à la Ruhr et descendant vers la Lombardie en marginalisant les pourtours européens marins.

Ce regroupement a incité d'autres régions maritimes à constituer des synergies, encouragées en cela par la Loi d'Aménagement du Territoire votée en janvier 1995. Cette volonté devrait permettre l'émergence à moyen terme d'une politique de développement et d'aménagement du Littoral où l'Etat et les Collectivités Locales seraient des partenaires égaux.

3. PROMOVOIR UN DEVELOPPEMENT DURABLE

Tout développement passe par la préservation de l'environnement et à cette fin des **outils** revêtant des aspects juridiques, techniques ou institutionnels **ont été mis au service de la protection**.

De 1985 à 1995 ont été identifiées des milliers de zones naturelles d'Intérêt Ecologique Faunistique et Floristique (ZNIEFF) ayant un interêt particulier pour la conservation de la diversité biologique, notamment des zones côtières.

La protection par maitrise foncière a permis au Conservatoire National du Littoral et des Espaces Lacustres de voir le jour. Il acquiert et remet en état des terrains qui représentent aujourd'hui 41.000 Ha, et 5.500 km de linéaires côtiers; l'objectif est d'atteindre la maitrise de 30% du littoral.

Des protections conventionnelles et contractuelles concernent plus particulièrement l'agriculture qui couvre 40% de l'espace littoral.

Enfin, aujourd'hui, la politique du Ministère français de l'Environnement se concentre sur la protection des paysages et des zones humides dont chacun sait la grande utilité écologique.

ANNEX IV

INFORMATION ON OTHER ACTIVITIES

(i) IOC EXHIBITION

An exhibition, entitled "International Co-operation in Marine Science", was displayed at "Coastal Change '95"; on the invitation of the local organizers, it was prepared by the Publications and Public Information Unit of IOC/MRI, UNESCO, and co-sponsored by the Aquitaine Region (BORDOMER Organisation). This exhibition brings together materials, which have been prepared over the last few years, into a summary or "bird's-eye" view of the actions and mandate of IOC and UNESCO in marine science and related subjects. It briefly describes representative programmes and other activities in which the IOC and its partners are involved. In addition to activities that are implemented or coordinated by the Commission, a certain number of panels brought attention to activities carried out by Member States within the IOC's objective of achieving an international ocean partnership.

The exhibition consisted of a series of about 60 panels, including some oceanographic charts, display cases with selected documents, computer demonstrations of a CD-ROM on coastal management, videos etc. Housed on the ground floor of the "Hôtel de la Région" (site of the conference), the exhibition was also open to the public during the entire week of the "Coastal Change '95". For the event, a 22-page brochure was prepared in French by the above-mentioned unit of IOC-UNESCO and reproduced by BORDOMER in some 1,000 copies (which supply was completely exhausted). The total number of visitors could probably be estimated as at least 2,000.

This exhibit was previously displayed at the Second International Conference on Oceanography (Lisbon, 14-19 November 1994), and an invitation has been extended by the Spanish organizers to display the exhibition, with the sponsorship of the University of Las Palmas, during the Fourth Session of IOCEA (Las Palmas, Gran Canaria, Spain, 8-12 May 1995).

As well, it is planned to display the ensemble of materials, with some additions, during the Eighteenth Session of the IOC Assembly (Paris, 12-27 June 1995). Any suggestions as to further enhancements may be directed to Mr. Gary Wright, Editor, IOC/MRI, UNESCO. The objective is to continue to develop a fairly complete exhibition, which carries the message of the IOC and its partners and which can be transported on invitation to various major oceanographic events. Since budget limitations have to be respected and a certain amount of funding is always needed for this type of exercise, co-sponsorships are appreciated.

(ii) INTERNATIONAL ACCOMPANYING SESSIONS

(a) Espaces Côtiers, risques naturels et technologiques - 7 février 1995, 16.30

Présidée par:

J. P. MASSUE, Conseil de l'Europe, Secrétaire Exécutif de l'accord partiel Européen ouver relatif aux risques majeurs

Animée par:

Professeur F. DOUMENGE, Directeur du Musée Océanographique de Monaco

Avec la participation de:

- Professeur M. AUBERT, Président du Conseil Scientifique du CERBON (Nice)
- Professeur J. C. FLAGEOLLET, Centre Européen sur les risques géomorphologiques (Strasbourg)
- Madame B. AUDRAN, DDE du Morbihan (Vannes)
- Mr. A. MICALLEF, Directeur European Centre on Insular Coastal Dynamics, Foundation for International Studies (Valetta-Malte)

- Mr. S. V. LATOUKHOV, Chef du Département "Securité de la vie sur les mers et la protection de l'environnement - Académie Maritime d'Etat (Makarov-St. Petersbourg)
- Dr. Katarina V. NIKONOROVA, Ass.Professeur at the Noosphere and Ecology Institute Women's Environeemental Management (Moscow)
- Mr. G. CANNIZZARO, Telaspacio Nuovo (Rome)

(b) International and Regional Programmes and Organizations - 7 February 1995, 16.30-19.00

Chairman:

P. COOK: OSNLR Programme

C. C. E. HOPKINS: Some ICES activities in the Coastal Zone
Environmental Impact Assessments

H. HOTTA: Technological Development for the Effective Utilization of the Coastal Sea in Japan

M. INSULL (FAO): FAO Plan for Integrated Coastal Zone Management

P. MORRISON: The Northumberland Coast Management Initiative

H. B. NICHOLLS: Coastal Change at Coastal Zone Canada 94

(c) Etudes de cas des côtes Aquitaines - 8 février 1995, 16.30

Avec la participation de:

- J. SEINLARY, Vice-Président du Conseil Régional Aquitaine
- P. BUAT-MENARD, Directeur Départment Géologie Océanographique DGO, Université de Bordeaux I
- J. L. MAUVAIS, Responsable Service Avis et Aménagement IFREMER
- J. P. TASTET, IGBA/DGO, Université de Bordeaux I - Les paysages du littoral témoins des changements côtiers: l'exemple aquitain
- G. LE POCHAT, Directeur du BRGM - Les facteurs déterminant l'érosion de la Côte des Basques
- A. FERAL, Chef du Département Etudes, Environnement et Aménagement du PAB - Le port de Bordeaux: au service de l'économie régionale; l'aménagement de l'estuaire de la Gironde - un atout pour le développement: son environnement
- J. P. DRENO, Directeur Station IFREMER Arcachon - Une nouvelle approche de l'environnement littoral: l'étude intégrée du Bassin d'Arcachon

(iii) PRE AND POST CONFERENCE FIELD TRIPS

PROJET D'EXCURSION

Les excursions proposés illustrent deux aspects de l'approche des changements physiques de l'environnement côtier. Elles peuvent recevoir 20 et 50 personnes, le transport est assuré par autobus. La gestion logistique et scientifique des excursions est assurée par le Département de Géologie et Océanographie.

THEME 1: APPROCHE CONTEMPORAINE DES CHANGEMENTS COTIERS

Lieu: Baie d'Arcachon - Durée: 1 jour Date: Dimanche 5 février 1995 - Responsable: Dr. H. HOWA, Maître de Conférence

(i) But de l'excursion

Montrer les changements côtiers intervenant à différentes échelles spatiales et temporelles sur une côte sableuse soumise à une régime dominant de houle; étude, impact sur les aménagements, évolution future.

Le Bassin d'Arcachon est une lagune résultant de profondes transformations de l'ancien estuaire de la Leyre par le jeu de l'action des houles et du transit sédimentaire littoral. Les passes d'entrées de cette lagune sont situées entre la pointe du Cap Ferret et celle de la Salie. A l'extérieur et à l'intérieur des passes se développent des deltas de marée.

(ii) Visites

a) La Salie :
-Wharf et exutoire d'eaux usées industrielles
-Ensablement intempestif des installations
-Dynamique sédimentaire littorale, traçages fluorescents, quantification
-Evolution d'un banc littoral, modélisation prévisionnelle.

b) La dune du Pilat :
-La plus haute dune d'Europe (103 m)
-Hypothèses de sa formation
-Les paléosols témoins de l'histoire dunaire.

c) La flèche du Cap Ferret :
-Evolution d'une flèche alimentée par la dérive littorale
-Evolution de la dune littorale et son aménagement
-Erosion par les courants de marée et les houles.

THEME 2: APPROCHE HISTORIQUE DES CHANGEMENTS COTIERS

Lieu: *Nord-Médoc et Lacs littoraux (Sanguinet)*- Durée: *1 ou 2 jours*- Dates: *Samedi 11 et Dimanche 12 Février 1995*- Responsable: *Professeur J.P. TASTET.*

(i) But de l'excursion

Genèse, évolution, et occupation humaine des paysages littoraux au cours des derniers millénaires, prévision de l'évolution future.

La côte Aquitaine est un littoral macrotidal extrèmement dynamique, soumis à l'action de fortes houles et d'intenses vents d'ouest.Les paysages actuels résultent de l'évolution récente (Holocène) de la zone côtière, en particulier sous l'action des variations du niveau de la mer. L'étude de cette évolution, à partir de ses enregistrements sédimentaires, permet de reconstituer les environnements passés, en particulier ceux des sites archéologiques, et de prévoir le devenir d'un littoral toujours fragile.

(ii) Visites

a) Presqu'île du Mèdoc:
- La côte, dynamique actuelle, dérive littorale, érosion et sédimentation
- Les systèmes de dunes littorales
- Les marais estuariens actifs, leur dynamique, leur évolution future
- Les générations de marais estuariens "anciens", leur histoire, leur aménagement, leur exploitation
- L'occupation humaine des paysages et ses témoins archéologiques
- Les Grands Crus du Médoc dans les Paysages

b) Système lacustre littoral (Sanguinet)
- Le système dunaire, comparaison avec le Nord-Médoc
- Morphologie et genèse des lacs littoraux, impact sur l'occupation humaine depuis l'Age du Bronze
- Les témoins archéologiques sublacustres

Cette excursion peut être raccourcie à 1 seul jour par suppression de la visite du système lacustre littoral.

(iv) DAILY JOURNAL OF THE CONFERENCE

COASTAL CHANGE PRESS INFO NO.5 (Friday, 10 February 1995) and Press File

INITIÉS

• Jacques Valade, ancien ministre, sénateur de la Gironde, président du conseil régional d'Aquitaine, a annoncé hier soir, à l'occasion du Banquet de la Mer qui s'est tenu à l'hôtel de région (il a réuni plus de 450 convives !), que Bordeaux allait se doter d'une nouvelle structure, véritable "permanence de réflexion". Avec à sa droite Egbert Duursma, président du comité scientifique de la conférence Coastal Change et à sa gauche Peter Cook, président du comité exécutif, Jacques Valade a ainsi confirmé officiellement l'engagement du conseil régional de créer une instance permanente, interface entre les scientifiques, la population et les élus. Il a fait appel aux experts présents pour qu'ils se joignent à cette aventure qu'il souhaite ouverte au monde entier. Cette allusion aux projets communs de la Commission océanographique inter-gouvernementale (COI) de l'Unesco et du conseil régional d'Aquitaine constitue, on le sait, une entreprise préparée de longue date. En effet, Océanexpo a été créée en 1970 puis Jean-Pierre Baste a mis sur pied, en 1985, la première édition de Bordomer. Sans aucun doute, Jacques Valade, avec cette annonce, réalise-t-il son vœu de faire de Bordeaux une métropole internationale incontournable dans le domaine des espaces côtiers. Nous devrions en savoir plus à l'occasion de la conférence de presse qu'il va tenir, tout à l'heure, à 11h15.

• L'institut européen de formation à la gestion de l'environnement, qui a vu le jour l'an dernier à Bordeaux à l'initiative de la région Aquitaine, envisage de lancer une formation sur les risques côtiers. L'institut est présidé par Jacques Valade, président du conseil régional d'Aquitaine. Autre projet : la création d'une fédération européenne de la formation sur la gestion de l'environnement.

• Dans son discours, ce matin, le président du comité exécutif de la conférence, Peter Cook, va évoquer quelques thèmes qui lui sont chers. Il devrait rappeler les "oppositions" des espaces côtiers (développement/conservation, destruction/préservation, pollution/nettoyage, érosion/sédimentation, etc...) et appuyer son propos par des analyses pertinentes : *"les grands booms humains se font dans les pays en voie de développement et sont proportionnels à l'apparition des problèmes d'espaces côtiers"*. Peter Cook préconise donc une approche fragmentaire complétée par de bonnes communication, coordination, harmonisation et intégration. Interrogé hier sur ses préconisations, il propose une "carbon tax" pour les nations fortement émettrices de CO2. Il envisage même un monde où existeraient des "littoral tax et des thalassic tax".

• Des problèmes de dernière heure l'ayant retenu au sommet africain de l'Unesco Adnan Badran, directeur général adjoint de l'Unesco, n'a pas eu la possibilité de rejoindre, hier soir à Bordeaux, les participants de Coastal Change.

• On l'a appris pendant la conférence, la direction de l'Institut français de recherche pour l'exploitation de la mer (Ifremer) vient de changer de directeur. Pierre Papon a quitté ses fonctions la semaine dernière et tout laisse à penser que Pierre David, directeur de la cité des sciences et de l'industrie de la Villette lui succédera.

• L'observatoire de l'environnement littoral et marin Manche et sud Mer du Nord vient de publier son bilan 1994 et son programme 1995. Ce dernier comprend des programmes thématiques : TDC (Trait De Côte), QDE (Qualité Des Eaux) PATER (PATrimoines et Espaces Remarquables) et REHA (REssources HAlieutiques) ainsi que des programmes techniques : SIGLI (Système d'Information Géographique LIttoral), EPCIL (Exposition Permanente de Cartographie et d'Iconographie du Littoral), USLI (fichier d'USagers du LIttoral) et RELI (fichier des REssources scientifiques sur le LIttoral). Les programmes de coopération sont : INTER (actions INTERnationales de l'observatoire, visant la mise en place d'un réseau d'institutions et de compétences en matière d'environnement littoral et marin), OBSERVATORY (qui est officiellement sollicité par la Kent County Council pour participer à la mise en place d'on observatoire comparable à ELM), HYDRO (l'observatoire et le ministère flamand des travaux publics envisagent un échange systématisé de données dans le domaine de l'HYDROdynamisme) et EUCC (en accord avec les critères du programme ECOCOAST de l'European Union for Coastal Conservation (EUCC - Leiden NL).
Il convient d'ajouter à cette liste les programmes de diffusion et d'alerte : COSTAL (COnférences et STAges sur le Littoral), EDILI (ÉDItion d'une revue trimestrielle - bulletin scientifique européen manche et sud mer du nord - et de documents d'information scientifique sur le LIttoral) et LIPRO (le LIttoral en PROspective), qui

Press file

Pages

APPENDICES

Practical details on Bordomer :

Press contact : Anne-Marie Roux and Sandrine Sié
Bordomer Organisation Tel. 56 51 20 92 - Fax. 56 48 28 19

(v) *AD HOC* CONSULTATION OF EXPERTS ON OSNLR

Taking advantage of the opportunity offered by the Coastal Change Conference with the presence of a large number of earth-science experts, an *ad hoc* Consultation was organized in order to obtain ideas and advice on the future development of the IOC-UN DOALOS Programme on Ocean Science in Relation to Non-Living Resources (OSNLR) particularly in the context of the IOC follow-up to UNCED and UNCLOS.

The *ad hoc* Consultation considered *inter alia* that OSNLR and particularly its coastal component, has a major role to play and suggested various OSNLR actions to be further developed in the framework of the IOC Strategy and Action Plan (Document IOC/INF-991).

	Title	Languages
	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
	IOC Workshop on the Biological Effects of Pollutants; Oslo, 11-29 August 1986.	E
	Workshop on Sea-Level Measurements in Hostile Conditions; Bidston, UK, 28-31 March 1988	E
	IBCCA Workshop on Data Sources and Compilation, Boulder, Colorado, 18-19 July 1988.	E
	IOC-FAO Workshop on Recruitment of Penaeid Prawns in the Indo-West Pacific Region (PREP); Cleveland, Australia, 24-30 July 1988.	E
	IOC Workshop on International Co-operation in the Study of Red Tides and Ocean Blooms; Takamatsu, Japan, 16-17 November 1987.	E
	International Workshop on the Technical Aspects of the Tsunami Warning System; Novosibirsk, USSR, 4-5 August 1989.	E
xpl.	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
	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
	IOC Workshop to Define IOCARIBE-TRODERP proposals; Caracas, Venezuela, 12-16 September 1989.	E
	Second IOC Workshop on the Biological Effects of Pollutants; Bermuda, 10 September-2 October 1988.	E
	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
	IOC/WESTPAC Workshop on Co-operative Study of the Continental Shelf Circulation in the Western Pacific; Bangkok, Thailand, 31 October-3 November 1989.	E
	Second IOC-FAO Workshop on Recruitment of Penaeid Prawns in the Indo-West Pacific Region (PREP); Phuket, Thailand, 25-31 September 1989.	E
	Second IOC Workshop on Sardine/Anchovy Recruitment Project (SARP) int he Southwest Atlantic; Montevideo, Uruguay, 21-23 August 1989.	E
	IOC *ad hoc* Expert Consultation on Sardine/Anchovy Recruitment Programme; La Jolla, California, USA, 1989.	E
	Interdisciplinary Seminar on Research Problems in the IOCARIBE Region; Caracas, Venezuela, 28 November-1 December 1989.	E (out of stock)
	International Workshop on Marine Acoustics; Beijing, China, 26-30 March 1990.	E
	IOC-SCAR Workshop on Sea-Level Measurements in the Antarctica; Leningrad, USSR, 28-31 May 1990.	E
xpl.	IOC-SCAR Workshop on Sea-Level Measurements in the Antarctica; Leningrad, USSR, 28-31 May 1990.	E
	IOC-SAREC-UNEP-FAO-IAEA-WHO Workshop on Regional Aspects of Marine Pollution; Mauritius, 29 October - 9 November 1990.	E
	IOC-FAO Workshop on the Identification of Penaeid Prawn Larvae and Postlarvae; Cleveland, Australia, 23-28 September 1990.	E
	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
	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	IOC Workshop on Coastal Oceanography in Relation to Integrated Coastal Zone Management; Kona, Hawaii, 1-5 June 1992.	E
86	International Workshop on the Black Sea; Varna, Bulgaria 30 September - 4 October 1991.	E
87	Taller de trabajo sobre efectos biológicos del fenómeno «El Niño» en ecosistemas costeros del Pacífico Sudeste; Santa Cruz, Galápagos, Ecuador, 5-14 de octubre de 1989.	S only (Summary in E, F, S)
88	IOC-CEC-ICSU-ICES Regional Workshop for Member States of Eastern and Northern Europe (GODAR Project); Obninsk, Russia, 17-20 May 1993.	E
89	IOC-ICSEM Workshop on Ocean Sciences in Non-Living Resources; Perpignan, France, 15-20 October 1990.	E
90	IOC Seminar on Integrated Coastal Management; New Orleans, USA. 17-18 July 1993.	E
91	Hydroblack'91 CTD Intercalibration Workshop; Woods Hole, USA. 1-10 December 1991.	E
92	Réunion de travail IOCEA-OSNLR sur le Projet « Budgets sédimentaires le long de la côte occidentale d'Afrique » Abidjan, Côte d'Ivoire, 26-28 juin 1991.	F
93	IOC-UNEP Workshop on Impacts of Sea-Level Rise due to Global Warming. Dhaka, Bangladesh, 16-19 November 1992.	E
94	BMTC-IOC-POLARMAR International Workshop on Training Requirements in the Field of Eutrophication in Semi-Enclosed Seas and Harmful Algal Blooms, Bremerhaven, Germany, 29 September - 3 October 1992.	E
95	SAREC-IOC Workshop on Donor Collaboration in the Development of Marine Scientific Research Capabilities in the Western Indian Ocean Region; Brussels, Belgium, 23-25 November 1993.	E
96	IOC-UNEP-WMO-SAREC Planning Workshop on an Integrated Approach to Coastal Erosion, Sea Level Changes and their Impacts; Zanzibar, United Republic of Tanzania, 17-21 January 1994.	E
96 Suppl. 1	IOC-UNEP-WMO-SAREC Planning Workshop on an Integrated Approach to Coastal Erosion, Sea Level Changes and their Impacts; *Submitted Papers* 1. Coastal Erosion; Zanzibar, United Republic of Tanzania 17-21 January 1994.	E
96 Suppl. 2	IOC-UNEP-WMO-SAREC Planning Workshop on an Integrated Approach to Coastal Erosion, Sea Level Changes and their Impacts; *Submitted Papers* 2. Sea Level; Zanzibar, United Republic of Tanzania 17-21 January 1994.	E
97	IOC Workshop on Small Island Oceanography in Relation to Sustainable Economic Development and Coastal Area Management of Small Island Development States; Fort-de-France, Martinique, 8-10 November, 1993.	E
98	CoMSBlack '92A Physical and Chemical Intercalibration Workshop; Erdemli, Turkey, 15-29 January 1993.	E
99	IOC-SAREC Field Study Exercise on Nutrients in Tropical Marine Waters; Mombasa, Kenya, 5-15 April 1994.	E
100	IOC-SOA-NOAA Regional Workshop for Member States of the Western Pacific - GODAR-II (Global Oceanographic Data Archeology and Rescue Project); Tianjin, China 8-11 March 1994.	E
101	IOC Regional Science Planning Workshop on Harmful Algal Blooms; Montevideo, Uruguay, 15-17 June 1994.	E
102	First IOC Workshop on Coastal Ocean Advanced Science and Technology Study (COASTS); Liège, Belgium, 5-9 May 1994	E
103	IOC Workshop on GIS Applications in the Coastal Zone Management of Small Island Developing States; Barbados, 20-22 April 1994	E
104	Workshop on Integrated Coastal Management; Dartmouth, Canada, 19-20 September 1994	E
105	BORDOMER 95: Conference on Coastal Change; Bordeaux, France, 6-10 February 1995	E
106	IOC/WESTPAC Workshop on the Paleographic Map; Bali, Indonesia, 20-21 October 1994	E