

LOICZ NEWSLETTER

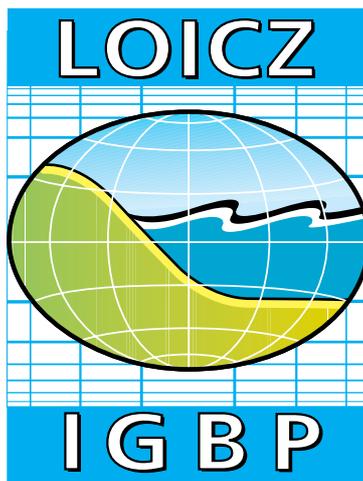
Marine typology down-under

Terry Hume and Ton Snelder

Typology projects are underway in order to provide a framework for the assessment and management of New Zealand's estuarine and continental seas. The Estuarine Environment Classification (EEC) groups estuaries on the basis of their major controlling physical factors into domains of broadly similar physical and ecological properties and management implications. The outputs are a database/inventory, conceptual models, and a classification tool for addressing management questions. The project is at the stage of classification design and database building. A complementary project, the Marine Environment Classification (MEC), is also underway.

Issues and background

New Zealand has about 350 estuarine systems spread along 11,000 kilometres of open coast. The largest is Kaipara Harbour (74,000 ha) but most are less than 1,700 ha. The diversity of estuary types and habitats are a function of New Zealand's active margin and headland dominated coastal setting, diverse geologic past and catchment sediments, variable wave climate and rainfall. This situation poses a wide range of issues and challenges for regional and territorial authorities that manage the coast (Healy & Kirk 1982, Hume & Herdendorf 1988). Although New Zealand's population is small (3.3 million), the pace of change accompanying the arrival of Europeans has been very dramatic. Anthropogenic effects stem from ports and marine farms, reclamation of intertidal areas and marshlands, and suspended sediment and siltation effects accompanying catchment runoff from forestry, roading and subdivision, which remain arguably the biggest threat to estuarine ecosystems. There are probably few estuaries in



This is the nineteenth newsletter of the Land Ocean Interactions in the Coastal Zone (LOICZ) International Project of the IGBP. It is produced quarterly to provide news and information regarding LOICZ activities

New Zealand that could be considered in pristine condition.

Choosing appropriate science tools to assist environmental management

Science assists management by providing knowledge (field studies and case studies) and tools (numerical models, conceptual models, and classification systems). The challenge for scientists is to select the tools that best suit the problem, select an appropriate scale and convey the important elements of the issues to the general public.

From field studies we learn how systems work and are able to parameterise the key drivers in systems. Case studies are valuable to understand how estuaries behave under different circumstances, particularly under different land use and land use management in their catchments. Numerical models give us a predictive capability, information over wide spatial scales, and readily digestible information as pictures with a geographic reference. While the focus for the

scientist is on these three approaches, conceptual models and classification are sometimes more appropriate from an economic and management point of view.

Conceptual models distil complex ideas into simple pictures. The best conceptual models and classifications are underpinned by science. Classification can standardise, or 'codify' this understanding so that we approach estuary management from the same fundamental understanding and point of view. Classifications are a general sense tool, and will not explain the details of cause and effect, or replace the need for detailed and site-specific investigations in some cases. Our 'environmental factor' approach to classification is a high level summary of our understanding of the main properties and functioning of estuaries.

Our approach to estuary classification

Estuaries come in many shapes and sizes and are dynamic environments containing many different habitats. They have been variously defined by their geographic location, geomorphology, and the physical, chemical and biological properties therein. Confusing to the public is the fact that on New Zealand maps they are named variously as: estuary, creek, firth, inlet, gulf, cove, river, bay, lagoon, harbour, stream, sound, port, arm and retreat.

A broad working definition that covers the wide-range of estuaries is:

"a partially enclosed coastal body of water that is either permanently or periodically open to the sea in which the aquatic/ecology environment is affected by the physical and chemical characteristics of both runoff from the land and inflow from the sea"

This definition recognises the role of catchment and ocean forcings in determining estuary properties. It includes drowned river and tectonic valleys, barrier-enclosed tidal lagoons, coastal lagoons, tidal rivers, coastal embayments, structurally and tectonically influenced estuaries, and glacially excavated valleys or fjords.

The EEC uses conceptual models and a database/inventory and classification tool for addressing management questions.



Figure 1. A tidal lagoon.



Figure 2. Drowned valley estuaries.



Figure 3. A tidal river.

Conceptual models

The EEC began by building conceptual models of different estuary types using an 'expert knowledge' approach as a starting point to help shape ideas and a tool to use while we developed a more sophisticated classification. These models will be reshaped as our knowledge improves and as they are tested. The cartoon illustrations for a tidal lagoon and a fjord highlight the differences in processes in these different estuary types. In tidal lagoons catchment runoff is dumped in the headwaters and carried seawards by the tides. On the shallow intertidal flats wind waves resuspend sediment and tides transport it in the channels. Bars protect the estuaries from ocean swell. In comparison, fjords are deep and the bed is not disturbed by waves. Runoff is transported as a surface layer by tides and density flows away from the shore. In New Zealand fjords runoff drains through heavily forested catchments producing a tannin stained layer of freshwater on top of the seawater that reduces light penetration and attenuates phytoplankton growth.

Such cartoons provide a framework for explaining processes to managers and the public - for instance, why an approach used for monitoring in one estuary type is not appropriate in another type. The Australians have made excellent use of

these tools in reporting the health of their estuaries (e.g., WQMST 1998).

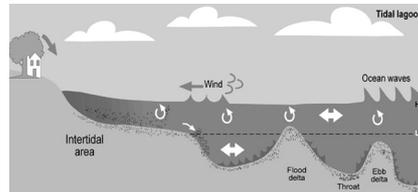


Figure 4. A conceptual model of processes in a tidal lagoon.

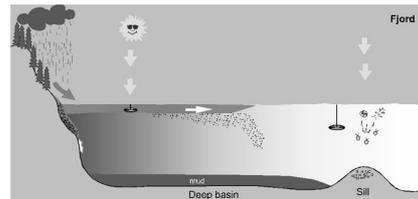


Figure 5. A conceptual model of processes in a fjord.

The database and classification tool

A constraining issue in building a classification is the lack of data for New Zealand estuaries, particularly ecological data. To overcome this we chose to use an 'Environmental Factor' approach, which uses data representing physical components of the environment (e.g., climate, tides, and geology) to produce hierarchical classification systems. It is based on the principle that physical components of the environment interact to 'drive' ecosystems. Drivers of the pelagic and benthic ecosystems in estuaries are: light, water mass, freshwater inputs, wind mixing of the water column, tidal mixing and stratification, flushing, and wind wave stirring of the seabed. Spatial and temporal variation in drivers is expected to be related to spatial and temporal patterns in ecosystem properties (such as biotic distribution), and capture broad patterns in the pelagic and benthic environment. The environmental factors are structured into a classification using a 'rule-based approach' to map estuarine systems on the basis of knowledge of the cause of differences in ecosystem structure.

For each estuary, a 'set of factors' was generated that represent, or are a proxy for, the drivers of the ecosystem. Factors are generated from data describing spatial variation in both environmental variables, including 'static' variables (e.g., bathymetry, catchment land cover and geology) and dynamic variables (e.g., wind, solar radiation, air temperature, runoff), and patterns in the physical environment that express the effect of drivers (e.g., modelled tidal data, modelled swell data). Models, coupled with GIS, were used extensively to generate

variables and factors for both catchments and estuaries. The coastline was mapped using the New Zealand 1:50,000 Digital Topographic Database. Catchment boundaries were defined as polygons and derived from a NIWA database.

Factors generated for the EEC include:

- Tide range is a proxy for tidal forcing, predicted at the mouth of each estuary using the NZ Tidal Model (Walters et al. in press, Bell et al. 2001).
- Mean annual runoff (mm/yr) to an estuary is estimated by overlaying the catchment boundary on a runoff grid for New Zealand (500 m pixels) to provide an areally weighted figure.
- A wind wave resuspension factor describes the relative likelihood of estuary waters being made turbid by waves stirring the seabed. It is computed from fetch, wind rose data, and estuary depth data for intertidal areas using a combination of numerical models. Wind-driven waves are developed under restricted fetch conditions inside estuaries and their orbital currents resuspend sediment.
- A rain power factor was generated as the areally weighted mean of the product between mean annual rainfall (mm) and slope (degrees) for the NZ Land Resource Inventory elemental areas. It describes the erosive strength of the rainfall and the generated runoff for a given catchment geology.

Our basic management unit and starting point was a single estuary, which provides a means for comparing one estuary with another. This approach becomes less useful as estuaries get larger. Large (or compound) estuaries contain many different environments and 'estuaries within estuaries' (component estuaries). And are best dealt with by mapping at a larger scale by subdividing them into geomorphological units (e.g., arms and bays in which different processes operate). An alternative approach is to use a regular grid, which is the method proposed for the MEC. The end-product of the work is not a 'static' classification. By linking the database with a classification engine (algorithms that operationalise rule-based decisions), management questions can be addressed. For instance, the system can be used to manage public expectation for water clarity in estuaries by identifying those estuaries where the water is likely to be turbid due to river inputs or wind waves stirring the tidal flats. It can also be used to select representative estuaries for monitoring and selecting appropriate

Environmental Performance Indicators. Unique habitats/environments such as estuaries of pristine quality can be identified and set aside for reserves. The database will provide a much-improved national picture of New Zealand's estuarine resources and the environment and identify 'gaps' in our knowledge.

So far we have developed the factors to be incorporated into the database for the North Island estuaries and built the database. The South Island database will be completed next year and we will generate some trial classifications for all New Zealand estuaries.

The Marine Environment Classification

A MEC has been designed to classify New Zealand's large EEZ. This covers an area of approximately 10.9 million km². The MEC is being approached in a slightly different way to the EEC, although the two classifications will be 'operationally seamless'. MEC classification will be carried out at two levels of resolution. First, a 'national scale' classification will be based on spatial coverage or 'factor layers' of environmental factors developed for a 1 km grid. This relatively coarse grid will show limited detail in complex coastal areas like estuaries. A second and higher resolution 'regional scale' classification will cover the area from the shore to the inner continental shelf with 100-200 m cells.

The MEC is being designed to capture broad patterns in environmental and ecosystem properties in the pelagic and benthic marine environments. It is based on an environmental factors approach to classification. The draft MEC design is based on 18 environmental factor layers, selected to represent spatial variation in large-scale physical process that 'drive' marine ecosystems. Extensive use will be made of numerical models and remotely sensed data (e.g., SST from satellite imagery) to develop factor layers. The factor layers will be mapped individually by 'linking' the data to the grid using GIS. Classifications will be made by 'combining' the factor layers using two types of 'classification procedure': rule-based and multivariate. The MEC will evolve through (1) a test stage on a small data set, (2) collating physical and biological factor databases, (3) generating initial trial classifications and (4) final testing. The MEC regional classification complements the EEC approach by providing greater resolution in large estuaries containing many different environments.

Links and contributions to LOICZ typology

LoiczView provides a web-based software tool to classify and extrapolate coastal characteristics (Buddemeier & Maxwell 2000). It uses a geospatial clustering algorithm to generate classes. It draws on a global database with climatic, catchment, oceanic and other variables at 0,5 degree cell structure. LoiczView provides a tool to compare New Zealand estuaries at a global scale. It can also be used to analyse the EEC and MEC datasets in an alternative manner to our largely rule-based approach. The EEC, and particularly the MEC, will be useful to test how adequately the LOICZ dataset (0,5 degree cell resolution) discriminates classes in small, elongate, and mountainous landmasses with spatially variable rainfall like New Zealand. Factors generated in the EEC and MEC are useful in LOICZ typology. LOICZ typology and the 'typology down-under' are pretty much in-step for this purpose.

Acknowledgements

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LOICZ/CZMC

Delta Project: Improving the Planning and Management of Modified Mega-Deltas

A new river deltas project is being initiated jointly by LOICZ and the Coastal Zone Management Centre of RIKZ, in The Hague, the Netherlands. This project extends from earlier LOICZ activities on delta science by building a network of scientists, engineers and environmental managers to collate and synthesise lessons learned from case studies. This delta project concept evolved from the Conference on Sustainable Development of Deltas (1998) and the World Water Forum (2000).

Deltas are the centre of gravity of the watersheds or drainage basins. In most deltas fresh and salt water meet, creating gradients that are very important for the existence of a variety of ecosystems. Deltas attract economic activities such as industry, transport and agriculture, but also people. This results in increased pressure on the delta, its adjacent river basin, the coastal zone and the sea. Growth of economic interests and population increases the deltas' vulnerability to pollution and natural hazards. Climate change and other external factors also have impacts. These pressures require adaptive planning and management. In the past, measures were taken and structures were built for human use of deltas. Not all of these were successful; some, such as armouring the deltaic coast of the Netherlands have caused problems for both the population and the environment.

The aim of the modified mega-deltas project is to learn from the experiences

of development within deltas and from the planning and management of deltas to see how we can develop deltas in a sustainable manner with respect to both nature and human occupation. The initial phase of the project, Improving the Planning and Management of Deltas, divides the world's deltas into three categories: unmodified mega-deltas (e.g. Amazon, Congo, and Lena), modified mega-deltas (e.g. Rhine, Mississippi, Nile, and Niger) and non-mega-deltas. Worldwide, there are approximately 21 modified mega-deltas.

The project will develop a website as an information and archive tool and, initially, use a questionnaire to build information and encourage global participation in the assemblage of case studies and discussion among contributors. The preliminary website can be found on <http://www.netcoast.nl/projects/netcoast/delta/index.htm>.

Questions to be answered include:

- What are or will be the most important changes in deltas?
- How are the fluxes of nutrients and sediment in deltas altered by human interventions?
- What information is available about best management practices in deltas? Are they being evaluated? What can we learn from these?
- Which concepts and tools are available for supporting delta management? Have they been applied?
- What research is needed for further elaboration on delta management practices?

Links are being established with LOICZ and the DPSIR framework, the LOICZ typology, and the CZMC project on the evaluation procedure for assessment of Integrated Coastal Zone Management (ICZM).

The project contributes to Focus 4 of LOICZ. Evaluation of coastal zone management practices in deltas is of interest to the Netherlands' Coastal Zone Management Centre (see <http://www.netcoast.nl>); outcomes of the project are expected to contribute to the identification of relevant issues for the Third World Water Forum, to be held in Japan in 2003. A network of scientists is being built, case studies are being collected and the first workshop, The Planning and Management of Modified Mega-deltas, is planned for the end of September 2001 in the Netherlands.

SURVAS

Synthesis and Upscaling of Sea-level Rise Vulnerability Assessment Studies

The SURVAS project is developing a global assessment on vulnerability of the coastal zone to sea-level changes, using a common assessment methodology. Led from the UK by Dr Robert Nicholls, it had a busy and successful implementation in 2000.

SURVAS focussed on the development of a network of international experts interested in vulnerability and adaptation studies and the organisation of four workshops on these issues:

- The Methodological Workshop, January 2000, Trent Park, Middlesex University, London, UK;
- The European Regional Workshop, June 2000, ZMK, Hamburg University, Germany;
- The African Regional Workshop, November 2000, NARSS, Cairo, Egypt;
- The APN/SURVAS/LOICZ Joint Conference on Asia/Pacific, November 2000, Kobe, Japan.

The **Methodology workshop (January 2000)** identified key indicators for the assessment of coastal natural susceptibility and socio-economic vulnerability and resilience to impacts of climate change, particularly accelerated sea-level rise (ASLR). It also considered the practical implementation of the ideas embraced by the SURVAS package, which was sent to all participants at the three regional workshops.

This resulted in:

- a first appraisal of data available through a range of global datasets obtained via on-line sources, and
- the improvement of the SURVAS package. This included modification of a number of tables and questionnaires on the nature and the use of the coastal zone, current coastal management problems and potential impacts. The SURVAS package was subsequently tested and further improved using three national case studies with contrasting situations (Germany, Poland and India).

Through each regional workshop the SURVAS network has been growing, and more than 200 international experts in a variety of fields are now involved.

In **June 2000**, the **European Workshop** was held in Hamburg, Germany.

Most coastal European countries were represented (see project web-site <http://www.survas.mdx.ac.uk/>). This Workshop was a catalyst for a number of countries to initiate work on national vulnerability assessment for sea-level rise (e.g., Norway, Turkey, and to a certain extent, Portugal). Another outcome is the establishment of closer academic links and exchanges.

In **November 2000**, the **African Workshop** was held in Cairo, Egypt. 15 countries from all major African regions were represented. A group of African experts on sea-level rise (chair: Dr. Isabelle Niang-Diop, Senegal) was established to further efforts to understand the potentially serious implications of sea-level rise for Africa. Most of the participating countries have produced or initiated vulnerability assessment studies and the data will be added to the final SURVAS database. A *Proceedings* will be placed on the SURVAS Web page in spring 2001

In November 2000 the **APN/SURVAS/LOICZ Joint Conference** was held in Kobe, Japan. The event combined national perspectives on vulnerability and adaptation to impacts of sea-level rise with state-of-the-art research on coastal zone issues in the Asia-Pacific region. Important data for the SURVAS database were identified.

Ongoing SURVAS activities include:

- The theme issue of the *Journal of Coastal Research*.
- Preparation of the *Proceedings* of the Cairo Workshop and the APN/SURVAS/LOICZ Joint Conference.
- Preparation of a brochure on using the SURVAS Matrix of indicators of vulnerability and adaptation to impacts of sea-level rise.
- Synthesis of national data and construction of the SURVAS database.
- Preparations for the Overview Meeting which will take place in London, in June/July 2001.
- Preparation for the **Americas Regional Workshop**, to be held late 2001 or 2002.

GIWA News

The acronym GIWA (Global International Waters Assessment) will be familiar to most LOICZ scientists, some of whom will be increasingly involved in

this global program. The GIWA methodologies have been developed and are available from their web-site (www.giwa.net), and the implementation of the regional research and capacity building workshops are in full swing.

Recently a capacity-building workshop was held in Kharkiv, Ukraine, gathering experts constituting the GIWA network in the Black Sea, the Caspian Sea and the Aral Sea sub-regions (Azerbaijan, Bulgaria, Georgia, Iran, Kazakhstan, Romania, Russia, Turkey, Ukraine, and Uzbekistan). Participants were introduced to the GIWA methodology, and jointly conducted the first part of the assessment: the scaling and scoping exercise. This involved group work and plenary sessions, where the assessment was performed and methodological aspects of the work were discussed. Because of the complexity of the sub-regions to be studied, a two-dimensional structure was suggested; expert coordinators of each sub-region will work closely with the regional team, and local focal points will ensure sound locally-based expertise. The Kharkiv workshop was the first major GIWA activity in the regions of the Black Sea, the Caspian Sea and the Aral Sea.

Similar successful GIWA training workshops were held in Bangkok, Moscow, Beijing, Tashkent and Tallinn earlier in 2000. Additional workshops are planned for Bangkok and Townsville. The first GIWA General Assembly is scheduled to be held at Kalmar, Sweden 9-11 October, 2001. Further information about the GIWA program and activities can be found on their web-site or obtained from the GIWA Coordination Office: info@giwa.net.

LOICZ WORKSHOPS

1. East Asia Basins Regional Assessment and Analysis Workshop

East Asian coastal seas are influenced by the most important rivers on earth. The sediment loads from Asian river systems are estimated to contribute about 70% of the 1.35×10^{10} t total. Of the 17 major global deltas, 11 are located in Asia and 5 of those in East Asia.

The climate varies from sub-arctic through temperate and subtropical to tropical zones. The Western Pacific, ENSO and North Pacific cycles influence the transport of water and materials mainly from the Tibetan

Plateau through numerous drainage basins to the coastal shelf seas. Huge areas of coastline are dominated by small but numerous catchments.

Rapid demographic change and economic development is an outstanding feature of much of East Asia. More than 50% of fertiliser production and damming activities occur in Asia. Catchment-based coastal impacts are increasing rather than decreasing. There are also large water management activities such as damming to satisfy future power and water demands, for instance in the Yellow and Yangtze River catchments.

These were some of the agenda items at the LOICZ East Asia BASINS regional assessment workshop, held in Hong Kong 26-28 February, supported by the Asia Pacific Network for Global Change, APN, and START, and hosted by the Hong Kong Baptist University. 18 scientists used the DPSIR-based LOICZ Basins Regional Assessment Tables to derive a set of qualitative or semi-quantitative indices of driver importance and state change for river basin/coastal sea interaction. Comparisons on various scales provide a link to other regional Basins assessments and to LOICZ typology development. Three working groups were formed: the sub-tropical south (Vietnam and Gulf of Tonkin), the central area (Yellow and Bohai seas) and the north, with (Sea of Japan, Taiwan and Japan).

This workshop will contribute to a LOICZ Reports and Studies volume, provide input for the first LOICZ global synthesis in 2002 and contribute to peer-reviewed journals.

2. The Americas: Biogeochemistry and Typology Workshop

A set of workshops addressing biogeochemical estuarine models and the typologies of coastal forcing and environmental settings for the Americas was hosted by Victor Camacho at the Universidad Autonoma de Baja California in Ensenada, Mexico, 29 April - 4 May 2001. This extended the LOICZ-UNEP project on coastal biogeo-chemical assessment to the Americas region.

The 30 scientists from North, Central and South American coastal nations, gained familiarity with the use of the LOICZ typology tools and developed typologies at national, regional and global scales for climatic and oceano-

graphic context of coastal biogeochemical budgets, catchment forcing conditions and thematic topics such as calcification and coral reef distribution. Synthesis work on the biogeochemical models database and its scaling from local to global assessment continued to make progress, especially in relation to the Americas region. New attributes were developed for the LOICZView tools, adding features that extended the statistical evaluation to the user and providing manipulative features such as overlays, supervised clustering and enhanced visual-comparison access. Products from the workshop and the upgrade of LOICZView has been incorporated into the Typology web-site, and will be included in the combined workshop report and CD-ROM to be published following the Africa-Europe regions workshop scheduled for The Hague in early July.

Two other workshops were held in association with the typology activity. Training in the LOICZ biogeochemical approach was given to additional researchers from Mexico and South America who contributed a further 20 budget sites to the geographical coverage of the region. These are being incorporated into LOICZ publications and the Biogeochemical Modelling web-site. Scoping and database developments to support typologies for the wider ocean regions were subject of a small workshop to support the OBIS project that is allied to LOICZ. Follow-up research and activities are continuing to expand the successful outcomes from the workshops.

3. SAMBas II Workshop

Supported by the Universidade Federal do Ceará and UNESCO/IOC, the South American Basins study, SamBas, held a second workshop in Fortaleza, Brazil, 2-5 May, with 20 participants including representatives of the LOICZ Basins task group and IOC. Key questions were addressed using the LOICZ Regional Assessment Tables (see Newsletter 18). Two working groups (Pacific and Atlantic coasts) refined the regional SamBas synthesis and filled gaps, addressing rivers and coastal issues along the Pacific coast and better assessing the "human dimensions" of river-based flux changes to the coastal ocean. A qualitative index system for between-site and sub-regional comparison of issues was set up. Attention was paid to critical loads of

riverine material flows for environmental and social system functions. Approximations were made of distances of current system states and fluxes from “critical thresholds” with implications for sustained provision of coastal goods and services. The workshop also considered human development indicators as approximations for observed biogeochemical coastal change. The focus was on links between nutrient fluxes and human development e.g., through biological oxygen demand. Demographic data such as poverty indices, per capita income, family structure and size and education levels were found to relate to water quality, coastal impact and change. Studies are currently underway in south-east Brazil and the approach being used there could become an integral part of future scientific work in SAmBas and other LOICZ Basins projects.

The group recommended investigation of historical demographic developments and resource use along river – coast systems. Combined with information about natural goods and services, this can throw some light on former triggers of social choice that generated developments and the potential for the future.

UNESCO/IOC expressed interest in this approach, to find and apply effective indicators of change in the frame of Coastal-GOOS and to provide tools for scenario simulation in coastal management. The IOC representative, Julian Barbieri, underlined a strong rationale for links noted that training needs could also benefit from the LOICZ/IOC relationship.

The gaps and hot spots identified during the two SAmBas workshops provided a set of key study areas/catchments covering the Pacific and Atlantic coasts:

- San Juan and Patia, two high sediment yielding rivers in Colombia
- Magdalena River, the largest continental contribution to Caribbean Colombia
- Guayas River - Gulf of Guayaquil, Ecuador
- Biobio River - Concepcion/Talcahuano Bay, northern Chile
- Jaguaribe and Ceará rivers, north-eastern Brazil
- Paraíba do Sul River/Septiba/Guanabara bays, south-eastern Brazil
- Patos Lagoon, southern Brazil
- La Plata River estuary including the Uruguayan and Argentinean coasts
- Negro River, Patagonia, Argentina

The sites provide a good coverage of the climatic and geographic sub-regions. Key persons in the SAmBas network agreed to develop proposals for the case-study sites

and to investigate potential funding on national and international levels.

The regional co-ordinators of SAmBas are Prof. L. Drude de Lacerda (Fortaleza) and Dr. Giovanni Daneri (Valparaiso).

While LOICZ and IOC will continue to support SAmBas, key work on sites must come from the regional scientific community.

A LOICZ Reports & Studies volume including a refined regional assessment and suggestions for a future SAmBas will be published, posted on the LOICZ website and contribute to the first global LOICZ synthesis book. It will also underpin a regional proposal by the SAmBas network.

OTHER WORKSHOPS

Volga-Caspian Basin

A Planned UNESCO Pilot Project on Sustainable Development

The Volga–Caspian Basin has an unusually high number of endemic species. It provides goods and services to the most populated parts of the former Soviet Union and is subjected to numerous trans-boundary resource use and management issues. The five scientific programmes/commissions under UNESCO: IOC, IHP, MAB, IGCP and MOST are considering a joint demonstration project on the sustainable development of this basin. LOICZ was invited to contribute to the ICEF Great Rivers 2001 Forum, held in Nizhny Novgorod, Russian Federation, 15-18 May 2001.

Embedded in the UN World Water Assessment Programme (WWAP), offspring of the World Water Forum, the project will focus on the achievement of long-term sustainable development in the Volga–Caspian basin. Key elements will include: catchment issues; links into the marine coastal zones, principal sinks for land-based sources of pollution and sedimentation and areas where flooding events and sea-level rise affect people. The pilot project will obtain inventories of regional and local change under natural and human forcing and establish geo-referenced meta-databases. Existing projects such as the Volga Revival and the Caspian Environmental Programme and information from the Hydro-meteorological Services will be carefully evaluated. A broad risk-assessment of the surface, subsurface and coastal water systems and boundary conditions is expected to provide further insight into systems’ resilience and will be evaluated

in combination with human stewardship and related management issues.

LOICZ will assist in identifying appropriate key scientific questions, templates for project design as applied in the global LOICZ Basins assessment project, and participatory approaches. The current EUROCAT project (see Newsletter 18) on catchment-based forcing of coastal change in Europe could serve as a template for the design. If the project is realized it will contribute to the global Basins effort with a perspective beyond the current LOICZ programme. LOICZ’s involvement underlines the increasing relationship with IOC and will enable new options for collaboration in the broader “water” field.

LOICZ IPO NOTES

The **LOICZ SSC** will meet in Amsterdam 7-8 July to consider the performance and direction of the programme. In addition to general operations, the development of the LOICZ Synthesis book and the questions and plans for the future of LOICZ will be main topics for decision. Key research questions for a second phase of LOICZ (2003-2012) as part of IGBP II, will be outlined by the SSC. These will form a base for extension and discussion by wider consultation within the LOICZ and broader community.

IGBP is in full preparation for its Global Change Open Science Conference (Amsterdam 10-13 July). LOICZ people are involved in presentations, organisation and attendance at the Congress which promises to be a grand affair – show-casing the fascinating and often unique findings about how the Earth systems interact and change. The broad implications of, for example, teleconnections, temporal context of changes and spatial patterns of process shifts, often in unexpected ways due to human pressures and natural causes will be key points of debate.

Opportunities for collaboration between LOICZ and a number of other agencies and programmes continue to be pursued. LOICZ is involved with the design phase of the **Millennium Ecosystem Assessment** and anticipates continued association during implementation over the next 4 years. Our fruitful and vital association with UNESCO’s **Intergovernmental Oceanographic Commission** is taking

another significant step forward with the development of a co-sponsorship arrangement by the IOC for LOICZ. Our combined work, for example in the area of ICAM and support for Coastal GOOS, will be further and more obviously extended as the new IOC issues-based structure comes into play. LOICZ is a participant in the **Global Conference on Oceans and Coasts at Rio+10** that IOC is staging in December 2001. It will assess scientific progress and continuing and new challenges in the marine realm for reporting to the World Summit on Sustainable Development in Capetown, South Africa in 2002.

The IPO has been very active this year in coordinating a large number of regional workshops addressing coastal biogeochemical modelling, river basins and typology issues in different regions of the world. While brief reports are given in the LOICZ Newsletter, the science is described in detail in a continued stream of **publications** – LOICZ R&S Reports and peer-reviewed journals. These are listed in each Newsletter and are available from the IPO. Importantly, these regional assessments of materials flux and human dimensions underpin the current work of integration and synthesis by LOICZ. The much promised revamping of the LOICZ **web-site** is underway and should now provide an up-to-date service to everyone, giving access to research findings, publications and LOICZ developments.

HAVE YOU SEEN

Some recent publications describing advances in coastal science, with great relevance to LOICZ, particularly in the local case studies of systems processes, changes due to human pressures and the inter-connectivity of processes and pressures.

Coastal Hypoxia: Consequences for Living Resources and Ecosystems.

Eds. Nancy N. Rabalais & R. Eugene Turner, June 2001, 463 pages. Contact: AGU Customer Service (orders@agu.org).

The establishment of anoxic conditions in the Gulf of Mexico is described. Topics dealt with include the effects of this periodic environmental condition on plankton, physiology and behaviour of communities, benthic organisms, fish and fisheries, food webs and ecosystems. The wider global nature of this

disturbing phenomenon is considered in concluding chapters.

Oceanographic Processes of Coral Reefs. Physical and Biological Links in the Great Barrier Reef.

Ed. Eric Wolanski, 356 pp., 2000. CRC Press LLC, Boca Raton, Florida USA.

A collected volume of synthesis, assessment and research papers dealing with the wider coastal zone (land, land-sea interface, reef systems) dynamics of processes. The physics – scaling, inter-connectivity, linkages – and interactions of human pressures on tropical ecosystems systems are clearly portrayed from current research. A snapshot and opinion on reef management and the political climate are provided. An accompanying CD-ROM graphically supports the text, to provide a picture of the land-ocean system interaction of the GBR, and this is applicable to coral reefs in general.

Science and Integrated Coastal Management. Dahlem Workshop Report 85.

Eds. B. v. Bodungen & R.K. Turner, 2001, 378 pages. Contact: Dahlem University Press (dahlemup@zedat.fu-berlin.de).

A comprehensive report of the 85th Dahlem Workshop, held in December 1999 addressing integrated coastal zone management. Coastal management issues and problems are identified through a series of global case studies. Importantly, the applicability of knowledge and the certainties and uncertainties of the relevant natural and socio-economic science are highlighted and discussed by leading experts from wide-ranging fields within the Dahlem Workshop forum. Various coastal management processes and institutional settings are assessed and form the basis for the deliberations and recommendations integrating science, management and decision-making.

Status of Coral Reefs of the World: 2000.

Ed. Clive Wilkinson, 2000, 363 pages. Australian Institute of Marine Science (see www.aims.gov.au)

An update on the state of global coral reefs from the Global Coral Reef Monitoring Network. A comprehensive report of regional coral reefs assessments is provided by the array of task groups around the world, describing current pressures and states, changes and threats, and institutional responses

(active or lack of) within the regions to management, conservation and protection. The extent and impact of the recent coral reef bleaching events that have affected this global ecosystem is apparent, and is ascribed to global temperature climate change and associated large-scale phenomena influencing local environments.

Pilot Analyses of Global Ecosystems (PAGE).

World Resources Institute, Washington DC. Available on line at <http://www.wri.org/wr2000>.

A series of overview reports has been prepared to date addressing the global state of 5 earth ecosystems: Coastal Ecosystems, Agro-ecosystems, Freshwater Ecosystems, Grassland Ecosystems, Forest Ecosystems. Each report, by design, is a first attempt to “take stock of [the ecosystem] extent, its condition, and its capacity to provide goods and services we will need in years to come”. The reports result from wide ranging collaboration between researchers, institutes and agencies to give an initial appraisal of the earth systems, providing a vital datum point for further global assessments such as the Millenium Ecosystem Assessment, and research programs such as IGBP.

Coastal Marine Ecosystems of Latin America.

Eds U. Seeliger, B. Kjerfve, 2001, Ecological Studies Vol. 144, Springer, ISBN 3540672281, 360 pages.

Coastal communities have a vital stake in nearshore ocean and coastal resource use. Increasing socio-economic demand for coastal goods and services is counteracted by decreasing revenues due to degradation of coastal forests and mangroves. This leads to considerable money flows for mitigation and restoration, but to achieve sustainable management, fundamental understanding of coastal system functioning and organization is needed. Seeliger and Kjerfve provide a comprehensive description of 22 major coastal ecosystems in Latin America where natural and anthropogenic-driven change has increased considerably during the last century. Systems under pressure and areas exhibiting nearly pristine conditions are discussed, ranging from the lagoons of northern Mexico to the bays of Patagonia. The book focuses on ecological features and energy fluxes and provides suggestions for management.

Water: Quantity – Quality Perspective in South Asia; V. Subramanian, 2000, 256 pages. Kingston International Publishers, England; surreykt@aol.com

Subramanian synthesizes decades of data from monitoring programs and literature to provide an extensive overview on water related issues under natural and man-made change in South Asia. This area contributes 9% of the global river runoff and drains to the Arabian Sea and the Gulf of Bengal. While the focus is mainly on the freshwater end of the water cascade, discussions provide a variety of biogeochemical and water quality information including groundwater resources and reveal the catchment-based pressures that affect South Asian coastal zones. The book points out that regardless of the susceptibility of the hydrological cycle in this region to larger natural triggers such as ENSO and the monsoon system, human water use and management contribute considerably to the availability of water and to protection against flooding and drought. It is an important source of information about a region which hasn't received broad scientific attention, but which is undoubtedly a crucial piece in a global basins jigsaw.

LOICZ PUBLICATIONS

[available as printed copies or from the LOICZ web-site: www.nioz.nl/loicz/]

Estuarine Systems of sub-Saharan Africa: C, N and P Fluxes. LOICZ UNEP workshop report. Eds. V. Dupra, S.V. Smith, J.I. Marshall Crossland and C.J. Crossland. LOICZ R&S 18, 2001.

SARCS-WOTRO-LOICZ: Biogeochemical and human dimensions of coastal functioning and change in South-East Asia. Eds L. Talaue-McManus, H.H. Kremer and J.I. Marshall Crossland. LOICZ R&S 17, 2001.

LOICZ Web Site: Biogeochemical Budgets and Modelling – new sites and tutorial materials (<http://data.ecology.su.se/MNODE/>).

LOICZ Web Site: Typology (<http://water.kgs.ukans.edu:8888/public/Typpages/index.htm>)
Also (www.kgs.ukans.edu/Hexacoral/Workshops)

LOICZ CALENDAR

LOICZ UNEP Africa and Europe thematic workshop on upscaling and assessment of nutrient fluxes in coastal estuarine systems. 2-5 July 2001.

RIKZ- CZMC, The Hague, The Netherlands (by invitation).

Contact: LOICZ IPO.

LOICZ Scientific Steering Committee Meeting. 7-8 July 2001, Amsterdam.

Contact: LOICZ IPO.

AfriBasins II workshop on African river catchments/coastal fluxes and human dimensions. November 2001.

Nairobi, Kenya (by invitation).

Contact: LOICZ IPO.

LOICZ-UNEP Polar regions workshop on biogeochemical modelling of estuarine systems. 9-11 September, 2001, Stockholm, Sweden.

Contact LOICZ IPO or Prof. Fred Wulff..

LOICZ-UNEP global thematic workshop on upscaling and assessment of nutrient fluxes in coastal estuarine systems. 11-14 November, 2001, Lawrence, Kansas USA. Contact LOICZ IPO.

LOICZ "Synthesis" and Open Science Meeting 5, 22-25 May 2002, Miami, Florida, USA. Contact LOICZ IPO.

OTHER MEETINGS

IGBP Open Science Conference. 10-14 July, 2001, Amsterdam, The Netherlands. Contact: igbp@congrex.nl, www.sciconf.igbp.kva.se

3rd International Conference on Land Degradation and Meeting of the IUSS Sub-commission C – Soil and Water Conservation. 24-28 September 2001, Rio de Janeiro, Brazil. More information on www.cnps.embrapa.br/ICLD

General Assembly, Global International Water Assessment (GIWA). 9-11 October 2001, Kalmar, Sweden. Contact GIWA Coordination Office (info@giwa.net).

Joint IAPSO-IABO Assembly and XII Colloquium: 2001

An Ocean Odyssey. 21-28 October 2001, Mar del Plata, Argentina. Contact: gmperrill@criba.edu.ar or iado@criba.edu.ar

Euresco CLIVAR/PAGES Conference on Abrupt Climate Change Dynamics. 10-15 November 2001, Castelvecchio Pascoli, Italy. Contact PAGES IPO (pages@pages.unibe.ch).

Global Conference on Oceans and Coasts at Rio+10: Assessing Progress, Addressing Continuing and New Challenges. 3-7 December 2001, UNESCO, Paris. Contact IOC Secretariat, Paris.

IAS/SEPM Environmental Sedimentology Workshop: Continental Shelves – Processes, Record, Utilization and Management. 7-10 January 2002, Hong Kong. Contact Wyss Yim (wwsyim@khu.hk).

International Symposium on Low-Lying Coastal Areas: Hydrology and Integrated Coastal Zone Management. 9-12 September 2002, Bremerhaven, Germany. Contact Alicia Aureli, UNESCO (a.aureli@unesco.org).

11th International Biennial Conference on Physics of Estuaries and Coastal Seas (PECS). 17-20 September 2002, Hamburg, Germany. See (<http://www.pecs-conference.org>).

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