

LOICZ NEWSLETTER

The river basin dimension of coastal zone research

by Wim Salomons and Kerry Turner

It is nothing new for the LOICZ community to know that the coastal zone is subject to material fluxes from the continent. Contributing to these fluxes are those from direct discharges like sewage inputs and, still rather unknown, from groundwater discharges.

Unfortunately, in most cases the fluxes are determined by averaging (or with some other statistical methods) the data from the last estuarine or riverine monitoring station. This is valid for estimating inputs into the coastal zone, however it omits the dynamics of the river catchment and of the coastal region. Dynamics means both the natural changes caused by climate change, vegetation cover etc. as well as the direct human induced impacts like changes in agriculture, urbanisation, tourism and transport.

These changes have to be incorporated into a dynamic integrated model in order to predict the impact of global changes on the coastal area. To properly develop these dynamic models to predict future change in fluxes or with hindcasting to explain the past changes, requires a strong understanding of the interactions with the human dimension-part of LOICZ: Focus 4. An appropriate conceptual tool for such an integration exercise is the Pressure-State-Impact-Response framework (Figure 1). In this framework, *pressure* refers

to those forces and interactions that are likely to change the coastal system. These forces and interactions often result from the sectoral pursuit of stakeholder interests through the exploitation of one or a limited number of environmental functions. The *state* of the coastal system represents the condition of significant components of the system that may be affected by these pressures. Changes to this state may lead to *impacts* which could be felt by both environmental and economic processes within the coastal zone. The combined information on pressure, state and impact can form the basis for potential trade-offs between conflicting interests. Hence, *response* describes the policy and management actions that can be undertaken to mitigate the undesirable impacts of the imposed pressures on the state of the system. It involves the identification and evaluation of alternative management strategies and their enabling policy instruments em-

This is the ninth 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

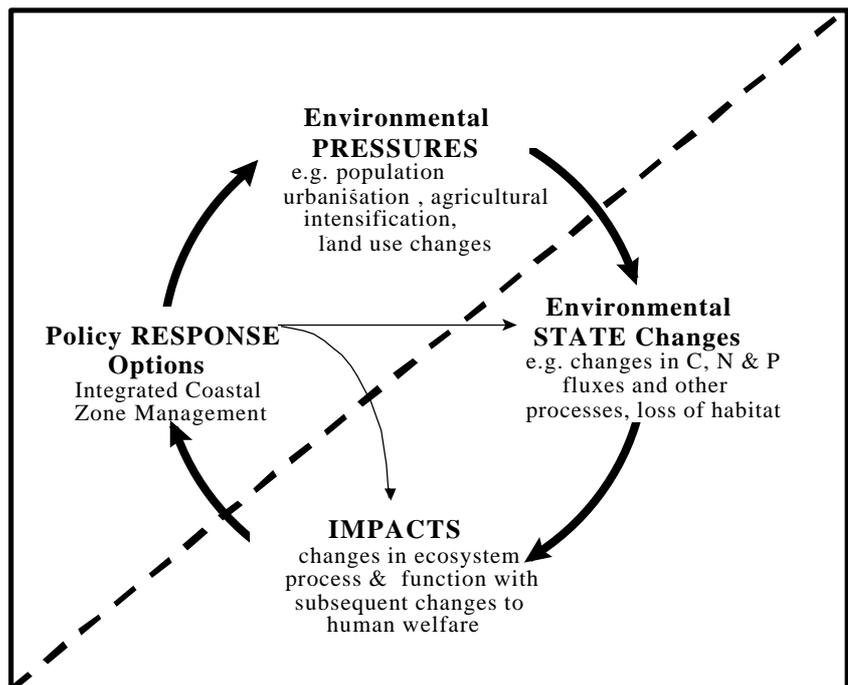


Figure 1. The PSIR Framework

ployed to facilitate trade-offs in the light of relevant policy goals. Turner et al. further elaborate this PSIR framework in the upcoming LOICZ report¹.

The PSIR framework is translated in Figure 2 into a detailed flow scheme applied to nutrients fluxes from the catchment soils down to the ocean. In bold are shown the LOICZ relevant 'impacted' areas: the estuary and the coast. These two areas are intertwined in a complex system, which includes the catchment, the atmosphere, wetlands and groundwater (Box A); all are major sources for nutrients, main reservoirs and the linkages between socio-economic activities and the biogeochemical cycle of nutrients. The main anthropogenic inputs are from agriculture, industrial activity, and sewage treatment plants. Large differences in residence time exist between nitrogen and phosphorus, the latter being primarily transported by particulates and thus prone to permanent or extended temporary retention. Phosphorus entering the soil through agricultural fertilisation is only partly taken up by crops, the main part becoming adsorbed to soil particles. Residence times in the soil, based on natural removal processes, are on the order of

many decades. In contrast, nitrogen moves with water through surface runoff and quickly enters streams. In temperate regions, the main input into agricultural areas occurs in the winter/spring. Part of the nitrogen enters ground water and, in some agricultural areas, problems exist with regard to its quality. Another part of the nitrogen is released to the atmosphere via denitrification, and is returned by wet/dry deposition. In certain coastal areas such as the North Sea system, the atmosphere is a major source of nitrogen. In river systems, temporary storage of particle-bound nutrients takes place in riverbed sediments, flood plains and wetlands in general, along estuaries and coasts. Riparian areas play an additional important role in the removal of nitrogen at the catchment level.

The system in Box A generally represent the natural dynamic system but is static with regard to external forcing. Box B introduces the two major external forcing functions. One is the change in climate. This will affect land cover, discharge, frequency of extreme events, etc. The second is the human dimension. Socio-economic developments at the catchment level affect the use of land, building of dams affects

sediment transport and changing land use again will have a large effects on hydrology. The combination of the information in Boxes A and B will result in possible scenario's for the future. Important is the assessment of the scenario's sensitivity for response and change, hence a third box C is introduced which deals with determining key areas and critical loads for those areas. Here we have also a strong link with the budget modelling exercise. Globally, it is expected that we will observe large regional differences in critical loads.

We are not able yet to apply a scheme like the one shown in Figure 2 at the global level. In the coming period we have to identify and use regional studies which can contribute in identifying the major biogeochemical processes and the external forcing functions. However, there are a number of initiatives already underway which are, relevant to this approach. One is the LOICZ Report by Turner et al. Within IGBP the recently established Water Group (see their report "Continental Aquatic Systems")ⁱⁱ provides an overview of available data sets and concepts for covering the organised our first regional work-

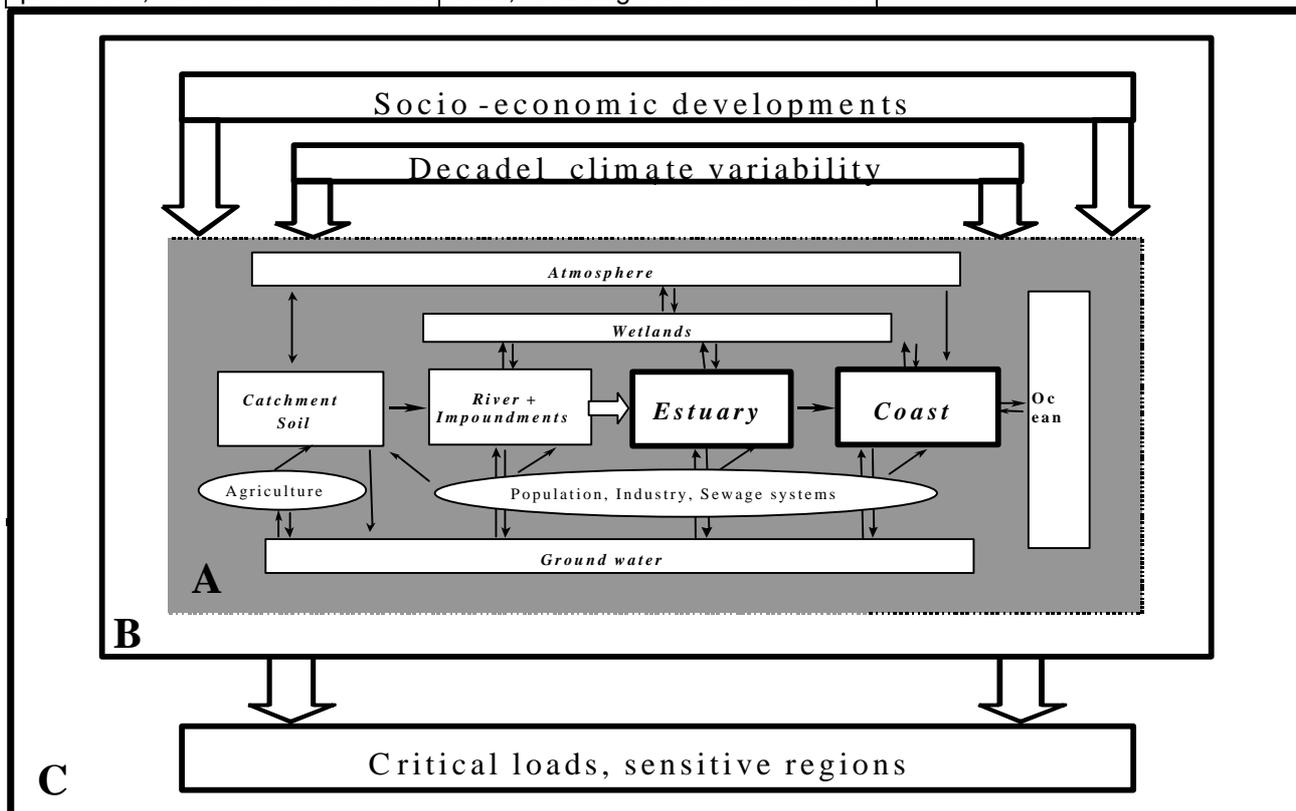


Figure 2. Conceptual framework for nutrient fluxes to the coastal zone

'complete' flux, starting from the soils. Last, LOICZ organised our first regional workshop along these lines in Amsterdam in November. This workshop brought together 20 researchers from Europe who are actively involved in this type of integrative research. Out of this workshop a working plan developed encompassing 10 river basins in Europe. Similar workshops will be held in the future for other global regions, to extend the working base. Should you have research addressing these areas, please contact either Wim Salomons or Kerry Turner.

ⁱ R.K. Turner, W.N. Adger and I. Lorenzone (1998): Towards integrated modelling and analysis in coastal zones: Principles and Practice. LOICZ Report. In Press.

ⁱⁱ D. Sahagian and Lei Chou (1998): Continental aquatic systems. IGBP report.

START-Oceania Inaugural Meeting

by Nick Harvey

The START-Oceania Committee held its inaugural meeting at the University of South Pacific (USP) in Fiji from 5-9 October, 1998. The Committee comprises Kanayathu Koshy of USP (Chair), Mike Hamnett (University of Hawaii), Christian Colin (ORSTOM, New Caledonia), Nick Harvey (University of Adelaide, Australia), Graeme Sem (SPREP, Samoa) and John Campbell (University of Waikato, New Zealand). The START-Oceania Secretariat is based at USP with Koshy as the Director. Administrative staff will be appointed in 1999.

The START-Oceania meeting was held in conjunction with two workshops, Coastal Zone Management and Climate Change and was sponsored by the Asia Pacific Network, and START. The workshops attracted about 50 scientists from the Oceania region.

The USP Vice-Chancellor, Mr Eskia Solofa, welcomed the international participants and challenged START-Oceania to develop expertise and training relevant to the region rather than provide scientific advice based on westernised perspectives linked to foreign aid programmes. The Secretariat and Workshops were officially opened

by Mr Romulo Garcia, the UNDP Resident Representative in Fiji.

Two plenary sessions set the global, regional and local contexts for each of the two workshop themes. In the Climate Change session, plenary addresses were given by John Hay (University of Auckland, NZ), Mike Hamnett (University of Hawaii) and Epeli Nasome (Director of Environment, Fiji). In the Coastal Zone Management session, plenary addresses were given by Roger McLean (ADFA, Australia), Chalapin Kaluwin (SPREP, Samoa) and Patrick Nunn (USP).

The workshops and the START-Oceania meeting went extremely well and Roland Fuchs (Director, START) was impressed with the amount of work and co-operation produced from the participants. Four major projects were developed during the four day workshop, including 'Island-Ocean Interactions in the Pacific' which has strong linkages to the LOICZ Focus Four theme. These projects are currently being refined and will be submitted to overseas funding agencies.

European river basins addressed

by Maarten Scheffers

The LOICZ-IVM workshop on European river catchments and the coastal region was hosted by the Institute for Environmental Studies (IVM) of the Free University in Amsterdam, 11-12 November 1998. The workshop is one in a series being organised by LOICZ in contribution to the IGBP Water Group, a cross-project activity between IGBP projects.

About 20 researchers from European institutes discussed regional case studies and developed opportunities for collaborative relating to LOICZ Foci 1 and 4. The case studies of European research dealt with the interactions between river basins and coastal regions, demonstrating a wealth of research across an array of catchments but a need for improved integration across the work.

Two working groups initiated the

development of regional projects, including:

- A) from discussion of material fluxes in and from the river catchment areas to the coastal zone, a preliminary proposal: "Changes of fluxes in river basins of Europe; its natural and anthropogenic causes and its socio-economic consequence", and
- B) from discussion of the science management-policy interface, a preliminary proposal built around sustainable coastal tourism pressures on basins and estuaries.

A steering committee is completing the proposals for submission for EU funding. The Workshop report will be available from LOICZ IPO in January 1999.

ELOISE and LOICZ strengthen links

by Hartwig Kremer

The 2nd Annual Scientific ELOISE Conference held in Huelva, Spain, September 30 - October 3, 1998 involved some 300 researchers and gave a comprehensive overview and status of about 30 European land-ocean interaction research projects dealing with:

- Global Changes and Biogeochemical Cycles and Fluxes;
- Ecosystem Structure and Functioning and Human Impacts and
- Coastal Zone management and integration of natural and socio-economic science

Besides horizontal fluxes of nutrients, sediments and harmful substances, major focus was on the forcing of flux changes and their consequences, and good descriptive modelling tools. They have reached an elaborated state at some demonstration sites but, the predictive capacity still needs significant effort. A gap was the integration of socio-economic science.

This was further emphasised when representatives of the EU stressed that project evaluation in the new Fifth Framework for Research and Development (FP 5, 1999 onwards) will include the issue of exploitation of scientific products. A clear identification of clients, the

relevance of science deliveries and how to manage the transfer to multi-user groups will be needed.

Reference was made to the LOICZ experiences in the field of integration of scientific disciplines and determining the human dimensions of biogeochemical flux changes, during discussion, and a stronger collaboration between ELOISE and LOICZ was recommended. The ELOISE program agreed to:

A) strengthen collaboration with LOICZ and to place stronger emphasis on the field of science integration and human dimensions. The new LOICZ guidelines "Towards Integrated Modelling and Analysis in Coastal Zones: Principles and Practice" were regarded as a welcome scientific input.

B) a joint ELOISE/LOICZ workshop on "Socio-Economic Aspects of Fluxes of Chemicals in the Environment" will be run in early 1999 (probably 8-10 March) hosted by the Norwegian Institute for Air Research, NILU, in Kjeller. Major themes will be: i) the ELOISE and LOICZ research results on coastal zone pressures and their environmental and socio-economic consequences into the policy-making mechanisms, and, ii) research needed to address this information transfer. The workshop will bring together various science disciplines and science users.

C) the ELOISE Annual Conference at Noordwijkerhout, The Netherlands in early December 1999, planning to have joint LOICZ contribution, such as;

- Socio-economic impacts on fluxes of pollutants,
- Budgetting of nutrients in coastal systems,
- Continental aquatic systems.

These issues will provide logical links between the programs.

LOICZ SSC Membership

Three new members (Liana Talue-MacManus, Jozef Pacyna, James Syvitski) will join the LOICZ SSC from 1 January 1999. In welcoming these members, we gratefully acknowledge the committed and generous contribution made by the retiring members Ed Gomes, Patrick Holligan and Tetsuo Yanagi.

LOICZ PUBLICATIONS

SCOR Working Group 104 (American Zoology limited copies available from the LOICZ IPO).

Copies will be available in January 99.

Towards Integrated Modelling and Analysis in Coastal Zones: Principles and Practices, *LOICZ Reports & Studies No. 11.*

Australasian Estuarine Systems: Carbon, Nitrogen and Phosphorus Fluxes, *LOICZ Reports & Studies No. 12. Will be published in January 99.*

LOICZ CALENDAR

- Mexican & Central American Coastal Lagoons Biogeochemical Budgets Workshop, 12-16 January 1999, Merida, Mexico.
- Follow up meeting on River Catchment and the Coastal Region, 15 January 99, Amsterdam, The Netherlands.
- SC-IGBP Meeting, 23-26 February 1999, Estoril, Portugal.
- ELOISE/LOICZ workshop on "Socio-Economic Aspects of Fluxes of Chemicals in the Environment". 8-10 March (tentative) 99, Kjeller, Norway
- LUCS Data Expert Meeting on Coastal Zones of Southern India (LUCS-DIS, in collaboration with LOICZ), 7-9 April 1999, Goa, India.
- 2nd IGBP Congress and SSC9 Meeting, 7-13 May 1999, Yokohama, Japan.
- LOICZ 4th Open Science Meeting, 15-18 November 1999, Bahía Blanca, Argentina.
- South American Estuaries Modelling Workshop, November 1999, Bahía Blanca, Argentina.

- ELOISE Conference, December 1999, Noordwijkerhout, The Netherlands.

- IGBP Open Science Millennium Conference, April or May 2001, (proposed) Washington, USA.

Typology & Biogeochemical Budgets

Major workshops on global coastal typology and biogeochemical budgets for the Australian region were held in October 1999. These have added significant thrust and information to LOICZ foci 2 and 3 objectives. Details will be reported in the next LOICZ Newsletter and specific outcomes are to be found in the LOICZ web site.

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First Announcement

Please copy and share with your colleagues
Or post on a Notice Board
December 1998

FOURTH LOICZ OPEN SCIENCE MEETING

REGIMES OF COASTAL CHANGE

To be held at

Bahia Blanca

Argentina

15 – 18 November 1999

The Land-Ocean Interactions in the Coastal Zone (LOICZ) is a Core Project of the International Geosphere-Biosphere Programme: A study of Global Change (IGBP). LOICZ addresses the scientific issues and uncertainties associated with changes in the world's coastal zone, and is involved in and promoting coastal research under a number of research themes in various geographical regions around the world.

The Fourth Open Science Meeting is intended to provide a forum for review of on-going and planned LOICZ science, to identify methods for integrating the science into models for global analysis, and to secure additional commitment of scientists to participate in the research that is planned for this second five-year phase of the project. The Meeting also aims to encourage a dialogue and to initiate collaboration amongst individuals from the global community of coastal zone scientist interested in global change.

General Program Outline

The Meeting will consist of a number of plenary sessions and topical sessions, workshops and evening working groups. Plenary sessions will consist of invited keynote papers complemented by contributed posters that address issues central to LOICZ research:

- Horizontal fluxes of water and materials through river basins into the coastal seas,
- Groundwater flux and significance to coastal seas,
- Biogeochemical budgets, for example, in coastal habitats estuaries, deltas coastal seas,
- Coastal typology methods and developments,
- Scaling issues – space (local studies to global) and time,
- Influence of the human dimension on coastal changes, and
- Integration of socio-economic and natural sciences.

A forum for in-depth review and discussion of these and related initiatives will be provided by workshops and small evening group session. Some specialist and regional workshops will be held immediately pre-Meeting. Individual researchers will be strongly encouraged to contribute posters that summarise concepts, results and models that are relevant to LOICZ objectives and goals. Further information can be found on the LOICZ web site (www.nioz.nl/loicz/).

Organisation and Participation

The Meeting is organised by the LOICZ Scientific Steering Committee, the LOICZ International Project Office and a local committee from the Instituto Argentino de Oceanografia in Bahia Blanca, Argentina. The Meeting is open to scientists world-wide, in keeping with the IGBP philosophy. Some financial assistance is available to defray the costs of participation of coastal zone scientists from developing countries.

Key dates include:

Second circular and registration	31 March 1999
Deadline for registration	31 May 1999
Poster abstracts	1 July 1999

ELOISE OPEN SCIENCE MEETING

The European Land-Ocean Interactions Studies (ELOISE) project cluster is the largest concerted effort in coastal zone science in the world. It consists of 30 projects sponsored by the European Commission within its programmes Marine Science and Technology (MAST) and Environment and Climate. The major aim of ELOISE is fundamental research on land-ocean interactions within different disciplines, including socio-economics, and to provide a forum for discussion between the different fundamental sciences and their users in society. ELOISE is the contribution of the European Union to LOICZ (Land-Ocean Interactions in the Coastal Zone), a programme of IGBP (International Geosphere-Biosphere Programme).

The 1st and 2nd ELOISE Open Science Meetings were held in 1997 in Arcachon, France and in 1998 in Huelva, Spain. These meetings provided a successful forum for scientists working in different European projects on coastal zone science. The 3rd ELOISE Open Science Meeting will be held in Noordwijkerhout, in the Netherlands from 1-4 December 1999. The third Open Science Meeting of ELOISE is open to all scientists with an interest in the complex and multiple problems of the coastal zone. At this meeting the scientific results from fifteen major EU projects will be synthesised. During special theme sessions a number of important problems of coastal zone science and management will be discussed.

The meeting will be held in Leeuwenhorst Congress Centre, Noordwijkerhout, The Netherlands.

Local organising committee
Prof. Dr. Carlo Heip
Dr. Lucas Stal

Information: Congress secretariat, Yerseke
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Updated information on the congress will be available on ELOISE web site: <http://europa.eu.int/en/comm/dg12/eloise/eloise-h.html>

OTHER MEETINGS

- JGOFS International Scientific Symposium, Biogeochemistry of the Arabian Sea: Synthesis and Modelling, 18-20 January 1999, Bangalore, India.
- Conference on Marine Environment, the Past, Present and Future, 26-28 January 1999, Kaohsiung, Taiwan.
- 1999 Open Meeting of the Human Dimensions of Global Environmental Change Research Community, 24-26 June, Kanagawa, Japan.
- Fifth International Conference on Coastal and Port Engineering in Developing Countries. 19-23 April 99, Cape Town, South Africa.
- Non-CO₂ Greenhouse Gases (NCGG-2) Scientific understanding, control and implementation. 8-10 September 99, Noordwijkerhout, The Netherlands.
- International MEDCOAST Conference on Wind and Wave Climate of the Mediterranean and the Black Sea. 30 March - 2 April 99, Antalya, Turkey.
- 1999 Gordon Research Conference on Polar Marine Research. 7-12 March, Ventura, California, USA.
- 3rd International Symposium Environmental Geochemistry in Tropical Countries. 25-29 October 99, Rio de Janeiro, Brazil.
- 15th Biennial International Estuarine Research Federation Conference, "Where the River meets the Sea", 25-30 September 99.