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Managing European Coasts

Past, Present and Future

With 62 Figures

Springer

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Foreword

Coastal zones play a key role in Earth System functioning and form an "edge for society" providing a significant contribution to the life support systems. Goods and services derived from coastal systems depend strongly on multiple transboundary interactions with the land, atmosphere, open ocean and sea bottom. Increasing demands on coastal resources driven by human habitation, food security, recreation and transportation accelerate the exploitation of the coastal landscape and water bodies. Many coastal areas and human activities are subject to increasing risks from natural and man-induced hazards such as flooding resulting from major changes in hydrology of river systems that has reached a global scale. Changes in the hydrological cycle coupled with changes in land and water management alter fluxes of materials transmitted from river catchments to the coastal zone, which have a major effect on coastal ecosystems. The increasing complexity of underlying processes and forcing functions that drive changes on coastal systems are witnessed at a multiplicity of temporal and spatial scales.

Demographic pressure has resulted in an acceleration of human interventions that impact natural processes taking place in the coastal zone. The demands for coastal resources and human security are further exacerbated by broad scale changes of climate patterns and oceanic circulation. This combination of anthropogenic drivers/pressures combined with natural system oscillation and natural change keeps changing our environment to an extent that has culminated in what is now described as the "Anthropocene". However, even today our understanding of regional and global changes that impact coastal systems is still hampered by traditional disciplinary fragmentation. In order to maintain or restore a sustainable delivery of goods and services for humankind, science is challenged to better inform society, decision-makers and planners about:

- Global changes that are part of natural cycles of change, such as climate, and those due to changes in the global economy/trade and policy;
- Regional (trans-boundary and supra-national) changes as a result of multi national and regional drivers and pressures in the coastal zone; and
- Regional changes at often transboundary catchment level, which affect the downstream coastal zone and the near-shore marine environment.

Consequently the regional or local perspective of coastal change becomes increasingly important simply by recognition that coastal people are more and more seen as an integral part of the system. On European scales policy making has identified the relevance of the river basin or catchment scale for coastal change in one of the most recently launched regional legal "instruments", the European Water Framework Directive (Directive 2000/60/EC, L 327/1, Brussels, 23 Oct.

2000. Coastal management gaps and needs have been reviewed in form of an extended multiple site pilot project in Europe resulting in the EU recommendations concerning the implementation of Integrated Coastal Zone Management in Europe (2002/413/EC, L 148/24, Brussels 30 May 2002). For their Common Implementation Strategy, both initiatives require a profound scientific underpinning that is capable of conceptualizing the coastal zone against driver – change relations. Global and regional drivers and their interplay with social and societal choices need to be considered if scenarios shall be developed that can inform both the policy maker and manager.

The ELOISE thematic cluster is the European Union's contribution to the Land Ocean Interactions in the Coastal Zone, LOICZ, core project of the International Geosphere and Biosphere Program, IGBP. After 9 years of collaborative regional research, ELOISE has made an effort to synthesise its findings form 60 multinational and often trans-disciplinary projects and to highlight major directions towards future sustainability in the coastal zone. ELOISE stems originally from the Environment & Climate and the MAST (Marine Science and Technology) Research Programmes under the 4th EU RTD Framework Programme. Acting in con-cert with the Programme for International Co-operation (INCO) and the research programmes of the Member States it continued under the 5th Framework Programme.

In 2003, in order to enhance the "Community Added Value" of the ELOISE cluster and to synthesise its science, the ELOISE consortium and secretariat has carried out three thematic workshops on:

1. Upscaling and demands at the European and global levels,
2. Integration into European Policy, and
3. Developing coastal futures for Europe.

These workshops feature a mix of fundamental and applied science encapsulated in a harmonized and effective synthesizing and communication mechanism based on a "Dahlem Conference Approach". The goal was, through a retrospective, current and future perspective, to identify information needs, instruments and frameworks that enable the science community to inform the coastal management in Europe on all relevant scales.

The book presented here reports on the latter two workshops, that were held back-to-back. It focuses on four major areas. In the first chapter, Laure Ledoux and her co-authors review the general relevance and applicability of ELOISE science for and in European coastal policymaking. Not surprisingly in recognition of the rather curiosity-driven origin of the ELOISE research, they identify a visible mismatch in the policy information needs and the products provided. Rarely has the mostly fundamental science been able to acknowledge the multiple and partly variable temporal and spatial scales of coastal change and environmental and human interaction. Finding ways to properly upscale the various "case studies" still remains a challenge that calls upon the science to develop and use typological approaches that allow an issue based categorisation of land ocean interactions. The involvement of the human dimension has been running behind and so has the recognition and reflection of the different views of coastal stakeholders on "their" coastal zone. This fragmentation in people's

perception is basically symptomatic also of the traditional scientific work. The outcome of the first workshop is summarised in the second chapter of this book by Peter Herman and his co-authors.

A second block (Themes 2-3) reviews one of the most progressive and complex legal instruments, the European Water Framework Directive (WFD), its relevance for Coastal Zone Management, the data needs and methodological implications. It also considers the question of how to support the implementation of such a complex instrument and its multi-scale and transboundary effects by appropriate institutions and capacity building. Being highly innovative the Water Framework Directive still faces persistent technical problems in determining the environmental objectives and in interpreting key concepts such as "ecological status". Findings underline the need to apply typological and model-based approaches to derive the reference conditions and to classify aquatic systems. The necessary monitoring needs to be underpinned by appropriate indicators that can capture system functioning and state change across the relevant scales. The consequences of the WFD are also examined within the more specific context including marine protected areas (MPAs). A successful implementation of the WFD will rely strongly on promoting communication and closer collaboration between scientists, economists and other stakeholders including the public from the onset and on their involvement in the decision making process. The relevant scale here is the water continuum encompassing catchment managers as well as coastal managers.

Exogenous drivers such as climate change and globalization are reviewed in terms of their effects on European coastal zones and means to effectively manage the coast (Theme 4). Decisions made for management and those considered in a more proactive context need to be informed by scenarios that rely on appropriate valuation of both the environmental and human values. Cases for scenario use are presented. Strong sustainability options will be carefully weighed between the three provisions of human safety, economic development and ecological integrity. However, climate and sea level change as well as economic development pose considerable uncertainty on any prediction a fact that not only calls for sophisticated scientific response but again for a continuous involvement of the public and the media.

Integrated assessment, its capacity to provide the multidisciplinary information for scenario development and its shortcomings are reviewed and examples are provided featuring a variety of traditional (tourism) and rather recent coastal land and sea uses (windparks). The authors assess three different scenarios (1) a world market perspective, (2) global sustainability and (3) a regional, environmental stewardship for a variety of natural and anthropogenic driver/pressure settings to provide a forward look at European coastal areas. The most relevant current state changes in the coastal environment on a regional scale are habitat loss (including coastal squeeze); changes in biodiversity; and the loss of fisheries productivity. Others such as eutrophication, contamination and erosion are thought to be of local or moderate importance. It is expected that while the key characteristic driving forces will continue, climate change will have additional, often related impacts. Ultimately, under a globalization scenario impacts seem to be increasing while under the other two more appropriate response form society may help mitigate the

impacts and lead to better sustainability. This thematic section provides a variety of cases including the Humber and Rhine River where integrated assessment is demonstrated and where the multiple scales relevant for scientific investigation and management become very obvious.

The book paves the way to an integrated view on the complex issues of coastal zone management. It showcases the shortcomings of existing scientific information mostly due to a miss-match in scales on which it is provided. The need for integrated approaches and participation from the onset is underlined and reviewed under various perspectives. By doing this the ELOISE book provides an experience and science-based rationale that provides a strong argument for a serious re-view of science, research design, science management and funding policy. It also underlines the need for improved networking and communication across the scientific disciplines as well as the funding agencies, the stakeholders and public. Mismatch of scales and lacking ownership are symptomatic for the perception that science so far rather rarely informed the policy and public awareness process appropriately.

The book strongly supports the fundamental change that the LOICZ project, the global interface of ELOISE, is undergoing in transition from its first decade of mostly curiosity-driven global change research towards an issue-driven scientific assessment, synthesis and communication platform. This is highlighted by the recently approved draft Science Plan and Implementation Strategy (http://www.loicz.org). It puts LOICZ much more than in the past into the position to deliver both up-scaled information needed to improve our earth system understanding on global scales as well as issue driven information that can be downscaled and used in management and awareness raising on local and regional scales. This long-lasting transition has been nourished substantially by the experiences made in the LOICZ core project ELOISE. The discussions and papers presented provide a good picture of how the bridges between traditional and future sciences need to be shaped.

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Preface and Acknowledgement

This monograph is the result of workshops which were organized as part of the "Eloise-Tender" contract from the DG-research (contract number EVK1-CT2002-70001). This monograph is primarily the outcome of two workshops organized in Egmond aan Zee, The Netherlands, June 2-5, 2003, but also incorporates the results of an earlier workshop held in Goes, The Netherlands, May 7-10, 2003. For these three workshops, overall themes (upscaling, policy relevance and "coastal futures") were identified to synthesize relevant results from the EU ELOISE research cluster.

The adopted format for the workshops was the "Dahlem-framework". This framework involves in-depth debate without formal presentations but informed by written material that is distributed among participants beforehand. Papers were contributed by invitation as well as through an open call. Each session was organised via a number of sequential meetings and led to a group report that was peer-reviewed.

We thank all workshop participants and fellow authors for their contribution during the workshops in June 2003, as well as for their patience and care during the subsequent editing process. Special thanks are due to Laure Ledoux, who had to step back from the editorial team for personal reasons but made important contributions at the inception of this work, to Ann Dixon and Corrie Zoll, who did much of the final style-and-detail checks, as well as to Agata Oelschlaeger of Springer, for managing our book at the publisher's end. Sadly, we want to commemorate our colleague and partner Giuseppe Bendoricchio who passed away.

We believe that the workshops and the input of the participants have generated a synthesis which appeals to both scientists and coastal managers.

Amsterdam, May 2004

Jan Vermaat, Kerry Turner,
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