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Holistic Systems Analysis for ICZM: The Coastal Futures Approach

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Abstract

This article outlines the approach of *Zukunft Küste – Coastal Futures,* one of two large platform projects funded by the German Ministry of Research (BMBF). Beginning in April 2004, the project is designed to support sustainable development along the North Sea coast of Schleswig-Holstein. It involves a total of 50 project partners and consists of four interrelated project modules and 12 sub-projects, each of which is guided by specific research questions. The scientific concept is based on bringing together tools from both natural and social sciences - e.g. scenario techniques, modelling, stakeholder dialogues and Multi-Criteria Analysis - in order to develop planning and management options at the local, regional and national level. A key theme will be the assessment of interactions resulting from offshore wind farm development, including impacts on ecosystem and habitat structures, the economy and infrastructure, conflicts between stakeholders as well as social values such as perception of the coast by local people. To ensure methodological and conceptual integration, integrated assessment (known e.g. from LOICZ) and indicators (based on the DPSIR approach) form an overall framework. This framework, which is built on former international research, can be flexibly applied to different thematic fields and is able to use qualitative and quantitative information. Another level of integration is the comprehensive dialogue with local, regional and national stakeholders, which aims to integrate these actors as active research partners.

1 Aims and general approach of Zukunft Küste – Coastal Futures

Zukunft Küste – Coastal Futures describes a co-operative research project supported by national and international scientific institutes, national authorities and Schleswig-Holstein State Ministries. Supported also by regional and transborder institutions, it brings together a total of 50 project partners. The following text is largely based on the project application (Kannen et al. 2003).

With its central aim of supporting sustainable coastal development and Integrated Coastal Zone Management (ICZM) on the Schleswig-Holstein coast, *Zukunft Küste – Coastal Futures* integrates two perspectives of the sustainable use of coastal areas:

- the future of the coast as living, economic and recreational space for the resident population,
- the potential contribution of the coastal zone to sustainable development on a national, european and global scale, e.g. through using regenerative resources, maximising uses and safeguarding important natural resources.

Both perspectives are apparent in the current debate on large-scale offshore wind farms. A Government Position Paper considers offshore wind energy to be an important means for reducing greenhouse gases on a national and European level. Further benefits include its considerable potential for technological innovation, which in turn provides new impulses for economic growth and job creation. However, this new 'player' also places new demands on coastal resources, not least because of its considerable spatial demands. In Schleswig-Holstein, the resident population is unsure whether it will actually be able to benefit from the expected positive developments (Volmari 2002), with added insecurities concerning the risks associated with the proposed wind farms for existing uses and the ecosystem.

In order to assess these issues in an integrated manner, integrated assessment of interactions is required as well as socio-economic analysis of trade-offs including an assessment of economic, ecological and social risks. Innnovative development potentials that might arise from linking wind energy to mariculture will form a key part of this assessment, as will the special situation of the islands and Hallig islands. The project will seek continuous integration of results in local and regional ICZM concepts through exchange with key regional actors.

Changing spatial structures through new forms of use are another specific focus of the project. The project will analyse and evaluate the impact of offshore wind parks on established economies, with tourism regarded as the most significant current factor. At the same time the project will use the interchanges between offshore wind park development, mariculture and tourism as a case study to assess options for implementing concepts of multiple use, providing specific suggestions for their implementation.

Research therefore focuses less on sectoral problems than interactions between different coastal uses, particularly considering human interchanges with the coastal ecosystem (Fig. 1). This also includes the evaluation of resources and potential negative impacts of human activities on resources, using risk and vulnerability analyses (The H. John Heinz III Center for Science, Economics and the Environment 2000, ISDR 2001) and ecological economics as tools.

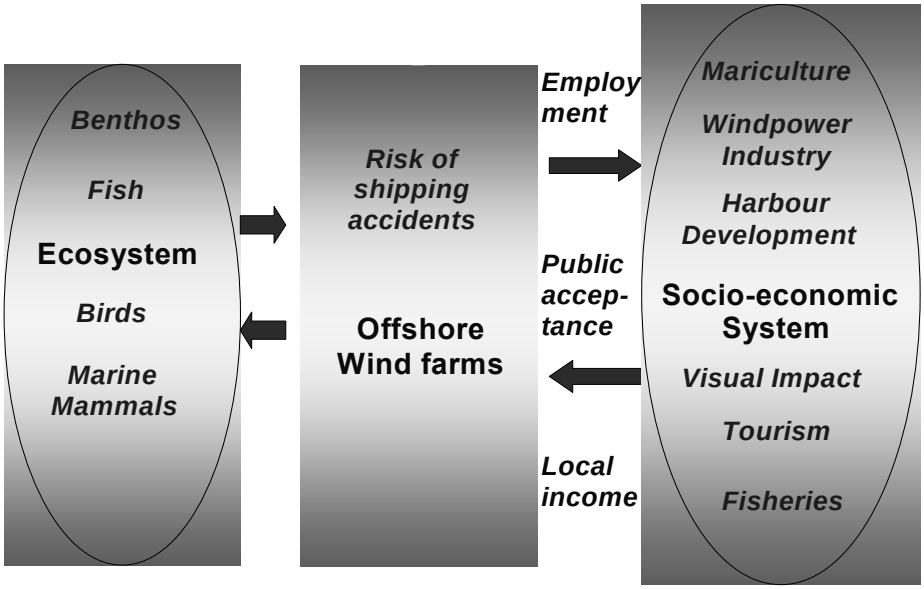

Fig. 1: Interactions as the core of integrated assessment (Kannen 2003)

This methodological approach aims to raise local and regional awareness of the complexities surrounding coastal zone decision-making and enable relevant actors to take into account complex interactions during strategic planning.

Forms of communication also play an essential role in implementing integrated management. Different thematic packages therefore focus on analysing, assessing and supporting networking and communication processes, involving different actors on the regional scale as well as interactions between the European, national and regional level.

At its core, the project therefore provides the necessary knowledge for guiding action in ICZM, developing and testing regionally and transregionally relevant tools through participative and transdisciplinary research.

2 Project Structure

Generally, the collaborative research project is divided into four interconnecting modules (Fig. 2). Each has a specific thematic or methodological focus and comprises several interrelated sub-projects. Module 3 for instance comprises four thematic packages and takes up offshore wind park development as a case study (see also Fig. 2). The module uses methods of evaluation, indicators and the tools of module 2 to analyse and evaluate local acceptance, economic potential, positive and negative impacts on other spatial uses as well as impacts on the ecosystem. Linking mariculture to offshore wind park development represents a potential win-win situation and could lead to mariculture becoming a new economic cluster on the West coast. One of the sub-projects aims to develop mariculture to the point of implementation, working with local actors in a model process and evaluating the impact of joint mariculture- offshore wind energy use on the ecosystem. Sub-project 3.4 complements the overall package by looking at tools for representing the risks and consequences that might result from shipping accidents in connection with offshore wind parks.

Module 1: Co-ordination and synthesis

SP 1.1: Programme management / Co-ordination / Synthesis

SP 1.2: Virtual competence centre as an information and management platform

SP 1.3: Education and training

Module 2: Integrated evaluation

SP 2.1: Development of a toolbox for integrated assessment

SP 2.2: International framework and interaction between management scales

SP 2.3: A Scenario-Manager to simulate and model regional development

Module 3: Impact analysis (offshore wind energy case study)

SP 3.1: Ecological impact analysis of offshore wind energy development

SP 3.2: Socio-economical impact analysis and assessment of opportunities and threats of offshore wind energy development

SP 3.3: Mariculture (Open Ocean Aquaculture [OOA]) in offshore wind parks

SP 3.4: Benefits and acceptance of scientific information in the public debate on elevated risks resulting from offshore wind energy developments (tools for analysing the consequences of accidents and evaluation of risks)

Module 4: Communication and networking (Tourism, Water Framework Directive, regional development and ICZM case studies)

SP 4.1: Analysis of networks and media

SP 4.2: Regional dialogues and participation

Fig. 2: Description of individual modules (A. Kannen 2003)

3 Social values as key factor for assessing environmental changes

In Zukunft Küste – Coastal Futures social values form a key starting point for analysing the relationship between coastal resource use and environmental protection. Social values change over time, so that the way society sets priorities is influenced by a variety of factors. The EU Water Framework Directive for example sets out to achieve good ecological status for coastal and freshwater systems, which implies that negative human impact needs to be minimised. “Good ecological and chemical status” of waters is expected to be achieved by 2015, with ecological status defined by biological, physical and chemical ecosystem parameters. In this context, the following questions arise:

- What are the limits of ecological tolerance to human impacts?
- To what degree will ecosystem structure and dynamics be allowed to deviate from pristine conditions whilst still being considered "good"?

To arrive at suitable management plans for coastal resources and space, an answer is required to both these questions. Societies and their decision makers need to understand that the services provided by ecosystems actually encompass a broad range of issues, part of which do not include the use of natural resources and all of which sjustified by a mix of ethical values (Barkmann 2000). Acceptable use of ecosystem services is actually sets by the power of different stakeholders to impose their will, partly expressed in social regulations such as environmental law. This means that definitions and regulations of "good ecological status" may vary with space and time and different cultures.

Taking into account the uncertainties about future human needs, future ecosystem development in the light of global change and the current limits to our understanding of the complexities of ecosystems and socio-economic systems, it is impossible to determine exact threshold values that would ensure proper ecosystem function and minimise risks for specific ecosystem services. The precautionary principle is one of the few feasible paradigms (Turner et. al 2001), one that is certainly in line with the idea of sustainable development . It also allows the development of management strategies that permit maximum use of ecological services while keeping ecosystem integrity at least at present level, thereby reducing the risk of hazardous natural developments. The objective of the integrated approach is therefore a large-scale information campaign, informing society about possible future trends and the associated risks and allowing the definition of an optimised balancing between "ecosystem use" and "ecosystem squeeze". Fig. 3 shows a scheme that has been developed to illustrate the inherent challenges imposed by identifying this optimum area, which can be taken as a critical threshold zone for the management of man & biosphere interactions.

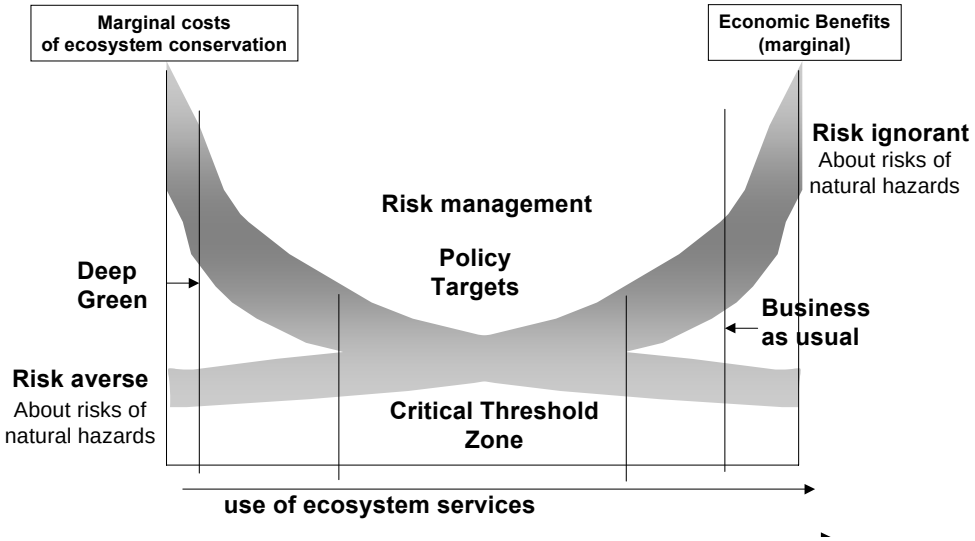

Fig. 3: Integration of socio-economic cost benefit analysis and an ecological risk analysis, (Colijn et al. 2002)

4 Conclusions

The project Zukunft Küste – Coastal Futures aims to take a fully holistic and integrative approach that develops and applies scientific tools whilst also involving stakeholders at local, regional and national levels as partners in research. Alhough this problem-oriented approach is very ambitious, the approach pursued by Zukunft Küste – Coastal Futures is aware of the need for ICZM processes to be integrated and sustainable in a regional context. Methodological components are tested vis-à-vis their applicability and brought together in a toolbox, which can serve as a starting point for transfer to other regional contexts and different cultures and geographical spaces. Such transfer naturally requires

some adaptations to be made. Integrating research and practical regional implementation, the collaborative research project aims to demonstrate local competence on Schleswig-Holstein's West Coast in implementing sustainable coastal zone management.

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