

## **1. Overview of Regional Workshops objectives and process**

The key objectives of the Land-Ocean Interactions in the Coastal Zone (LOICZ) core project of the International Biosphere-Geosphere Programme (IGBP) are to:

- gain a better understanding of the global cycles of the key nutrient elements carbon (C), nitrogen (N) and phosphorus (P);
- understand how the coastal zone affects material fluxes through biogeochemical processes; and
- characterise the relationship of these fluxes to environmental change, including human intervention (Pernetta and Milliman 1995).

To achieve these objectives, the LOICZ programme of activities has two major thrusts. The first is the development of horizontal and, to a lesser extent, vertical material flux models and their dynamics from continental basins through regional seas to continental oceanic margins, based on our understanding of biogeochemical processes and data for coastal ecosystems and habitats and the human dimension. The second is the scaling of the material flux models to evaluate coastal changes at spatial scales to global levels and, eventually, across temporal scales.

It is recognised that there is a large amount of existing and recorded data and work in progress around the world on coastal habitats at a variety of scales. LOICZ is developing the scientific networks to integrate the expertise and information at these levels in order to deliver science knowledge that addresses regional and global goals.

The United Nations Environment Programme (UNEP) and the Global Environment Facility (GEF) have similar interests through the sub-programme: “Sustainable Management and Use of Natural Resources”. LOICZ and UNEP, with GEF funding support, have established a project: “The Role of the Coastal Ocean in the Disturbed and Undisturbed Nutrient and Carbon Cycles” to address these mutual interests.

The work and products from a series of three regional workshops – Asia and Australasia, the Americas, Africa and Europe – are described here. They encompass efforts to integrate the regional geographical settings for the suite of about 170 biogeochemical site budgets derived from earlier and companion workshops, and to expand access to the data and tools in the global scientific community.

A set of common goals was established for the typology workshop series (Appendices I, II, and III). These included the development of typologies or classification of various geographical settings within the longitudinally-bounded region addressed by each workshop. Up-scaling and integration of data in a context of expert judgement and expert typologies were the corner-stones of activities within each workshop. The provision of training and awareness of a typology tool developed by the LOICZ project for these purposes was a major objective as was, where information was available, comparison with other scaling and typology approaches.

The C-N-P biogeochemical models for estuaries and coastal seas (Section 2.2 and Appendix V), developed by the common methodology of the LOICZ approach (Gordon et al. 1995), are delimited by their external forcings (material loads, human populations, oceanographic influences), climate regime and nature of the ecosystems that comprise the locality. These conditions form a tapestry of geographical settings that can be described across a variety of scales through a suite of variables. In our efforts to describe the biogeochemically functional state of the coastal systems, it is necessary to integrate the information across larger scales in order to determine patterns of nutrient effects and transformations and to derive information about “hot spots” and changing conditions and drivers of ecosystem function. LOICZ had earlier identified the use of a typology or classification approach as being an important tool that could be applied to the issue of up-scaling and integration.

The LOICZView clustering tool (Section 2.3 and Appendix VI) and databases (Section 2.1 and Appendix IV) had been developed to an early stage of utility before these workshops as one method for scaling and appraising the biogeochemical information. An array of physical, chemical, human

dimensions and biological variables had been acquired and fitted to a global coastal zone matrix at half-degree resolution. The ability to aggregate or cluster multivariable data had been tested and the workshops provided the opportunity for further testing, development, and application of the approach.

Most of the participants in the workshops had been involved in earlier biogeochemical budget workshops for their region and were aware of the purpose of the project, including the two-pronged approach of a) budgets derivation and b) up-scaling and integration. A major activity of the typology workshops was for participants to develop typologies with relevance to the biogeochemical budgets settings (for example, climatic settings, river basin loads, coastal ecosystems and habitats distribution) and to compare the outcomes with both their expert judgements and/or similar existing subjective typologies. In the process the typology tool and databases were extended and improved to meet the use requirements of the participants and the design requirements for products from the LOICZ-UNEP project. This set of evolutionary outcomes has seen the LOICZView scaling approach being applied to other related work in national coastal zone management and international projects addressing scaling and integration issues.

The training and capacity-building purpose of the workshops was a major thrust. There is a cadre of global scientists actively involved in use and extension of the approach to meet the goals of this project and the wider LOICZ project, and to applying the methods to local and regional questions. A significant outcome of the workshops will be the application of the acquired knowledge in a final workshop (November 2001) of the project in order to develop a global assessment of the C-N-P biogeochemical performance of estuaries and coastal seas.

Throughout the project, use has been made of the World-Wide-Web as a research and teaching tool, as a repository of scientific results from the C-N-P biogeochemical model developments (<http://data.ecology.su.se/MNODE/>) and the typology outcomes, and as a device for discussion and provision of training materials within the network of participants. Separate web-sites support the typology database ([www.kgs.ukans.edu/Hexacoral/Envirodata/envirodata.html](http://www.kgs.ukans.edu/Hexacoral/Envirodata/envirodata.html)) and the typology clustering tool ([www.palantir.swarthmore.edu/loicz/](http://www.palantir.swarthmore.edu/loicz/)), and they are linked for use. The continued access to interim and final electronic publications and upgrades of the tools has assisted in the rapid development and application of the tools and dissemination of the modelling and typology approaches.

This report is structured to provide an introduction and overview to the typology work of the three regional workshops in a text form. The work focuses on typology development rather than the biogeochemical model descriptions, although some workshop activities were directed at sub-set questions immediately related to the biogeochemical objectives. Detailed results and products from the workshops and the associated databases are contained in the companion CD-ROM as well as posted on project web-sites that can be readily accessed for a full account of the effort and work of the many participants in the project.