



## Social Science Responses to New Challenges for the Coast

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### Abstract

New developments in German marine and coastal zones present new challenges to their use. Off-shore wind energy generation, marine protected areas, or polyculture represent a combination of uses and signify profound change. The likely results of this change will undoubtedly include an intensification of land-sea interactions as well as the emergence of new conflicts over coastal use, for instance, wind farming versus fisheries versus shipping. Spatial planning and the administrative integration of land and sea have become crucial components of national ICZM strategy. Antagonistic interests and rival stakes must be adjudicated/resolved to achieve balanced, satisfactory, and fair use of coastal resources. To this end, spatial planning becomes an important instrument of mediation between the various coastal stakeholders, the actors in the coastal society and the coastal/marine environment. In order to be effective, spatial planning decisions must be based on accurate analysis of developments, coastal actors, and their interchanges. In addition to the ecological and economic impacts, the social impacts should be given particular attention as the key to directing future trends. This threefold challenge has been taken up by two large, joint research projects funded by the German Federal Ministry of Research (BMBF). These projects focus on the North Sea (Schleswig-Holstein west coast) and the Baltic Sea (Oder/Odra Delta) respectively. Within the framework of international ICZM requirements, this contribution highlights social science research strategies that will be applied in the context of these projects.

### 1 The Challenge: Overuse

Coasts provide the homes for 50 % of the world's population; this figure will soon reach 60 %, according to UN estimates. Oceans cover 72 % of the Earth's surface; 43 of the world's nations are small island developing states. Human civilizations originated on coasts. Coasts have been the focal points for trade and economic development. As a result of their attractiveness—scenic beauty and resource abundance—coasts are often overused.

In addition to conventional industries like shipping and fisheries, new types of resource use have become increasingly important, such as oil and gas exploration, mariculture and, as a newly emerging development, wind farms to generate renewable energy. This intensification of multiple human demands for resources and space in coastal and marine areas imposes increasing pressures on the coastal ecosystems and leads to competition and conflicts between different coastal stakeholders.

On the other hand, coasts are vulnerable ecosystems that face increasing risk of ecological changes. This in turn leads increasingly to adverse impacts on the social conditions of coastal inhabitants and other coastal users. For these reasons, integrated and sustainable coastal zone management (ICZM) has emerged as a policy field and an important area of research. ICZM deals with the competing demands for space and coastal resources, and the resulting conflicts. Solutions aimed at sustainable coastal development require on the civil society to reduce significantly one-sided or imbalanced user interests and to reconsider issues of governance. Therefore social perceptions, norms and values, underpinning governance and decision-making, are of utmost importance for management strategies.

## 2 The Scope: Sustainable Coastal Management

What do we mean by sustainability? Sustainability emerged as a new development paradigm out of the concept of “ecodevelopment”, its predecessor. The term “sustainability”, though used before, was popularized by the Brundtland Report, “Our Common Future”, from 1987. The goal was to reconcile environment and development; however, there was a bias in favour of environmental sustainability, which was necessary to counterbalance the emphasis on economic growth.

There are many definitions of sustainability. A quite useful one states that the meaning of sustainability is the maintenance of capital (Goodland 1995: p 3). Capital has a social, natural and economic form. Social capital includes, among others, tolerance, patience, cultural identity, community cohesion, laws and institutions. Natural capital essentially consists of two factors: the sources of raw materials and the sinks for human waste. Raw material use must be kept within regeneration or substitution rates. Waste “production” is to be kept within the assimilative natural capacity. Economic sustainability would then mean to keep the scale of the economic subsystem within biophysical limits, including production and consumption.

A “logical hierarchy” of sustainability can be identified. The need for social sustainability is a reason to pursue environmental sustainability; environmental sustainability, in turn, depends on economic sustainability. The “ethos of sustainability”, then, is the inherent quality of an individual or a society to produce or maintain social, natural and economic capital. How does that apply to management or, more specifically, to coastal management? The example of integrated and sustainable coastal zone management shows that inequalities or simply competing interests need to be negotiated in a process of mutual control and bargaining. Even if disagreement remains, there must be consensus on the degree of disagreement to be accepted, the entire negotiation process must maintain a high level of transparency. Consensus building by negotiation indicates a state or process of social sustainability.

Sustainable coastal management of that combined capital is “a multidisciplinary process integrating levels of government and community, science and management, sectoral and public interests, to provide programmes for the protection and the sustainable development of coastal resources and environments” (Coastal Zone Canada Association 2000: p 7). This authoritative definition is considered the key in discussing strategies to link partners in a scheme of joint coastal management. It seems timely, then, to reiterate a few pertinent questions as to the “what, who, where and why” of integrated coastal management:

- What is a coast and how do we manage it?
- Who are the coastal actors, users and stakeholders?
- Where do we need integration?
- Why process evaluation and progress assessment?

Coastal zones have been favourite areas for human settlement and trade for thousands of years. Greek culture and Greek philosophy is of coastal origin. The early Greek philosopher Thales (ca. 640-546 BC) is commonly understood as the founder of western philosophy, natural philosophy in particular. His ideas on water as the origin of matter and life may be seen in the light of his experience as a merchant and scientist in the social environment of the wealthy harbour town of Miletos on the Asia Minor coast. Today, coastal zones contribute more than a proportionate share to the respective gross domestic product and to the well-being of the local and tourist populations. At the same time, the population density is continually increasing in most coastal areas of the world. Due to permanent natural and anthropogenic change, and increasing environmental pressure, coastal areas have become highly vulnerable ecosystems already showing evidence of having been severely affected by these stress factors. Thus, ICZM gears its key questions to a critical level of ecosystem change, which communities and societies are willing to accept. The issues pertain to the social perception of ecological risks and to how society weighs the value of resource use against ecosystem protection (Kannen 2004a; Windhorst et al. 2004).

### 3 Global Goals

The Global Conference on Oceans and Coasts at Rio + 10” (UNESCO/Paris, 3-7 December 2001) recommended to the Johannesburg Conference (2002) and called on governments to:

“1. Develop national coastal/marine policies and other enabling conditions to implement ICM as a nested system of planning and decision-making that operates at a range of spatial scales; this will require increasing the capacity of local governments and community based groups to manage coastal and marine areas with appropriate scientific inputs and participatory processes.

“2. Create policy environments, including appropriate laws, regulations, and incentives that enable the mobilization of domestic and international financial resources for appropriate investments in development consistent with the management frameworks of ICM programs.

“3. Take decisive actions to ensure effective management measures for the coastal areas of each nation by committing the following targets:

- 20 % of national coastlines under management by 2012
- 60 % of national coastlines under management by 2022
- 100 % of national coastlines under management by 2032.”

(Global Conference on Oceans and Coasts 2001: p 6)

Specifically the last recommendation is a strong one because of its quantitative targets.

While the Johannesburg World Summit did not adopt these specific recommendations, it did boast three major achievements (Cicin-Sain, Bernal, Vandeweerd, Belfiore and Goldstein 2002). The first of these was the *Plan of Implementation of the World Summit on Sustainable Development* (WSSD). The *Plan* lays out provisions related to oceans, seas, islands, and coastal areas (Section IV, §§ 29-34). The section quoted focuses on cross-sectoral aspects, fisheries, biodiversity, marine pollution, and science and observation. Numerous actions proposed include a timeframe. Section VII on sustainable development of small island developing States (§§ 52-55) contains timetables for specific actions, as well.

The second achievement was the *Johannesburg Declaration on Sustainable Development*. Government representatives agreed upon this high-level political declaration. It recognizes coastal and marine challenges in the socioeconomic and environmental sectors. It also gives recognition to and shows commitment toward small island developing countries.

The third achievement was partnership initiatives to strengthen the implementation of Agenda 21. Partnership initiatives are an integrated part of the World Summit and translate the political commitments into action. Partners must fulfil certain requirements which include targets, timetables, monitoring and funding arrangements, as well as technology transfer.

In addition, a group called “Global Forum on Oceans, Coasts and Islands” was formed. The Forum is composed of individuals from governments, international organizations, and nongovernmental organizations including environmental, industrial, and scientific subgroups. The Forum agreed on ways to proceed beyond the WSSD. Subsequent steps include planned activities such as a follow-up Global Conference on Oceans, Coasts, and Islands to review past actions and to mobilize public and private sector support for the global oceans agenda (Global Conference 2003).

### 4 A German ICZM Strategy within an EU Frame

Internationally, ICZM as well as coastal and ocean policy have long been part of national interests and multilateral agreements. Germany currently follows an EU recommendation of May 30, 2002 (Council and Parliament) to develop strategies to apply ICZM in Europe. As a consequence, Germany’s first national ICZM research project was launched in March 2003 at the Social Science Research Center Berlin (WZB), in collaboration with the Research and Technology Centre West Coast (FTZ), Büsum, and the Institute of Geography, Kiel University (CAU). The aim of this project is to

develop recommendations for a national ICZM strategy in compliance with coastal spatial planning. The area in question includes the North and Baltic Seas up to the Exclusive Economic Zones (EEZ). The research is financed by the German Federal Office for Building and Regional Planning (BBR), an agency of the German Federal Ministry of Transport, Building and Housing (BMVBW).

Initial results include two reports on topical subjects and trends, developments and demands for action in coastal areas, as well as proposals and recommendations for coastal uses and spatial planning. Cooperation between federal ministries, between federal, state, and local agencies, as well as with local and regional stakeholders seems necessary for decision making and requires an ICZM strategy. A national workshop was held in October 2003 in Berlin to discuss the findings and make proposals for recommendations to the federal government for a national ICZM and coastal spatial planning strategy. This strategy will have to integrate planning efforts for land and sea, and align split competences between the German federal government, the German federal states (*Länder*), and various regional and local authorities and communities.

The situation in Germany is such that offshore wind energy plays an important role in that it supports present federal policy (2003/04) in its endeavour to replace nuclear energy with renewable energy. The political target is to develop offshore wind power capacity of 20,000 MW—which requires an estimated area of from two to 2,500 square kilometers—by 2030 so that, by 2050, the total share of renewable energy will reach 50%. The two German Federal Ministries involved, Environment and Economics, agree largely on the need to develop offshore wind energy (oral communication during a high level stakeholder conference, involving two state secretaries—*Staatssekretäre*—in Berlin on 16 April 2003). Both the administration and industry know and agree that those who start first will have an edge in global international competition for an estimated 40-billion-dollar/euro market over the next two to three decades. The companies and consortia have submitted their blueprints and wish to go ahead, at least with pilot projects. The claims concentrate on the North Sea, former West German territory, and less on the Baltic Sea, largely former East German territory. In either case, access to public space and federal spatial planning are needed in offshore waters (oral communication, 23 March 2004, at the BMU's national conference "Wissenschaftstage" in Berlin).

On the other hand, it should be noted that offshore wind farms are discussed quite critically at the local level, especially on the islands in the Wadden Sea. While macroeconomic issues, energy, and climate politics are the focus of discussion at the national level, the local level discussions centre on the risks and benefits for the coastal area. Key issues in this debate are the number of jobs created by offshore wind farm development in the counties (*Kreise*) of Nordfriesland and Dithmarschen, infrastructure investments, aesthetic aspects, and the potential damage to tourism as well as the increased risk from maritime accidents. Therefore, a comprehensive, integrated impact assessment is necessary, which would consider all of these aspects beyond just the ecological risks. This would mean, for example, dealing with stakeholder conflicts and economic trade-offs as part of a strategic plan, on the basis of spatial planning schemes, for the large-scale development of offshore wind farms (Kannen 2004b).

## 5 Coastal management and research: why social sciences?

Research activities on the Baltic and North Sea coasts need to be and will be connected. This task involves ICZM and sustainability research projects. The value and necessity of such a science service function is threefold: namely,

- to connect national *interdisciplinary* networks;
- to link science to management, policymaking, and civil society stakeholders in *transdisciplinary* cooperation;
- to anchor the national networks globally via *international* collaboration.

Inter- and transdisciplinary co-operation is a necessity for coastal management research and the implementation of specific measures. Partnerships in science will be needed to link social and natural science expertise (interdisciplinary co-operation). Further, partnerships will be needed to link the sci-

entists to coastal stakeholders, managers, administrators and policy-makers (transdisciplinary cooperation). At times, however, this seems to be much easier said than done. This problem is addressed in more detail below.

Coastal researchers, like coastal managers, should combine a mixed variety of professional skills (Kannen and Gee 1999). In all environmental research, including research on the sustainable management of coastal zones, it is necessary to understand how ecosystems function. Coastal researchers (and managers) have to analyze public policy, and they will be interacting in different cultural and vocational settings, e.g., with scientists, coastal managers, fishermen or entrepreneurs. These various fields must be integrated in order to be able to formulate reasonable policy recommendations.

How can we meet all these requirements? Few, if any, social or natural scientists have received such complex training, nor have many been exposed to such circumstances. The two most important linkages we have identified and selected are the connection from natural to social science and the connection from management to science.

Let us begin with the latter. From the outset, science and policy-making have seemed to be incompatible. Science describes, explains and tries to forecast. Policy-making governs human behaviour. Science attempts to be value-free. Policy-making is value-driven and explicitly normative. Scientific norms are designed to produce objective, valid and reliable results. Policy-making represents leadership, relying on human or rather social values and advocacy behaviour (National Research Council 1995: p 27). In sum, the scientist develops or reflects upon theories and develops methods or research techniques. The policy-maker's job reflects value orientations, constituencies and governance processes.

Some potential negative effects from the interaction between scientists and policy-makers may include lack of understanding, lack of communication, misuse of each other's products or acrimonious, self-defeating interaction. A university scientist produces research results and trains students. His or her output is usually not expected to induce behavioural changes. The purpose of policy-making is exactly the opposite, that is, to change behaviour. These differences in relation to the various groups of stakeholders could result in serious conflicts (National Research Council 1995: pp 33-34).

Aside from the problems it can generate, the interface between natural and social science presents some interesting challenges as well. Environmental problems and coastal issues combine different dimensions: political, social, economic and physical ones. The strict boundaries between university disciplines cannot be maintained when it comes to applied science and coastal environmental issues. Coastal systems integrate human and natural systems. The exploration of coastal systems integrates social and natural sciences. One specific approach towards integration is the human ecological approach focusing on the interactions between social and natural systems.

Natural sciences contribute to coastal policy by assessing how natural systems function: physically, geologically, chemically and biologically. Social sciences, in a broad sense, contribute to coastal policy by revealing how social, political and economic systems function. All approaches mentioned are needed; nevertheless, as in the management-versus-science case, there are obstacles to ideal integration of research between the natural and the social sciences. The obstacles are rooted in differences in history and tradition, language, world-views and incentive structures (National Research Council 1995: p 27). Externally, social scientists are often blamed for using too sophisticated, unintelligible jargon. Finally, personal career considerations are more often a motive for confining one's work and interests to a single discipline, than they are an incentive to promote interdisciplinary research.

Traditionally, the social sciences were not represented or they were underrepresented in many policy fields, including coastal policy and research (cf. Freudenburg, Gramling 2002). One reason for this may be that many social scientists consider themselves and their work to be "critical". "Critical science" has its merits and values, but it is by definition less constructive and operational than "positivist science". In addition, there is mutual ignorance about concepts, methods and models. Data may not be compatible. In terms of world views, different concepts of nature and ecosystems may produce different sets of values and will result in different policies (Nunneri et al. 2002). Conservation and preser-

vation versus the use and exploitation of nature is one such paradigm that represents the competition for natural resources.

So, why then, do we need social science skills in coastal research? Issues of governance and valuation complement, among other things, natural, “hard” science environmental research. Environmental planning and management follow policy goals that were set formally by decision-making bodies—governments, administrators, and parliaments. On a more informal level, civil society actors, non-governmental groups, or stakeholders heavily influence that process. Governance includes both the formal and informal aspects of decision-making and implementation.

Individual and group interests, values, and norms determine the decision-making process. But, social values are subject to change. Value change is part of a more general social change within a group or society, which reflects changes in preferences, attitudes, or monetary status. It is the job of social science to observe this process. Whereas observation may include an evaluation of norms already present, it has nothing to do with the generation of (new) norms. The quality and quantity of coastal ecosystem services, such as the provision of recreation, fishing and fish farming, or the provision of on- and off-shore bio-reserves, depend on the values attached to these services by empowered stakeholders.

Science is not normative. This statement holds for both the natural and the social sciences, at least insofar as mainstream science is understood. Science does not create norms or set standards. Environmental threshold values, for instance, follow societal values or the society’s economic potential. We may ask ourselves: What kind of natural environment do we want to have? Would we prefer, for instance, densely forested wilderness, or savannah, or a recreational park with a cultivated landscape? Whenever we consider environmental or coastal conservation, the following questions must come to mind: Which century’s/millennia’s/age’s nature do we wish to restore (given that nature has undergone so many radical changes on its own since the beginning of time)? What exactly do we mean by “pristine”? In particular, if we consider the level of eutrophication in the Baltic Sea, which has also changed over the centuries, millennia, and ages, upon which level do we set our sights? That is, in accordance with which stage of evolution/level of eutrophication should we attempt to restore the ecosystem of the Baltic Sea and coastal region? These are the norms that are to be set by social consensus and policy-making. The social sciences are charged with considering and exploring the social, economic, and political conditions requisite to achieving stated societal goals.

To integrate natural and social science concepts, and management needs and science requires comparable scales of process description, and an analysis of social, economic and natural process interactions. This becomes especially difficult when quantitative estimates of interactions are needed at local or regional levels, because often qualitative and quantitative data must be linked to “soft” information like values and perceptions of specific stakeholders and societal groups who steer policies and direct investment decisions for resource use.

While the interests and policy positions of stakeholder groups depend, to a large degree, on so-called “non-rational” values and perceptions, human-environment interactions can usually not be described on the basis of simple cause-effect relationships, because there is usually a wide and variable range of environmental pressures that create ecosystem impacts. Therefore, it is frequently the case that simplistic modelling approaches do not offer solutions for management problems.

To foster integration, it will be necessary to invoke new concepts and for scientists to be willing to take steps beyond their traditional approaches. Global science programmes such as “Land-Ocean Interactions in the Coastal Zone” (LOICZ) are moving in this direction (Kremer et al. 2004). Projects like EUROCAT (Kannen et al. 2004) and Coastal Futures (see below) focus on methodologies and tools that permit this kind of integration, following the rigorous inter- and transdisciplinary approaches of a “post-normal science”.

## 6 A new research agenda for German coasts

The principle use functions on the German coasts are, among others, tourism and recreation, recreational and commercial fishing, aqua- and agriculture, urban development, harbour development, coastal defence, nature protection and species and landscape preservation. All the various users in each of these fields compete for space and resources, including drinking water and energy. Land is needed for building, road and harbour construction. In addition to the accommodation and containment of traffic, this will mean the construction of shopping centres, sports centres and golf courses, health spas, hospitals, water treatment plants and perhaps new airports. Recreational uses such as hiking, jogging, cycling, swimming and diving, boating, wind surfing and angling presuppose an intact landscape and seascape. Construction of offshore wind farms requires cable connections and land nodes including airfields and service harbours.

Conflicts are bound to occur among the various users of the shoreline. A major source of conflict is the water quality for both bathing and drinking water. Eutrophication and other forms of water pollution are caused by aqua- and agriculture and possibly waste dumping. Military activities and harbour dredging cause habitat destruction and, in some places, groundwater pollution. Artificial reefs and marine protected areas conflict with fisheries, marine aquaculture, wind farms, and tourist activities. Coastal defence measures could counteract landscape preservation. A necessary first step is to identify the stakeholders involved, the degree of their involvement and their institutional and political environment.

A research initiative must necessarily concentrate on a limited number of issues. Two research projects based upon an integrative platform are being funded by the German Federal Ministry of Education and Research (BMBF). Both projects began in April 2004; they are designed to support sustainable coastal development. The projects comprise a number of subprojects; they encompass different scientific perspectives, approaches, methods, and tools. The projects bridge the natural, social, and cultural sciences, taking an *interdisciplinary approach*, in order to assist coastal planning and management at local, regional, and national level.

Further, taking a *transdisciplinary approach*, project researchers cooperate with a multitude of regional and local stakeholders who are eventually to become active partners in research. Practitioners from outside fields and other non-scientific stakeholders will function in an advisory capacity. The advisors will include politicians, coastal administrators, and local as well as regional experts—namely fishermen, farmers, harbour-masters, tourist office representatives and local entrepreneurs—for the areas we have selected and focused on.

Project results will feed into a national ICZM strategy to enhance coastal development. Finally, taking an *international approach*, both projects cooperate with adjacent countries or border regions and with supranational bodies or institutions to integrate results into a wider European or global framework.

### 6.1 North Sea

On the North Sea coast, the research project Zukunft Küste—Coastal Futures is designed to support sustainable coastal development and Integrated Coastal Zone Management (ICZM) for the west coast region of Schleswig-Holstein. The project combines two perspectives (Kannen et al. 2003):

- 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, by using regenerative resources and safeguarding natural resources.

Both perspectives are represented in the current debate over large-scale, offshore wind farms. On the local and regional levels, the innovative potential of the wind farming industry provides new impulses for economic growth and job creation. On the national to global scale, the use of regenerative wind energy is a means to reduce greenhouse gases in the atmosphere, to contribute to Germany's climate protection goals, and to approach the goals of the Kyoto Protocol.

In order to deal with these issues simultaneously, integrated assessment of interactions is required, as well as a socio-economic analysis of trade-offs, including an assessment of economic, ecological and social benefits or risks. Innovative development potentials that could result from linking wind energy to mariculture will form a key part of this assessment, as will the specific situation of the islands in the North Sea, especially the often flooded and permanently endangered *Hallig* islands. The project will explore continuous integration of results in local and regional ICZM concepts through exchange with key regional actors.

Another focus of the project is how changing use affects spatial structures. The project will analyze and evaluate the impact of offshore wind farms on established economies, with tourism regarded as the most significant coastal industry to date. A case study will explore the interchanges between offshore wind farm development, mariculture and tourism to assess options for implementing multiple-use concepts (polyculture).

The project *Zukunft Küste—Coastal Futures* attempts to take a holistic and integrative human ecological approach (Glaeser 1998a) that develops and applies scientific tools while it involves stakeholders at local, regional, and national levels as partners in research. Although this problem-oriented approach appears to be ambitious, it is simply geared to satisfy 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, different cultures, and different geographical spaces. Such transfer naturally requires some adaptation (Kannen et al. 2003).

The main aims of the project can be summarized as follows:

- integrative impact analysis of new forms of use and changing spatial structures in the coastal zone;
- critical analysis of concepts of multiple use to assess the potential for implementing multi-functional use of space, including the development of models for implementation;
- analysis, assessment, and active support of regional networking and communication processes;
- development of a practical concept that synthesizes project activities for ICZM on Schleswig-Holstein's west coast, and establishment of permanent structures for implementation.

## 6.2 Baltic Sea

In the Baltic coastal region, the project *ICZM Oder* will focus on the Oder (Odra) estuary. Regional development in the Baltic coastal region will have to deal with the issue of harmonizing conflicting goals. Research is needed to evaluate and enhance some specific measures. The main task is to identify the conditions for environmentally sustainable coastal development in combination with the conditions for successful transition out of the structural economic crisis. What economic and social factors enable coastal management to transform the structural crisis into a self-sustaining development of the Baltic Coast region?

The Oder (Odra) estuary is located on the border between Germany and Poland. Tourism development and nature conservation are paramount regional issues. Cross-border tourism and traffic between Germany and Poland is increasing. Following Poland's entry into the EU, these activities are expected to increase significantly. German-Polish cooperation will intensify, which means, in particular, that coastal planning and management will become a joint activity of both countries. Tourism and environmental quality are embedded as parts of overarching regional activity in the context of sustainable development. Regional ICZM is important; it will link the German and Polish coastal areas politically, socially, and economically and, in so doing, contribute to the long-term goal of regional sustainable development.



The following issues (Schernewski et al. 2003) will be addressed:

- inclusion of ICZM into existing regional governance structures, social initiatives, and networks;
- forms of communication and cooperation necessary to anchor ICZM in the region;
- contributions from regional/district/local Agenda 21 groups to assist in the adoption and transfer of ICZM;
- the role and impacts of training, coaching, and exchange of experiences in introducing ICZM concepts effectively.

The specific focus is to synthesize and harmonize German and Polish ICZM-related planning and to translate it into a cross-border vision and strategy for the sustainable development of the Oder estuary by means of dialogue and regional discussion. The coastal development prospects include activities relating to coastal waters and sustainable tourism. The result will be an ICZM policy for the Oder catchment area that meets the requirements of the EU Water Frame Directive, and that feeds back to and enhances national (German and Polish) ICZM strategies (Schernewski et al. 2003).

## 7 Recommendations

Based upon what has been outlined above and in the light of my experiences with the Swedish SU-COZOMA program (National Research Council 1995: pp 64-67; Glaeser 1998b and 1999), the main points are summed up below; to these, some suggestions and recommendations have been added, which I think are crucial for any viable coastal zone research program intended for use by local or regional, national or transnational coastal management institutions.

- (1) The first measure would have to be to improve the mechanisms of interaction. It would be definitely important to build up multidisciplinary projects and to encourage interdisciplinary cooperation and strategic research. Stakeholders should be involved to incorporate the users' viewpoints and articulate their needs. The scientific programs should be subject to an external review.
- (2) The second measure would be to enhance communication. We should specify information needs and summarize results in scientific as well as in lay language. Research results could thus be widely disseminated, not only in conference papers or scientific journals but also in the mass media. The media should be guided in their interpretation of events and results by way of press conferences and press releases provided by the program leaders.
- (3) The third measure is capacity building. We assess the interaction between science, policy, planning and management, and we encourage scientific involvement in coastal policies. Scientists from non-university agencies such as fishery boards should be encouraged to participate and to contribute. Science-policy training needs enhancement by including marine-oriented social science. Academic rewards for policy-oriented research ought to be provided as an incentive.
- (4) Integrative and adaptive management will be employed next. The "state of the coast" will be assessed to evaluate the performance of coastal programs. Scientific methods and tools must be improved. This would include simulations or predictive modelling, risk assessment and uncertainty measures; but it would also focus on joint analysis of qualitative and quantitative information.
- (5) Intermediate results, achievements and progress of a scientific or an institutional nature are constantly monitored. That way, the process counts even before scientific results can be demonstrated. International colleagues and experts are invited to advise and to comment on the progress made. In short, interdisciplinary work is maintained by theoretical synthesis work, institutional integration work, process orientation and transdisciplinary inclusion of the relevant stakeholders (see the related Swedish experience in Glaeser 1998a and b).
- (6) Adequate funding is necessary in order to properly translate and disseminate research results. It is imperative that science and policy capabilities be integrated, e.g., that facilities and data are

shared. The ideal way to build up good coastal research and management capacities would be through a facilitated exchange program for select personnel between national regions and internationally, as well as between science, administration, NGOs and private companies.

- (7) There are clear indications that, in the international arena, the emphasis placed on sustainable coastal and ocean policy will increase. It will therefore be of national importance for Germany to participate more visibly in these transnational negotiations and agreements than it has up to now, based upon relevant EU recommendations, cooperation with the *Länder*, and through participatory inclusion of informal civil society groupings and stakeholders.

In sum, interdisciplinary and transdisciplinary approaches in research and management are to be focused upon. Particular goals should be to document scientific knowledge as well as knowledge gaps, to elaborate conflicts in sustainable coastal development, to link stakeholders, and to suggest measures towards an Integrated Coastal Zone Management on the local and regional, the national and transnational level.

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