COAST LINE

Coastal management in Germany special

Planning

Networking

Information dissemination

EUCC The Coastal Union

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Foreword

Dear readers,

The German coast is divided between the North and Baltic Seas. This is not only a spatial division. A different genesis, tidal range, salinity, exposure etc. have caused a distinct coastline and distinct coastal ecosystems. The major coastal uses and the cultural heritage are not the same and the federal system in Germany supports a largely independent management of both regions. However, during the last years the need for an integrated coastal development has become more and more obvious. Many research, planning and management activities have been initiated and the similarities between the Baltic and North Sea approaches have become apparent. The co-operation and exchange of information between coastal researchers and practitioners as well as the exchange between the regions has also become much more intensive. This development was supported by the discussion-process about the national strategy for an Integrated Coastal Zone Management.

EUCC – The Coastal Union Germany which is responsible for an electronic coastal newsletter (with nearly 1000 subscribers) and the provision of several coastal information and dissemination tools has supported the growth of a joint coastal community in Germany. However, this German coastal research, planning and management activities are not very well perceived abroad. This was the background for the current Coastline issue. We would like to give you a short overview of at least some ongoing coastal activities in Germany. We hope this information will help to increase the international co-operation between our German coastal community and the rest of Europe.

Rosa Reboreda & Gerald Schernewski
EUCC – The Coastal Union Germany

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EUCC - The Coastal Union

EUCC devotes itself to people and Nature in coastal areas and the sea. It wants to conserve the characteristic coastal landscapes, plants and animals and stop the trend towards a concrete coastline. The EUCC particularly keeps a watchful eye on tourism, erosion and fishery developments.

Membership dues for 2007

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Conferences and meetings are listed on www.coastalguide.org/meetings

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Colophon

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Insets: Sylt in winter (Photo: Axel Eggert)
Warnemuende beach (Photo: Gerald Schernewski)
Harbour seal, equipped with a satellite-based trip recorder (Photo: Gabriele Mueller).

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Integrated coastal management

Photos: Bioconsult
Beamtrawler

Insets:
Twait shad
Containerterminal Bremerhaven
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ICZM is aimed at making a contribution to the development and preservation of coastal zones as an ecologically intact and economically prospering habitat for humankind and is an informal approach to supporting sustainable development of coastal zones through good integration, coordination, communication and participation. On the one hand, ICZM is a process that should permeate all planning and decision-planning levels as a guiding principle and, on the other hand, is a tool applied prior to formal procedures for the purpose of identifying potential development and conflict as well as for resolving conflicts. It is neither regarded as an independent formal planning and decision-making tool nor an instrument for pushing through specialized and individual interests.

The national strategy[1]

A national strategy for the development and implementation of ICZM in Germany, based on the EU recommendation 2002/413/EG, was developed in 2005/06 and accepted by the national government in March 2006. The development of this strategy is already part of the ICZM process. It follows extensive (preliminary) work by various parties involved, integrating the relevant actors into a supporting working group and was presented and discussed at a conference. During this process, the varying points of view of different stakeholders and the necessity of open communication have already clearly emerged and influenced the strategy.

The strategy describes and analyses the ecological, economic, social and legal situation in coastal and marine areas and, on this basis, elaborates steps to support the ICZM process and thus implementation of the basic ICZM principles. It calls for an analysis of the situation of the coast. Already major sections of the basic ICZM principles have already been implemented by means of current legal instruments. However, it urges a number of further adaptations of the legal control instruments and is aimed at fostering the ICZM process through the establishment of an ICZM secretariat. ICZM forums are envisaged as a major means of communication and elaboration of common goals for the development of coastal zones. Additional experience is to be gained at various levels in best practice projects.

ICZM will apply within the EEZ, the 12 mile zone, the transitional waters in accordance with the Water Framework Directive, the areas adjoining estuaries and influenced by the tides as well as the adjoining rural districts and respective administrative units on shore. ICZM should permeate all relevant areas, therefore, all actors will contribute to its implementation. At the same time bottom up and top down processes must complement each other since different approaches are appropriate for different problems and challenges.

www.ikzm-strategie.de
www.bmu.de
www.bfn.de
www.uba.de

[1] Bastian Schuchardt, BioConsult Schuchardt & Scholle GbR: contact: schuchardt@bioconsult.de; www.bioconsult.de

Marine spatial planning

The Green Paper adopted by the European Commission in June 2006 "Towards a future Maritime Policy for the Union" calls for spatial planning systems to regulate economic activities in coastal waters, building on the ecosystem-based management approach. This is a new policy area and will be a great challenge for administrators and planners alike.

The relationship between ICZM and spatial planning[1]

A research project "Integrated Coastal Zone Management (ICZM): Strategies for coastal and marine spatial planning" has recently been concluded (www.bbr.bund.de). Conceived to support the development and implementation of a national ICZM strategy, the project took stock of development trends, opportunities, and challenges faced by Germany's coastal and marine areas and made practical suggestions for implementing long-term ICZM processes. A key element of the project was the relationship between ICZM and spatial planning. Recognising profound changes in the way marine spaces are used, the project first of all discussed new and emerging demands on spatial planning, particularly those arising from increasing land-sea interactions and the growing density and intensity of marine use. It then considered ICZM and spatial planning as management tools, proposing ways of linking them in an integrated approach to national ICZM. Proposals for marine spatial monitoring were also made. Many of the ideas developed in this project have been incorporated in Germany's national ICZM strategy.

Warnemuende beach (Photo: Gerald Schernewski)

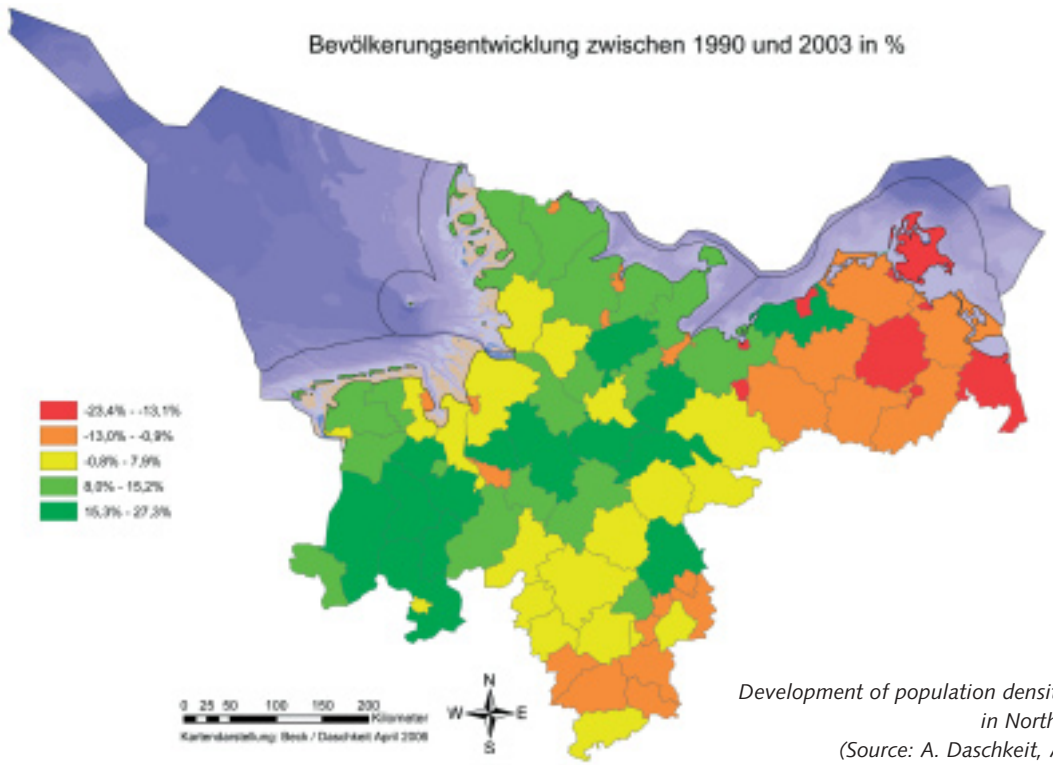
ICZM-Indicators[2]

Two sets of ICZM indicators can usually be differentiated (a) sustainable development indicators designed to give an idea of the sustainable situation of the coastal zones e.g. coastal erosion, quality of bathing water indicators, and (b) indicators which show the progress of the implementation of ICZM-processes through a series of different phases and related actions which have to be discussed and evaluated by stakeholders for different years and for different levels (national, regional, local). As a response to the German ICZM-strategy we have developed a GIS-based overview of Sustainability Development Indicators for coastal zones, and have made a proposal as to how to survey data on ICZM-processes using techniques from the social sciences.

The ICZM-Marker developed for the EU Working Group on Indicators and Data by EUCC International is also rather useful to raise awareness in local ICZM or spatial planning processes.

Assessing future coastal development[3]

The project Coastal Futures (www.coastal-futures.org) aims to assess chances and risks associated with marine and coastal use patterns associated with long-term political and societal developments. The research approach aims to raise awareness for the complexities surrounding coastal zone decision-making using the development of scenarios for the next 50 years. The



Development of population density 1990-2003 in Northern Germany (Source: A. Daschkeit, A. Beck, BBR)

scenario storylines are built around 5 different sea use patterns, each describing a different mix of driver settings and resulting in different priorities concerning the implementation of human activities in coastal and marine waters: They are sea and coast as (i) a natural area; (ii) leisure and tourism area; (iii) a source for renewable energies; (iv) an industrial area; and (v) a traffic area. Following the description of the specific set of drivers, pressures and impacts resulting out of these storylines, these rather extreme development paths were discussed and assessed in the frame of a vision for the North Sea coast of Schleswig-Holstein developed within a workshop by a small group of stakeholders. This is accompanied by additional scientific assessments including a comprehensive stakeholder assessment which links media analysis, document analysis, questionnaires concerning values and perceptions and an analysis of communication networks for local development along the North Sea coast of Schleswig-Holstein.

Long-term planning in the Wadden Sea[4]

The Wadden Sea, Europe's largest marine wetland area, provides many examples of marine spatial problems, arising from the obligation to protect nature and the need to maintain and create chances for economic development. The nature conservation area has a size of over 14,000 km², protected by national and international law although 75,000 people live within the area and another 3 million in the coastal zone. Since 1978, the trilateral Wadden Sea Co-operation (www.waddensea-secretariat.org) has developed common management approaches to the area embracing both nature conservation and economic development. In 2002, the Wadden Sea Forum, an independent platform comprising regional representatives of agriculture, fisheries, tourism, nature protection, industry, local and regional governments, was installed to develop a common vision and sustainable development strategies focusing on the period 2005-2020. The Forum's experiences have shown the relevance of long-term planning and stakeholder participation for the ICZM process (www.waddensea-forum.org) particularly with respect to input into the non-legally binding aspects of ICZM and the long-term management of the coastal zone.

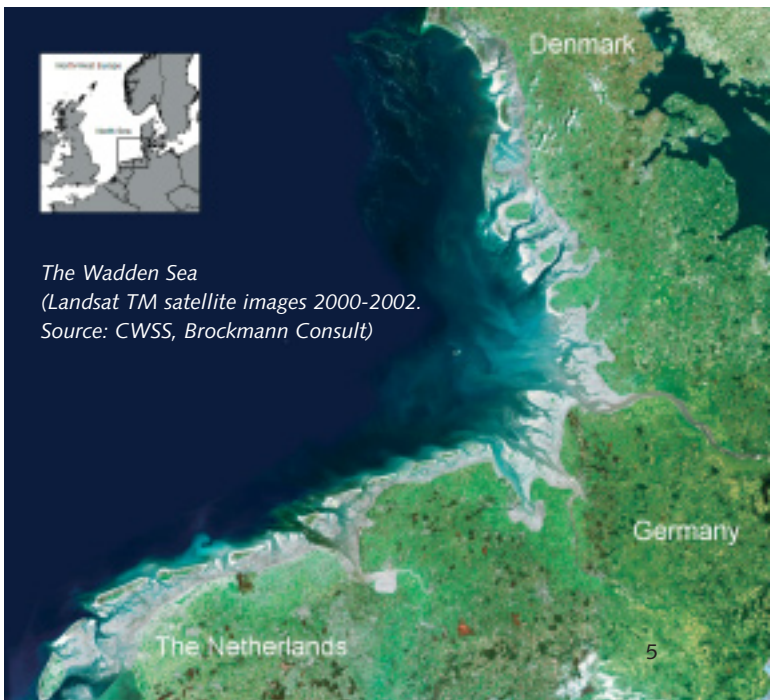
Pellworm (Photo: Katharina Licht-Eggert)

Sea-use planning[5]

Germany and especially the Bundesland, Mecklenburg-Western Pomerania, with its Baltic Sea coastline has already been for many years at the forefront in developing a comprehensive system of exchanging space-orientated data through GIS and establishing appropriate tools and capacities for maritime spatial planning.

The project "BaltCoast" (2002-2005) resulted in a first study of existing and potential use conflicts in offshore areas within the Baltic Sea and laid out a set of concrete recommendations on how a maritime spatial planning system could be established among the Baltic countries. In the meantime Mecklenburg-Western Pomerania has committed itself by law to develop a spatial plan for its own 12 mile zone and the Federal Ministry of Housing, Building and Regional Development is also about to start maritime spatial planning within the German EEZ. This process is currently supported within the project "PlanCoast" (2006-2008) which provides for expertise not only for the Baltic Sea, but also enhances relevant capacities in the Adriatic Sea as

Gannets at Helgoland (Photo: Axel Eggert)



The Wadden Sea
(Landsat TM satellite images 2000-2002. Source: CWSS, Brockmann Consult)

Many needs of a modern society, Harbour of Stettin © IKZM-Oder

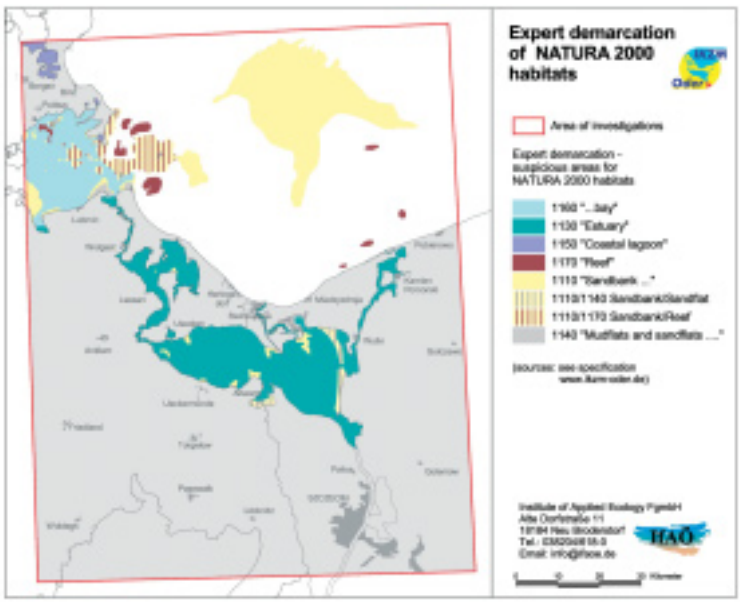
well as the Black Sea. The project is therefore a first milestone in putting the EU vision into practice and will serve as a reference point for future activities to come www.plancoast.eu).

Balancing exploitation and conservation of marine habitats[6]

An important tool for the conservation of marine ecosystems is the identification and characterization of marine habitats and related species. The different components of marine environments– seabed with benthic organisms, water body as habitat for plankton, fishes, marine mammals and other species like seabirds – have to be regarded. One approach for the identification of specific marine habitats with complex functions for different species is the demarcation of NATURA 2000 habitats. The relations between the distribution of marine indicator species and abiotic factors like sediment conditions, morphological structures and hydrographical parameters (water depth, salinity, exposition, streaming conditions, etc.) can also be used for the identification of Natura 2000 habitats. The current amount of available information does not allow the demarcation of Natura 2000 habitats on a fine scale. A precise habitat analysis requires complex and expensive investigations.

The coastal zone is characterised by a high density of activities of commercial exploration too. Besides traditional stakeholders like ship transport, fishery and maritime tourism other activities like dredging and dumping are carried out preferably near shore

Small scale demarcation for Natura 2000 habitats at Oder Estuary (Institute of Applied Ecology)



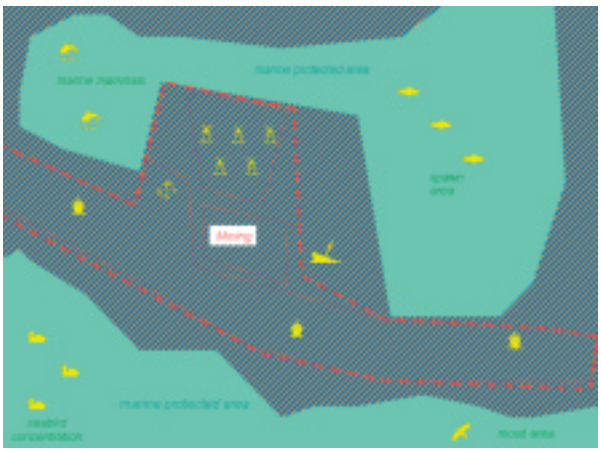
to limit the cost of transport and cost related to water depth. The environmental impact of a single project is often low if specific habitat structures are not affected. The sustainable protection of marine environment requires, therefore, the consideration of various cumulative effects resulting from the different types of anthropogenic impacts. The application of different tools for the spatial and temporal regulation in relation with ICZM processes is necessary to obtain the requirements of a sustainable commercial use together with a successful protection of marine resources (www.ifaoe.de).

Do we need more environmental law or less?[7]

New national and European thinking about the way we manage our coastlines, in particular in relation to climate change, may require additional legislation in the future. But do we need more law? Or do we already have too many regulations? In Germany, for every environmental theme like water, waste, air pollution, nature and conservation, energy and spatial planning there are special laws with many norms. However, there is now a chance for a radical reform of the national environmental law because the strategic goal of the new government is one book unifying all themes thus creating greater legal and planning certainty for all stakeholders.

This idea is accompanied, on the one hand, by the national process of de-regulation and, on the other, by the impact of European and international law. Global environmental problems cannot be solved unilaterally but require a multilateral approach and regulations of the EC place considerable importance on European environmental policy.

These are the fields we are working on in our Baltic Institute of the Law of the Sea, Environmental Law and Law of Infrastructure at the University of Rostock (OSU, http://www.jura.uni-rostock.de/OSU/OSU/Index.htm) including the project "Research for an Integrated Coastal Zone Management in the German Oder Estuary Region (ICZM-Oder)" (www.ikzm-oder.de).



Possible spatial regulations for balancing commercial use with protection of marine resources (Institute of Applied Ecology)

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Sustainable tourism

European tourism will face manifold challenges within the next decades due to global and socio-economic changes. The coastal areas of Europe remain preferred holiday destinations and their importance will continue to grow. Around the North Sea, tourism is concentrating mainly in the areas close to the coast. Although these coastal regions face similar challenges in building up or improving their tourism business, there has been more competition than co-operation in the tourism sector in the past. However, it seems obvious that joint efforts of several regions will be more successful than individual initiatives to overcome major problems typical for almost all North Sea tourism destinations, e.g. short seasons and decreased spending.

Transferring successful strategies [1,2]

The Interreg IIIB North Sea project *ToLearn* (www.tolearn.info) is based on the concept of "Learning Regions in the EU" and thus aims at identifying strategies which have proven successful in the development of sustainable tourism regionally or locally. Tourism experts in Belgium, the Netherlands, Denmark, Norway

The marina Neuhof near the nature heritage site Stralsund (Photo: Ralf Scheibe)

and Germany are working closely with tourism managers, entrepreneurs and stakeholders to focus on three key issues:

1. providing a data and information base for recent trends and challenges in the North Sea tourism sector;
2. building up a communication network and platform that enables or strengthens trans-regional and trans-national co-operation in tourism;
3. finding best-practise examples for tourism innovations in pilot regions and adopting such initiatives elsewhere.

Selected pilot regions where promising initiatives have already been launched to improve tourism sustainability, play an important role in the learning process.

Furthermore, the research project "ICZM-Oder" (www.ikzm-oder.de) contains the sub-project "Sustainable Tourism" and will generate a master-plan for the further development of coastal tourism in the Odra Lagoon Region.

How sustainable is your tourism project? [3]

There are numerous sustainable tourism projects in the Baltic Sea Region (at least by name) and many funding institutions

Sea dyke in Helgoland (Photo: Le Thi Thanh)

calling for sustainability as a basic requirement for funding. But there is no fixed standard to describe the sustainability of such projects. This observation was the starting point for the development of a database and check tool on the sustainability of tourism projects in the framework of the Baltic Sea Region INTERREG III B project AGORA. The aim of the AGORA sustainability check is

- to stimulate/encourage (more) sustainable tourism projects,
- to avoid the granting of projects with negative impacts on society, environment and/or economy,
- to stem the arbitrary use of the term 'sustainability',
- to serve as guidance for the search for best practices.

The sustainability check list will be used on projects that focus on the support or implementation of sustainable tourism *e.g.*

- projects supported by EU programmes like Interreg, Life, Leader+
- projects supported by national and regional public/private funds or organizations.

The assessment checklist is steered by an AGORA Sustainability Check Advisory Board. The draft checklist (see www.agora-tourism.net) is structured along nine objectives and contains 32 questions.

1 Horst Sterr, Achim Daschkeit, Gunilla Kaiser & Michael Schultz: Coastal Geography, Kiel; Goetz von Rohr & Kerstin Hoffmann: Applied Geography & Spatial Planning, Kiel; Christoph Corves & Lars Michelsen: Geography and Media, Kiel; contact: sterr@geographie.uni-kiel.de (Project ToLearn)

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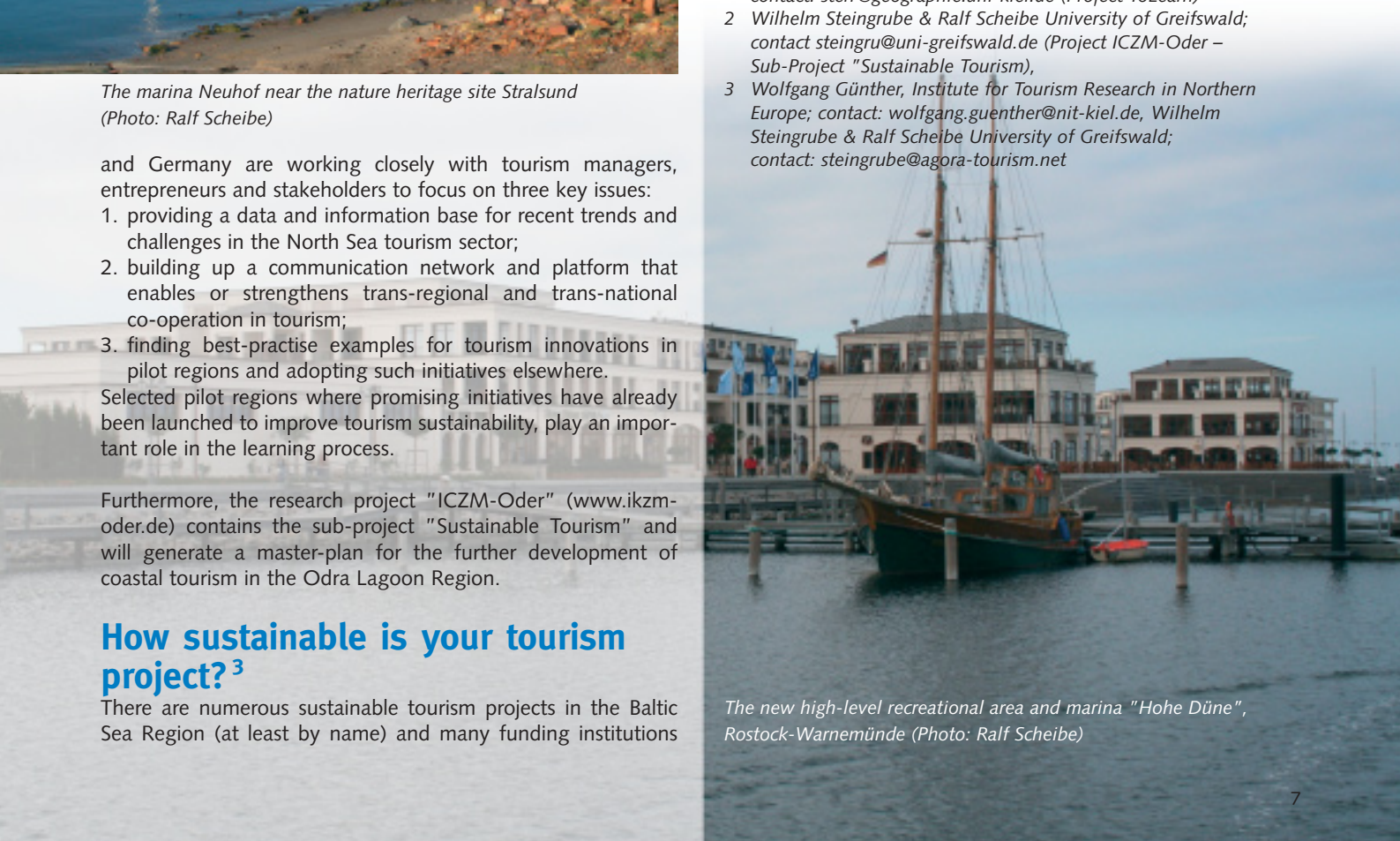
3 Wolfgang Günther, Institute for Tourism Research in Northern Europe; contact: wolfgang.guenther@nit-kiel.de, Wilhelm Steingrube & Ralf Scheibe University of Greifswald; contact: steingrube@agora-tourism.net



The new high-level recreational area and marina "Hohe Düne", Rostock-Warnemünde (Photo: Ralf Scheibe)

Offshore wind energy

Wind mills (Photo: Katharina Licht-Eggert)

Although 14 offshore wind farms (80 windmills each) have now received planning permission for the German Exclusive Economic Zone (EEZ), none have yet been built. The dynamism of offshore wind farm development and the potential changes associated with this has triggered a contentious multi-stakeholder debate in Germany. So what will be the future of offshore wind farming? Will it play a role at all in shaping the future of the coast, or will it remain mired in crossfire of international, national, regional and local interests? A deciding factor will be how soon the first offshore wind farms will actually be built.

Attitudes to wind-farms[1]

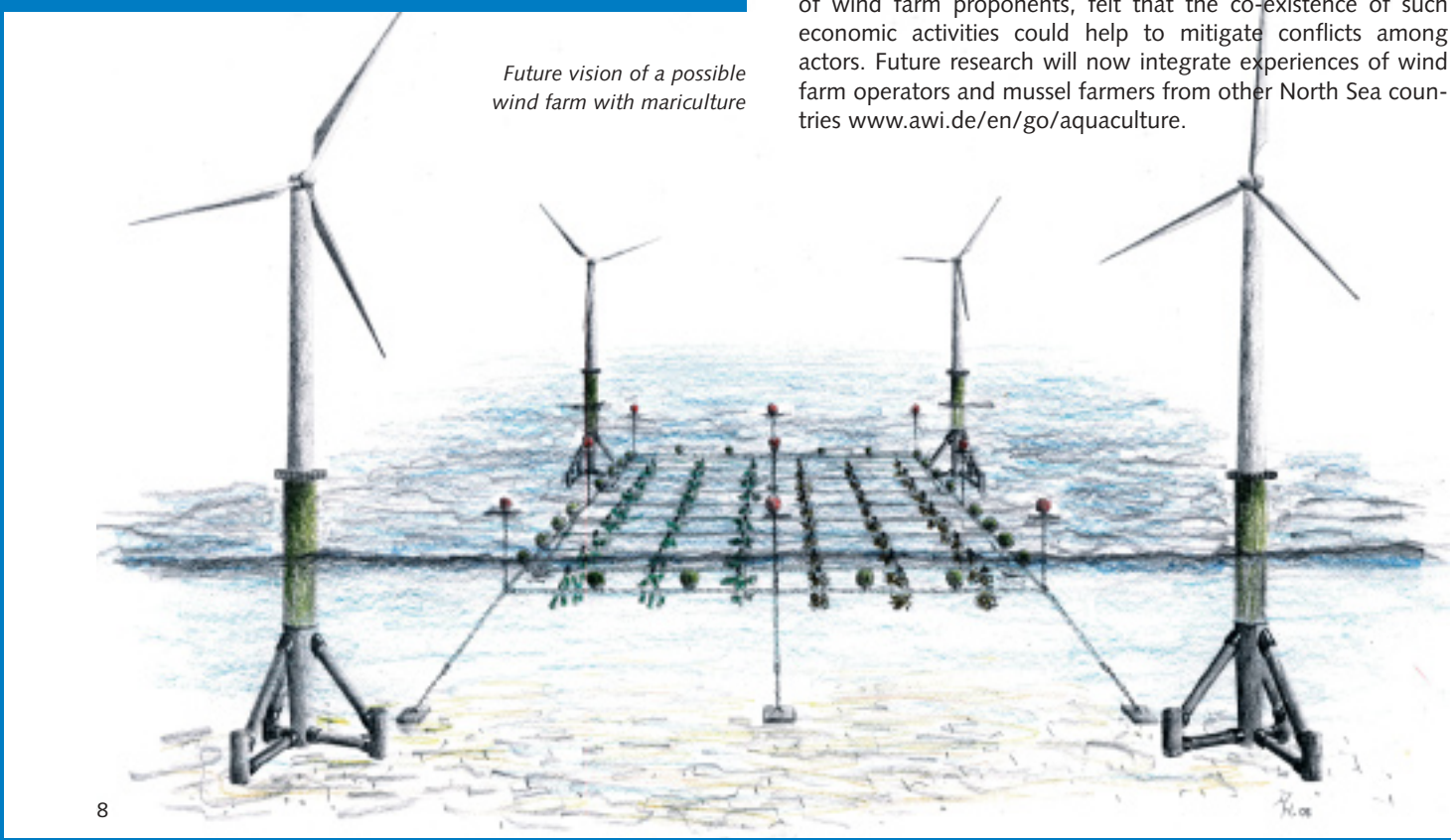
As part of a national research project "Coastal Futures – Zukunft Küste" (www.coastal-futures.org), a stakeholder analysis showed that many institutional stakeholders support offshore wind farming in the EEZ (ca. 80%). The local residents show no clear-cut preference (45% in favour and 44% against). The arguments used to defend positions were different between institutional stakeholders and local residents with institutional stakeholders generally using more, and differentiated, arguments. One big difference was that the local population seems highly concerned about the potential visual impacts of offshore wind farms on the local landscape (22% of all arguments raised). Such aesthetic arguments were rarely voiced by organised groups. Residents list the loss of key seascape qualities as a main reason for this fear, defined by intangibles such as the loss of the open horizon or the loss of a sense of freedom.

Integration of mariculture in offshore wind farms[2]

The establishment of multi-purpose areas in the sea might yield potential for integrating conflicting demands by maximizing compatibility between uses. The Coastal Futures project also surveyed the attitudes of representatives of fisheries, tourism, politics, nature conservancy, administration, and wind farming towards prospects and constraints of wind farms in combination with mussel and seaweed cultivation.

It might be expected that wind farming, in combination with mariculture, would lead to a higher acceptance of offshore wind farms since designated marine areas would be used twofold, maximising revenue from a unit of sea. However, whereas more stakeholders supported wind farms when combined with mariculture, most of the original opponents did not change their attitude. The latter group mainly consists of representatives of the fishery sector, tourism and administration which do not feel that the negative aspects of wind farms can be compensated by multi-use concepts.
Furthermore, more than half of all respondents, and two thirds of wind farm proponents, felt that the co-existence of such economic activities could help to mitigate conflicts among actors. Future research will now integrate experiences of wind farm operators and mussel farmers from other North Sea countries www.awi.de/en/go/aquaculture.

Future vision of a possible wind farm with mariculture



Marine mammals, seabirds and offshore windfarms[3]

The use of offshore wind energy is not without side effects. The research network MINOS+ (www.minos-info.org) is examining whether large-scale offshore wind farms might affect or endanger the harbour porpoises, common seals, and seabirds living there. The results are expected to provide the scientific basis for assessing the ecological risks of future wind farms. MINOS+ continues the work of its predecessor MINOS (1/02 - 3/04) and runs until the middle of 2007.

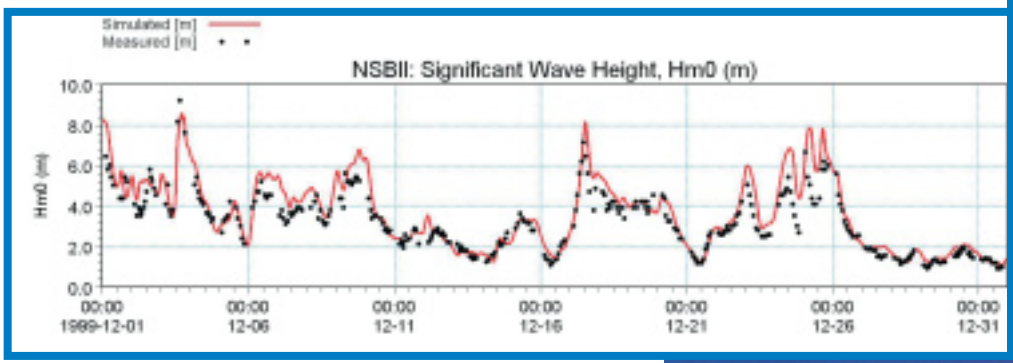
MINOS+ is focusing on: 1) examination of the hearing abilities of the marine mammals and their sensitivity to noise pollution, and 2) assessment of their distribution + sea birds and, if possible, their seasonal and spatial dynamics, in all German offshore waters including the EEZ. The work has already shown that during summer there are about 51,000 harbour porpoises in the German part of the North Sea.
The MINOS+ network consists of seven separate projects which apply a variety of sophisticated research methods *e.g.* aerial and ship-based surveys, seals equipped with satellite-based trip recorders and porpoises being eavesdropped with underwater microphones. The hearing of porpoises and seals is also being tested and all results are being stored for the long-term in the project's own database at the National Park Office (www.wattenmeer-nationalpark.de/main.htm).

Harbour seal, equipped with a satellite-based trip recorder (Photo: Gabriele Mueller)

Borkum West Testfeld Offshore Windfarm[4]

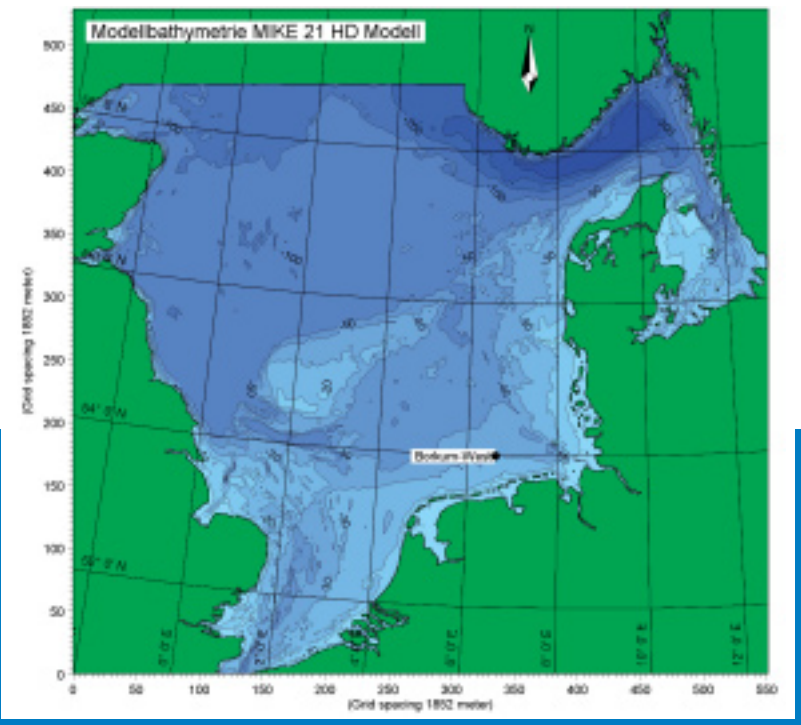
For the Testfeld Borkum West, lying approx. 45 km off the Frisian coast in about 20 m water depth, 12 windmills of the 5MW class are planned. DOTI GmbH plans to start construction in 2008.

A general pre-requisite for offshore projects is to have a statistically sound Metocean Design Base (waves, currents, waterlevels). For the area of interest in the North Sea, there are only a few long-term measurements of oceanographic data which could be used directly to provide statistically sound design data. Measurements that exist either cover too-short a time-period or are too far away from the area of interest (or both).
DHI Water & Environment has been awarded a Hindcast study to assess the Metocean design base for the Testfeld. To achieve this, a hydrodynamic model (the MIKE 21HD current/water level model) has been set up for the whole North Sea and calibrated with existing measurements. A spectral wind-wave model (MIKE 21SW) has been set up with a flexible mesh that allows a higher resolution in the project area. Continuous long time-series (27 years) of oceanographic data (waves, currents and water levels) have been created on the basis of tidal and meteorological input (wind and pressure). Statistical analyses of these long time series provide design data (*e.g.* 50 years return period events) for different parameters (*e.g.* wave heights and peak periods, wind surge, currents) as well as operational data such as weather windows and downtimes.

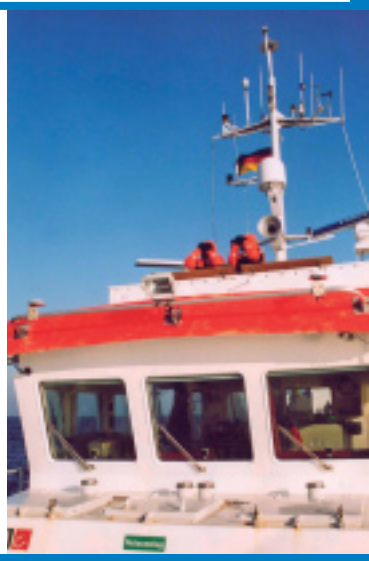


Comparison of simulated and measured significant wave heights at Nordseeboje II in the North Sea (Data courtesy of Bundesamt für Seeschifffahrt und Hydrographie, BSH, Hamburg).

This approach of using long-time Hindcast model data is a cost-effective way to minimise risks and allow safe planning.
Additionally, the models can later be used for other purposes, *e.g.* to forecast oceanographic or environmental data (www.dhi-umwelt.de, www.dhigroup.com).



Bathymetry and domain of the hydrodynamic model (MIKE 21 HD) for tide, currents, and waterlevels.



Counting sea birds from on board ship (Photo: Nicole Sonntag)

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Alien species

The spreading of invasive plant species into coastal dune vegetation poses a serious conservation problem.

Invasive plant species in dunes[1]

Dune vegetation is often species-rich with many rare species, but is very vulnerable *e.g.* the encroachment of shrubs like *Hippophaë rhamnoides* and especially *Rosa rugosa* as well as the spreading of mosses like *Campylopus introflexus* has considerable effects on species richness and diversity.These large, dominant, species-poor vegetation types, with a simple vegetation structure, have a low conservation value reducing both species and landscape diversity.

Experts based information systems NeoFlora (www.floraweb.de/neoflora/) and Nobanis (www.nobanis.org/) present a description of the most invasive plant species and includes information, about introduction, ecological effects as well as possible conter-measures. NeoFlora also includes a public internet forum to exchange experiences.

Flowers and fruit of Rosa rugosa
(Photos: René van Rossum and Maike Isermann)

1 *Maike Isermann, University of Bremen, Vegetation Ecology and Conservation Biology: contact: iserm@uni-bremen.de. See www.vegetation.uni-bremen.de/isermann_e.html.*

Oil and chemical contamination

The German coast has to contend with dense shipping traffic which calls for effective contingency measures to respond to oil and chemical incidents.

Oil on the beach - what to do?[2]

Together with the environmental ministries of the coastal states and the Federal Ministry of Transport, Building and Housing, ARCADIS has developed a computer aided contingency planning system.

The system includes the contingency plan concept with the alerting procedures - previously existing on paper - and all relevant data along the 4,600 km long coastline. Data on organisations and persons with the contact data, photos of the entire coastline, a database of existing oil recovery equipment including data on ships, combating teams and flight patterns, a combating manual, a pollution incident report and logbook are only a few examples of the available information. The GIS data shows the user, on a detailed map, the area of responsibility of the respective authority; the storage sites for combating equipment like protective clothing, shovels, pails; nature reserves; the type of coast and its sensitivity to oil and chemicals; places for oil interim storages; the onshore connections to the coast for heavy combating equipment like lorries and excavators; the places of engineering constructions and protection facilities like bridges, dykes, sheet pile walls and tourist facilities. Information on the water depth and the electronic navigation chart help the responsible Command for Maritime Emergencies to plan the use of vessels.

After a project time of several years in a close co-operation with the responsible authorities the system has become the most important tool to support the decisions of the Command (www.vps-web.de).

2 *Burkhard Schuldt & Katja Borgwardt, ARCADIS Consult GmbH: contact b.schuldt@arcadis.de*

A combating team cleans a polluted coast in France, Erika-accident (Photo: J. Holtz)

Climate change

Storm, Warnemuende (Photo: Le Thi Thanh)

Some climate change models predict that, within this century, average global temperatures will increase by over 1.5 degrees and sea levels will rise by over 2 meters. Other models forecast even higher values with an increased frequency and intensity of excessive precipitation events and of violent land and sea-based storms.

Impacts in the Baltic Sea region[1]

The impact of climate change will play an important role in the spatial and economic development of the Baltic Sea Region. Such impacts are currently being researched by the project *"Developing Policies & Adaptation Strategies to Climate Change in the Baltic Sea Region" (ASTRA, an Interreg IIIB project*, www.astra-project.org). From June 2005 to December 2007, regional impacts of the on-going global change in climate will be assessed to develop adequate strategies and policies for climate change adaptation.

The aim is to involve relevant stakeholders to produce responses towards climate change impacts - extreme temperatures, droughts, forest fires, storm surges, winter storms and floods – to elaborate suitable mid to long term adaptation and mitigation strategies. As a result, concrete mitigation and adaptation strategies will be reviewed and policy recommendations presented which will be recognized and supported by decision makers and regional and local spatial planners. The ASTRA case study on the "Oder/Odra Estuary Region" can be seen at www.ikzm-oder.de/astra.html

Flood defence[2]

In the last few years, ARCADIS has developed GIS-aided Flood Defence Plans for various areas along the coast of the Baltic Sea in Mecklenburg-Western Pomerania. Among other things the potentially flood-prone areas have been determined. The flooding was simulated by using a digital model of the terrain. This has resulted in various flooding scenarios which differ in their designed flood input and in the affected section of the coastline. Results of such simulations have also been used for the creation of a GIS developed, and implemented, in the website of the ICZM-Oder Estuary Region by ARCADIS. The system contains *i.a.* layers with information about flood-prone areas and flood-protection installations. The recent version of the GIS-ICZM should be an instrument for the visualisation of flood hazards.
It will be helpful to develop the GIS-ICZM for the visualisation of the effects of global warming. In the context of flood protection this could be done by using the predicted data of the higher sea levels as flood input for the simulations. The results of such simulations can be fitted into the GIS as an additional layer. Thus, the user will get the opportunity to compare the recently flood prone areas to those areas under future conditions as well as to estimate the effects on flood protection installations and built-up areas.

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View of an inundated dyke (StAUN Ueckermünde)

German research vessel Gauss © BSH

Marine monitoring

Marine monitoring has a long tradition in Germany. Primarily physical and chemical, but also biological parameters, of the North and Baltic Seas are regularly monitored by federal environmental state agencies responsible for the coastal waters and EEZ. The Water Framework Directive imposes very demanding requirements for biological monitoring of transitional and coastal waters. The European Marine Strategy will further extend these monitoring requirements into the shelf seas and open ocean.

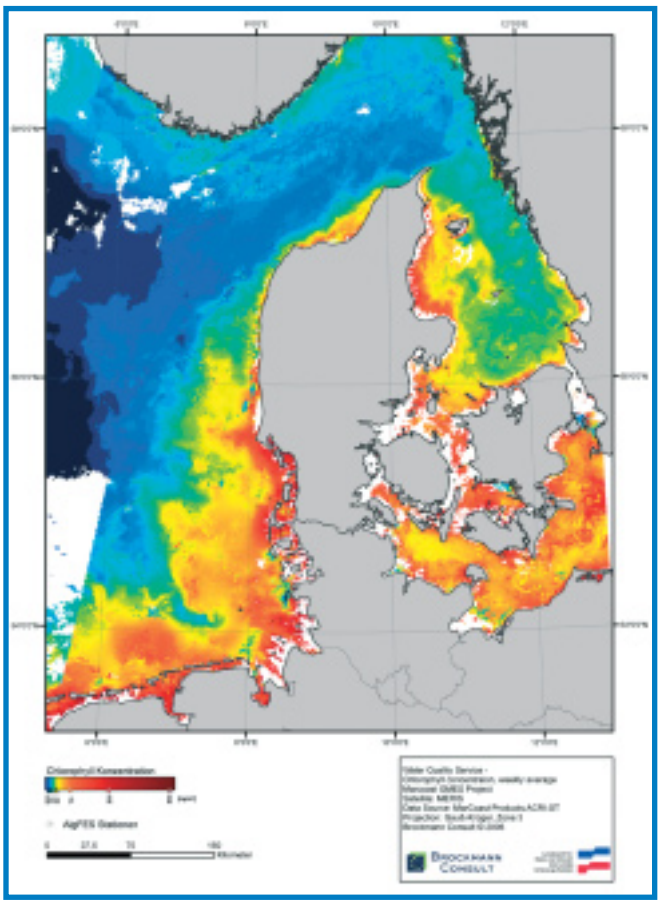
Concept for a revised marine monitoring[1]

In the 1980s, the responsible parties for monitoring combined forces into a harmonised programme which addressed the requirements of the OSPAR and HELCOM conventions. In recent years, however, additional reporting requirements have emerged to include the Water Framework Directive, the Habitats Directive, the Trilateral Monitoring and Assessment Programme and the European Marine Strategy. Considerably more emphasis will now be placed on biological parameters, to be combined in an ecosystem approach.

In 2005, it was decided to develop a concept for a revised marine monitoring programme which will address all the reporting requirements. A first draft has been developed with each component described in a parameter sheet. Distinctions have been made between the North Sea and the Baltic Sea, or between coastal waters and the EEZ because of the natural differences in the environment which require different monitoring approaches. Although, the challenge of harmonising the activities of 8 federal and 14 executive institutes still remains, a significant step forward has already been achieved in the harmonization and optimisation of marine monitoring in Germany as well as in the compilation of a comprehensive overview of all such activities (www.brockmann-consult.de/blmpplus, www.bsh.de/de/Meeresdaten/Beobachtungen/BLMP-Messprogramm/index.jsp).

Providing satellite-derived water quality products for marine areas[2]

One key parameter for monitoring marine areas is the chlorophyll-a concentration which is related to the phytoplankton bio-



Chlorophyll concentration in German coastal waters derived from MERIS satellite, averaged between 17.07 and 23.07.2006.

mass and which is also an indicator for eutrophication. Current methods using ships, buoys or helicopters will no longer be suited for the future large scale assessments required. Optical remote sensing has also been used and since 2002, the MERIS instrument on board the European satellite ENVISAT has provided high quality measurements with a spatial resolution of 300 m, well suited for coastal applications.
Brockmann Consult has now developed the Water Quality Service System which is acquiring and processing satellite data routinely and offering several water quality parameters, such as chlorophyll concentration, total suspended matter or yellow substance. The time scale of products ranges from daily data to monthly averages and is tailored to the needs of the user. In addition, algal bloom maps are generated weekly showing chlorophyll concentrations and providing a short report about the chlorophyll situation. Users of the products are national and international authorities responsible for environmental monitoring and management of coastal areas (www.waqss.de, http://starlab.es/hosting/MARCOAST/).

Morpho-dynamic changes in the Wadden Sea[3]

The North Sea Coast has a tidal range of 2 to 4 meters and the mouths of estuaries and the Wadden Sea are characterized by intense morpho-dynamics. The morphological changes in the Elbe estuary affect merchant shipping and require a sophisticated estuary management. To assess the effects of future measures, the understanding of morpho-dynamic processes needs to be improved.

Presently, we are running continuous measurements of flow parameters, suspended sediment concentrations, water levels and sea conditions in the mouth of the Elbe. At regular time intervals the bathymetry is scanned with a multi-beam echo sounder. Analysis of the data improves the comprehension of tidal flats. A sediment transport module will also be created which will help to predict morphological developments and devise a sustainable sediment management (www.tu-harburg.de/wb/czm).

Remote sensing of dynamic shores[4]

The shore of the south-eastern North Sea is a highly dynamic system where coastlines change continuously. At the northern part of the island of Sylt, morpho-dynamics have been surveyed with GIS. Coastline changes and sediment shifts have been monitored and quantified. The methods enable identification of vulnerable coastal sections and the required amount of sand to compensate eroding areas. Furthermore, it has been possible to forecast the development and monitor the effectiveness of beach replenishment measures.

The west coast of Sylt is eroding whilst the north coast is an accumulation area. Since 1972, beach replenishment has been carried out regularly whereby large quantities of unconsolidated sediments are artificially supplied to the system. These sediments are then eroded, transported by currents and deposited on the north coast. However, without beach replenishment the northern tip of the island would become detached from the rest of the island within the next 40 - 50 years (www.awi-bremerhaven.de/Benthic/CoastalEco/sedimentology/index.html).

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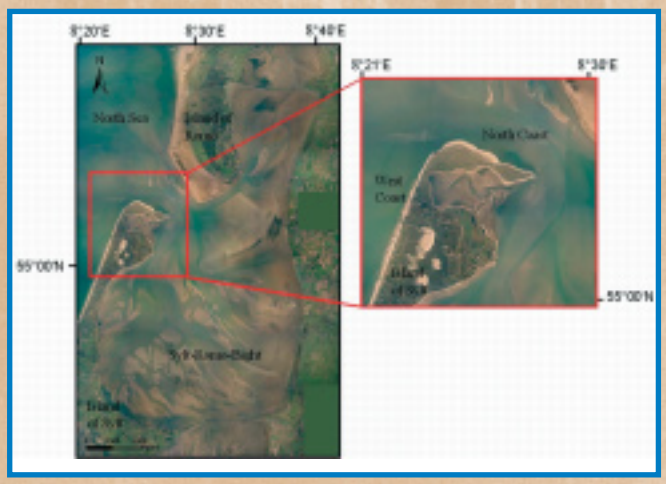
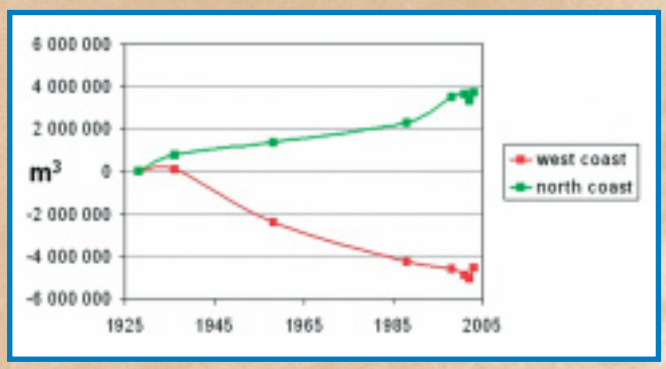
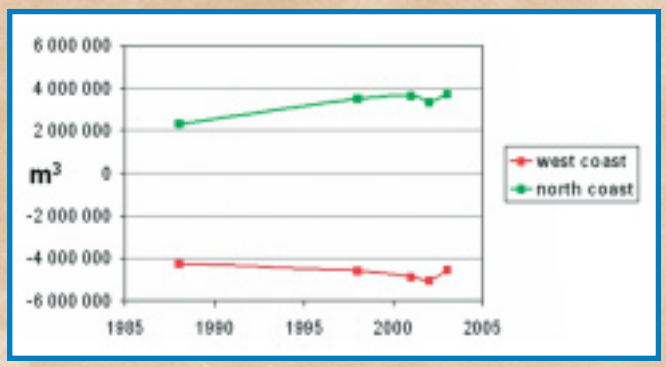
2 *Kerstin Stelzer, Brockmann Consult, Geesthacht; contact: kerstin.stelzer@brockmann-consult.de*
3 *Nicole von Lieberman & Thorsten Albers. Technische Universität Hamburg-Harburg, Institut für Wasserbau – Fachgebiet Küstenzonenmanagement; contact vonlieberman@tu-harburg.de, t.albers@tu-harburg.de.*
4 *Tobias Dolch. Alfred-Wegener-Institute for Polar and Marine Research, Wadden Sea Station Sylt; contact: Tobias.Dolch@awi.de*



The sandy barrier island of Sylt in the south-eastern North Sea. The northern part turned out to be a very dynamic area



The west coast of Sylt undergoes high erosion rates while the north coast is gaining in size (upper graph, cumulative frequency curve). But focusing the last 20 years, the coastal retreat in the west gets almost compensated with accumulation in the north (lower graph, cumulative frequency curve)



Beach replenishment at the west coast to compensate the high erosion (Photo: C. Buschbaum)

Devastating cliff erosion at the west coast of the island of Sylt after extreme weather events (from H.-J. Stöver (1990): Orkan über Sylt)

Coastal protection

More than 2.3 million people live in flood-prone coastal lowlands. Millions of euros are spent each year on technical measures to safeguard these people and their assets. In 2006, the German Advisory Council on Global Change delivered a report on the future of our oceans (www.wbgu.de). In the report, it is stated that: "there are indications that the continental ice sheets on Greenland and in the Antarctic are beginning to disintegrate. This has the potential to cause several metres of sea-level rise in the next centuries"; a potential that needs provident attention.

Dyke of Mandepolder with salt meadows near Norden, North Sea Coast, during flood (Photo: Frank Ahlhorn)

Coastal Risk Management[1]

The EU has introduced a Flood Directive which states that all Member States must establish flood risk management plans focusing on prevention, protection and preparedness. Hence, coastal risk management is more than a technical challenge. Integrated strategies that combine technical solutions with non-structural options like early warning systems and risk communication are called for.

Coastal protection authorities are facing the challenges in various ways:

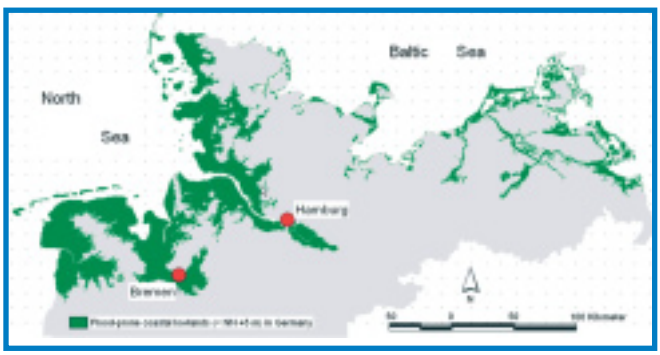
- Institutions are collaborating in INTERREG projects that deal with coastal risk management (see: www.safecoast.org, www.chainofsafety.org, www.comcoast.org).
- A working group of the Technical Committee for Coastal Protection evaluates present strategies with the merit of establishing recommendations for adaptation.
- A Danish-Dutch-German expert group from coastal protection, environmental and spatial planning authorities is working on sustainable solutions for coastal protection in the Wadden Sea (www.waddensea-secretariat.org).

These working groups and projects will deliver recommendations for integrated and sustainable coastal risk management strategies.

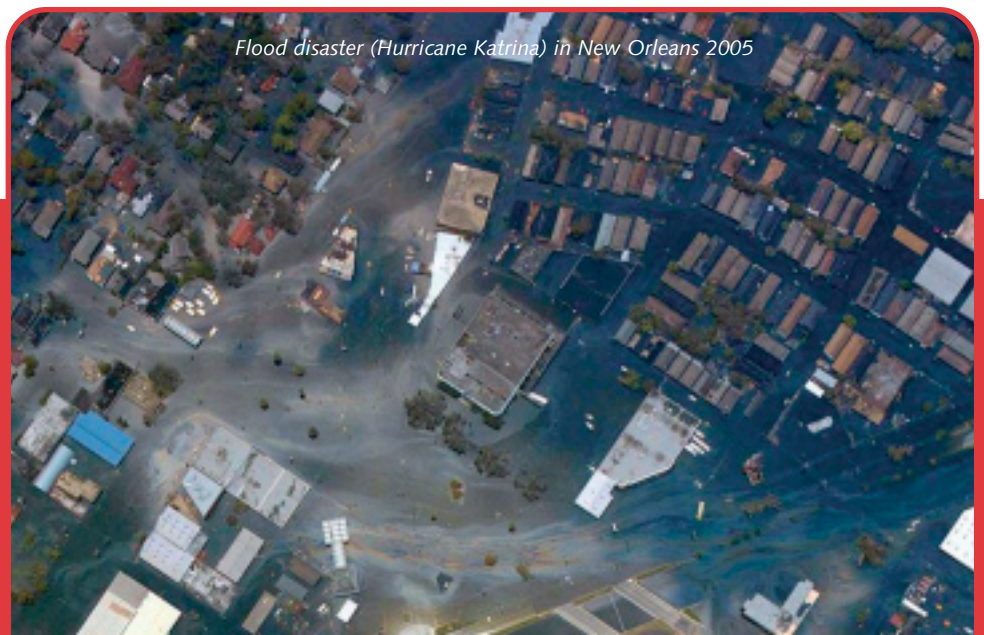
Risk and vulnerability assessment[2]

In order to develop adequate risk management strategies, methods for risk and vulnerability assessment to coastal hazards, on different scales, have to be further developed and improved. Our work has focussed on several trans-national projects. We are engaged in the identification of factors that determine the vulnerability of coastal communities in case of coastal flooding (*e.g.* storm floods, tsunamis). Furthermore, we are developing methods for quantitative assessment of vulnerability and resilience at various levels of scale and improvement of risk management towards decision-support systems. Damage potential analysis for flood prone areas on the North Sea and Baltic Coasts have been conducted at macro-, meso-, and micro scales.

A special focus of our present and future work is on quantitative (indicator-based) assessments of ecological, economic and social vulnerability and resilience as well as on the role of risk perception and participation in coastal risk management. The working group is especially involved in projects dealing with storm floods in the North Sea Region *viz.* MERK (BMBF), COMRISK (Interreg IIIB) & FLOODSITE (6th framework programme). The Excellence Cluster "Future Ocean" has also recently been approved at Kiel University. We will establish a new research group (together with coastal geology) within this cluster focussing on "Sea level rise and coasts at risk" http://www.uni-kiel.de/future-ocean/.



12,000 square kilometres of flood-prone coastal lowlands exist in Germany. Without protection, they could become flooded during extreme storm surges.



Flood disaster (Hurricane Katrina) in New Orleans 2005

Intense utilization of the coasts induce the ne

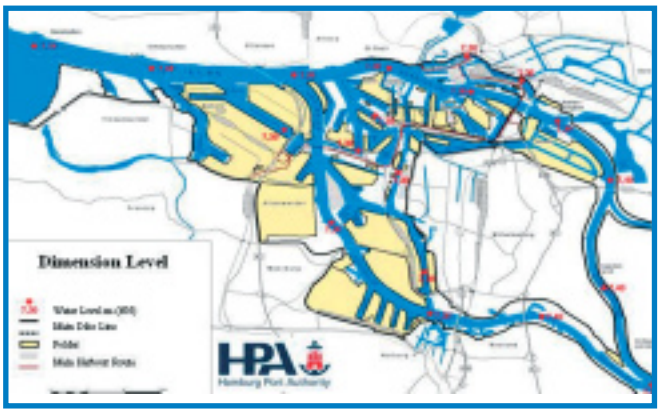
Dyke in Varel, Jadebusen between Wilhelmshaven and Bremenhaven (Photo: Frank Ahlhorn)

Multi-functionality and Coastal Protection[3]

The traditional approach to coastal protection in Germany is to build dykes and this will be true for the next decades. The question is, does the traditional way of raising dykes meet the challenges for coastal protection in the future? The European Interreg IIIB project ComCoast (Combined Functions in Coastal Defence Zones - International: www.comcoast.org , Germany: www.icbm.de/comcoast) develops and offers new opportunities to a wider approach in coastal management focussing on coastal protection. The main target is the implementation of the concept of multi-functional coastal defence zones. The project is developing methods and instruments to solve the challenges by widening the defence line to a defence zone. This concept will offer new opportunities for safety and development. Within the thematic work packages different tools are being developed to provide answers and applicable solutions for the following questions:

- How to identify feasible areas to implement the concept?
- How to evaluate the implementation of the concept regarding socio-economic and ecologic aspects?
- Which technical solutions are available and feasible?
- How to communicate new options for existing and future challenges?

The project will offer solutions which can be used to solve particular problems and it will also provide guidance for the whole process to apply the concept of multi-functional coastal defence zone.



Dimensioning Water Levels in Hamburg (Hamburg Port Authority)

Coastal protection in Hamburg[4]

Coastal protection in Hamburg, on the Elbe river, is based on the two pillars of "storm surge protection facilities" and "coastal defence on a prevent-and-avert basis". The guiding principle is a maximum possible safety standard for the whole city. The storm surge protection facilities comprise coastal protection constructions as well as other special constructive measures which are often in front of the public dyke line. The coastal defence comprises all measures at an organisational and planning level that are necessary as part of catastrophe control. This emergency planning consists of the forecasting system, information to the general public and local emergency operations in the districts and harbour which can lead to evacuation in the worst case. Storm surge observation and research are basic elements of this responsibility.
Research includes controlling tidal protection facilities by means of continuous examination of gauges which are themselves based on the analyses and evaluation of storm surge and climate warming developments as well as developing the forecasting system.

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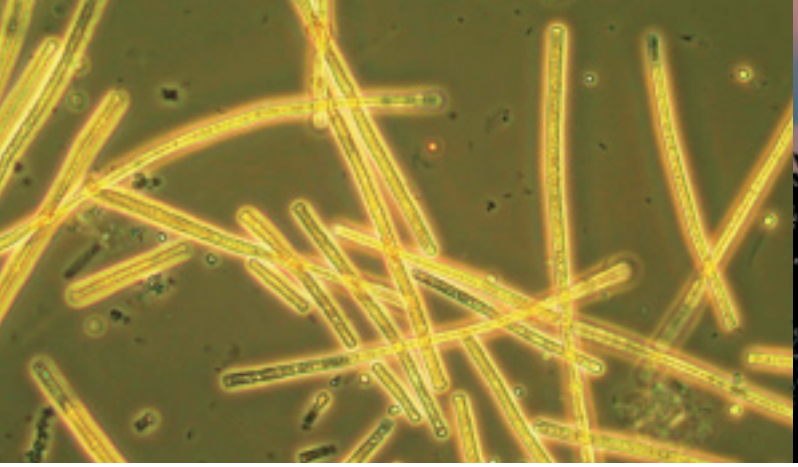
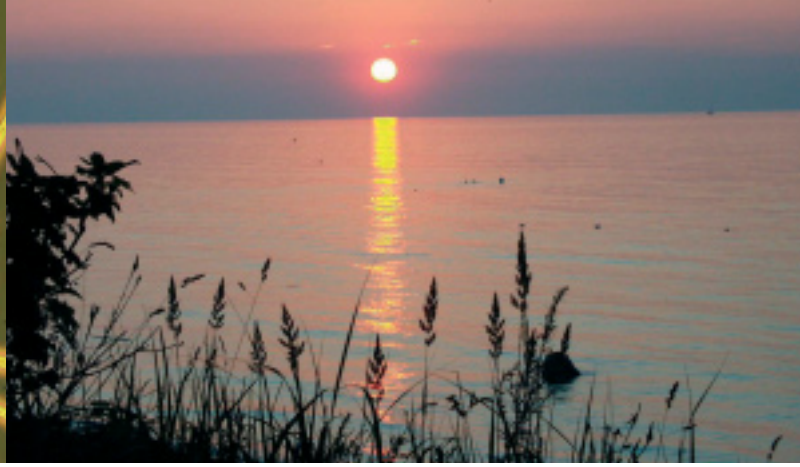
2 *Gunilla Kaiser, Horst Sterr, Achim Daschkeit, Dept. of Geography; University of Kiel: contact kaiser@geographie.uni-kiel.de. Further information: www.kuestengeographie.de; www.floodsite.net; http://comrisk.hosted-by-kfki.baw.de/.*
3 *Frank Ahlhorn, Institute for Chemistry and Biology of the Marine Environment (ICBM), University of Oldenburg: contact ahlhorn@icbm.de*
4 *Gabriele Gönnert, Hamburg Port Authority: contact Gabriele.Goennert@hpa.hamburg.de*

Storm Surge in Hamburg January, 10th, 1995

cessity to implement coastal risk management



The potentially toxic blue-green algae Aphanizomenon Baltica is often observed in the Oder estuary (Photo: Baltic Sea Research Intstitute)



Sunset over the Oder estuary (Photo: G. Schernewski)

Coastal and river management

The Water Framework Directive (WFD) is making important changes to the way we manage our water resources because management has to occur in river basins and no longer adheres to administrative boundaries. The legislation also requires the active involvement of all interested parties in developing the best approach to achieving good ecological status of water bodies.

Aspects of coastal governance[1]

To investigate whether the WFD will lead to institutional change at local, regional and state levels, a case study is being carried out in the Eider Catchment, located in Schleswig-Holstein (NW Germany). This is part of the project Coastal Futures (a Federal Ministry for Education and Research funded LOICZ Project - see www.coastal-futures.de). The analysis is also exploring opportunities and requirements for participatory governance in future water management. A next step will consider whether the WFD management process can be taken as an example for the design of participation processes and new governance styles in ICZM.

The Oder/Odra estuary[2]

In 2002 the German/Polish regional Agenda 21 "Szczecin Lagoon" was signed. It covers the entire Oder/Odra estuary region and serves as the basis for the national German reference project in Integrated Coastal Management, ICZM-Oder. This project was initiated to support the development of a national ICZM strategy in Germany. The major topics were *e.g.* participation approaches, sustainable tourism, ICZM indicators as well as legal and planning aspects. During the first years, a regional information system, including a GIS, has been developed. The aim is to increase the environmental awareness and to improve the accessibility of regional data and information.

Between 2007 and 2010, the ICZM-Oder project will focus on interactions between the Oder river basin, the coastal zone and the Baltic Sea. The Oder is one of the most important rivers in the Baltic region but it carries high loads of nitrogen and phosphorus which cause severe and ongoing eutrophication of the coastal waters. Coastal water restoration will require an integrated river basin - estuary - sea management approach. To understand the eutrophication history of the system and to test various future water quality management options, the GIS-based river basin model MONERIS and the 3D-bio-geo-chemical Baltic Sea model ERGOM were linked. This allows e.g. the evaluation of potential climate change effects as well as the analysis of land-use changes in the river basin on nutrient loads and coastal ecosystem quality. Furthermore, legal and planning options, and economic cost analysis will be carried out and the impact of management options on major coastal uses, like tourism and nature protection, will be evaluated. To support practical management in a comprehensive manner, the results will be included into a decision support system. The Oder/Odra case study clearly shows the short-comings of a regional ICZM and the need of an integrated river basin – coastal zone – sea approach (see www.ikzm-oder.de/).

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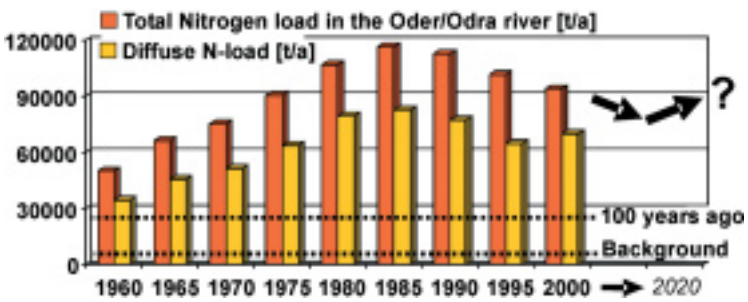
2 *Gerald Schernewski, Baltic Sea Research Institute: contact: schernewski@eucc-d.de*

Recent efforts to reduce the nutrient load in the Oder river were successful, but the Oder Lagoon remained eutrophic. Climate change and economic processes cause an uncertain future (modified after Behrendt et al. 2005)



Tourism is the main economic factor in the Oder estuary (Photo: G. Schernewski)

ENCORA group (Photo: Haese)

Networking

Networking has a special importance for Integrated Coastal Zone Management and can concern different aspects like the networking of the actors and stakeholders, of the territories, of the data and experiences, etc. The networks can be the results of national initiatives but also the aim of European projects like ENCORA or SPICOSA. Five different types of networks are described which show different aspects of networking that are taking place.

ENCORA Germany [1]

ENCORA is a European platform for sharing knowledge and experience in coastal science, policy and practice. It is a Co-ordinated Action within the 6th European Framework Programme. It facilitates networking by providing (1) a contact search mechanism to find co-operation partners, (2) assistance to establish information-exchange communities for certain topics of interest, and (3) an exchange programme for young professionals.

It is a network of networks with multi-disciplinary, national networks inter-acting with international, thematic networks. This sounds complicated, but in fact it is easy to use for members *e.g.* if someone wants co-operation partners in other EU countries in a certain field of interest, they can contact their national co-ordination office (NCO). By networking with the other NCOs, (s)he will start a contact search within the other national networks.

ENCORA has begun to develop a Coastal Directory that will be created in a WIKI environment. This 'Coastal Wiki' will become a powerful tool for sharing knowledge and experience in ICZM in Europe. If someone wants to share knowledge with other European colleagues, ENCORA invites contact with the co-ordinating office of the theme (TCO) that covers the field of interest. The TCO will then update on thematic activities, workshops and co-ordinate contributions to the Coastal Wiki for the respective themes.

It further aims at disseminating good practice guidelines across Europe and will propose a European Action Plan to address major deficiencies in science, policies and practices. Hence, by participating in ENCORA there is the possibility to exert influence on coastal policy in Europe.

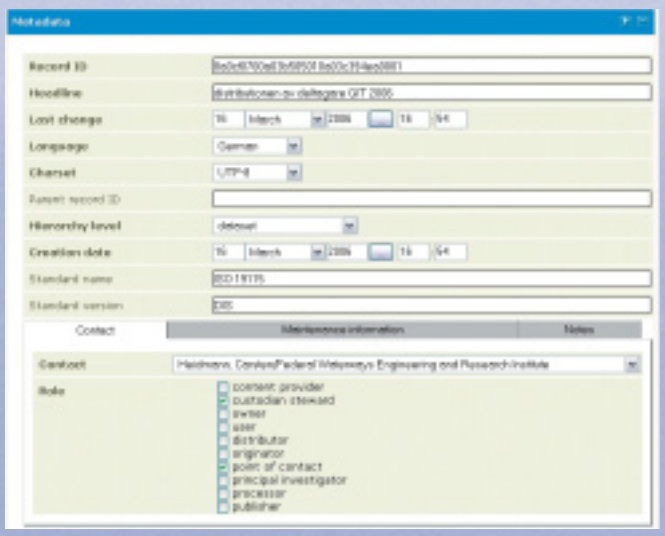
ENCORA Germany and EUCC-Germany work closely together in implementing ICZM. We share information, workshops, web tools, and databases. The idea is to have more impact on decision making by joint national efforts (www.encora.org, www.encora-gcn.de).

Coastman [2]

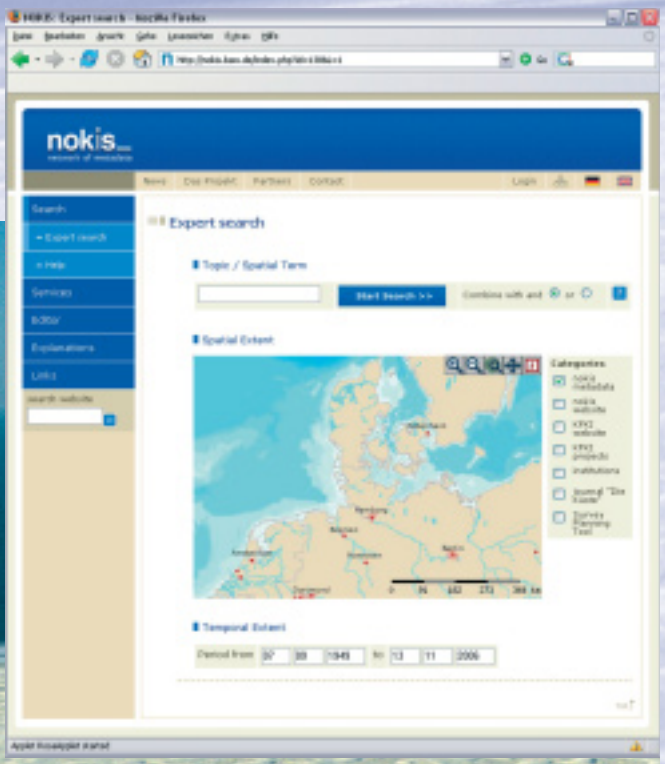
Coastman is investigating the interactions between environmental conservation, conflict management and sustainable development in six coastal zones of the Baltic Sea, aiming at developing solutions (www.coastalmanagement.net). In Germany, TuTech Innovation GmbH is investigating various interests in the Hamburg harbour and potential conflict resolution strategies.

A specific investigation was carried out by TuTech and EUCC - The Coastal Union Germany on the ICZM Progress Marker

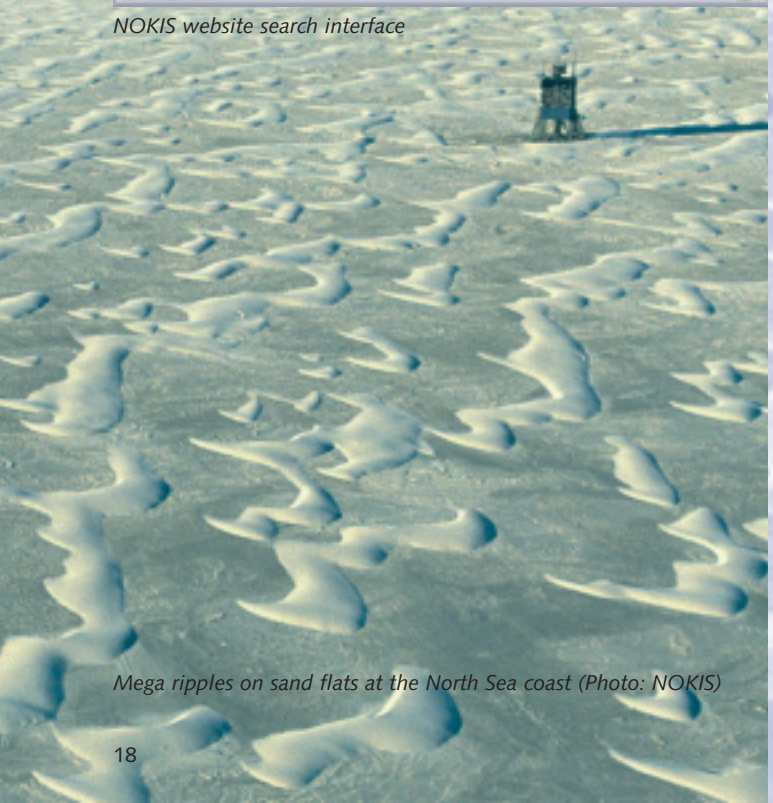
ENCORA brochure



NOKIS metadata editor



NOKIS website search interface



Mega ripples on sand flats at the North Sea coast (Photo: NOKIS)

which is intended to be used as a self assessment tool to determine the level of ICZM implementation. The Progress Marker was tested in Hamburg and the results were discussed during a workshop in June 2006. Local stakeholders and national indicator experts discussed its contribution to the implementation of the *National Strategy of ICZM in Germany* which was presented in April 2006.

SPICOSA[3]

Science and Policy integration for Coastal System Assessment (SPICOSA) is an Integrated Project in sub-priority 'Global Change and Ecosystems' of the 6th European Framework Programme. It will start in early 2007. The overall objective is to develop a self-evolving, holistic research approach and support tools for the assessment of policy options for sustainable management through a balanced consideration of the ecological, social and economic aspects of Coastal Zone Systems. The project consists of 5 thematic nodes *viz* (1) Science and Policy Interface Methodology, (2) System Approach Framework Methodology, (3) Study Site Activities, (4) Support & Services and (5) Knowledge Transfer; with altogether 13 work-packages. 51 European partners are involved, including DISY Information Systems (data management), Kolleg for Management and Formation of Sustainable Development (system output), the University of Bremen (information management), the Baltic Sea Research Institute Warnemünde (IOW) and the Institute for Ecological Economy Research (IEER).

The joint SPICOSA approach will be tested in 18 European case study sites (databases.eucc-d.de/plugins/projectsdb/index.php). In Germany, the Oder estuary will serve as the only case study. Based on work of the ICZM-Oder project, IOW and IEER will link economical analysis to the existing natural scientific-oriented, river basin - coast - sea approach. EUCC – The Coastal Union will co-ordinate and actively support the information and dissemination of the SPICOSA-results.

NOKIS – network of metadata in the coastal zone[4]

Starting in the year 2000, a coastal information system was set up for the German coastal zone of the North and Baltic Seas with a web portal http://www.nokis.org maintained at the Federal Waterways Engineering and Research Institute BAW in Hamburg. The intention was to unify the documentation of data available in, altogether, 15 State and Federal agencies and to meet the requirements of national and international data infra-structures.

Both the German Spatial Data Infra-structure GDI-DE and the European equivalent INSPIRE require application of the ISO 19115 Standard for Metadata for the intended vertical information flow. In order to meet the needs of the coastal user community which operates on rather detailed descriptions for the horizontal inter-sectoral information flow between data provider and data user, the NOKIS profile for the coastal zone was adopted.
This manageable set of 40 descriptive parameters includes all of the so-called recommended core elements of the higher-ranking infra-structures. A number of tasks related to Integrated Coastal Engineering and Integrated Coastal Water Protection need additional information which is maintained in profiles for monitoring, projects and numerical modelling. A powerful editor has been developed to facilitate the creation of metadata, either by manual input of individual metadata sets or through manipulation of large sets of metadata extracted from existing databases. NOKIS metadata are also used in management tools, where planning information with regard to surveying and monitoring activities is co-ordinated and harmonized. Technically, the func-

Dike foreshores at the southern coast of Eiderstedt, North Sea (Photo: KFKI)

tionality of interfaces such as catalogue services (cs-w) and web map services (wm-s) are the backbone of the network of metadata.
Several NOKIS services for data resources located with NOKIS metadata provide standardized on-line viewing and analysis functionality. A Gazetteer service is being set up for use both in the metadata editor and in the search interface of the web portal.

KFKI - Research and co-operation for German coastal waters[5]

In 1973, the German coastal Federal States and three Federal Ministries, *i.e.* Agriculture and Consumer Protection (Coastal Protection), Transport (Waterways), and Research and Technology founded the German Coastal Engineering Research Council KFKI (Kuratorium für Forschung im Küsteningenieurwesen) in order to co-ordinate coastal research activities, advance international co-operation and disseminate knowledge in coastal engineering.

About ninety projects of applied research have been funded so far, usually with participants from Federal and State agencies. The main topics can be grouped into the categories survey and position determination, geo-morphology and sediments, water level and storm surges, waves and wave impact, interactions, and information & communication. Following the recent development of numerical models to simulate bed evolution, the topic of morpho-dynamics is a current key issue.

A project database, including project reports and pertaining literature, is maintained and accessible through the KFKI website http://kfki.baw.de, which is an information hub for German coastal engineering events. In co-operation with the North Sea and Baltic Sea Coastal Information System NOKIS, valuable background information and specific data sets are made available. The web OPAC of KFKI's library http://kfki.baw.de/KFKI_webOPAC provides access to a unique collection of coastal engineering literature and conference proceedings.

KFKI is the editor of the journal Die Küste, with usually two editions per year, reporting about on-going research in the coastal zones of the North and Baltic Seas. Several special editions have been published, *e.g.* on Risk Assessment, Global Storm Surges or Recommendations on Coastal Protection. The newsletter, KFKI aktuell, has a circulation of 800 and is published twice a year. Its English edition is available on the KFKI website. The annual KFKI seminar on coastal research attracts many participants from different administrations, academia and industry. Finally, KFKI is member of the local organising committee of the upcoming International Conference on Coastal Engineering ICCE2008 in Hamburg.

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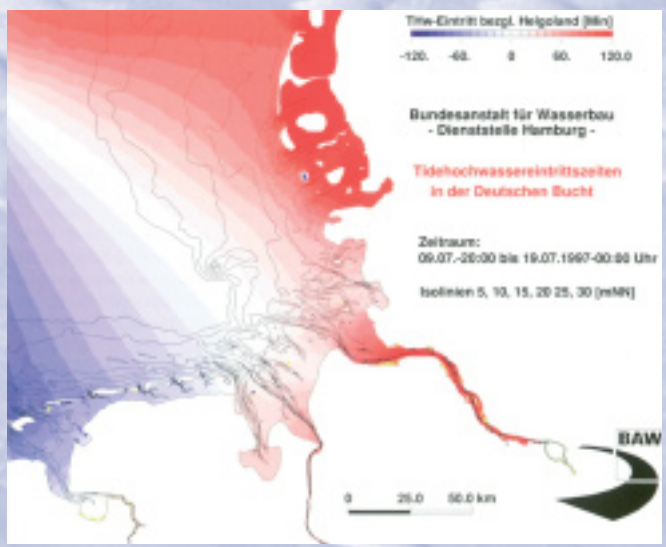

Time zones of high water calculated by the mathematical model of the German Bight (KFKI)

Public participation

Information and awareness raising are the main steps of public participation in any political and administrative decision-making process.

Workshop "Be once Don Quichote" in Oldenburg, 2005: 20 participants played the board game ANEMOS.(Photo: Dietmar Kraft)

"Insel und Halligkonferenz" in Berlin 2005 (Photo: Daniel Witzki)

Decision support for stakeholders[1]

As decision-making mostly follows complex paths, different data and models have been used for evaluating different outcomes. Abstract outcomes are created that are unlikely to be comprehended by a broad public. The junior research group IMPULSE is trying to integrate, evaluate and visualise complex environmental issues through information and decision support systems. The intention of these systems is to support sensitisation of the general public by creating easily accessible representations of information and evaluating possible outcomes of decision-making: two examples for the North and Baltic Seas follow.

Within the EU-Project POWER a web-based system, ANEMOS, is being developed to allow an objective assessment of various impacts of an offshore wind farm. It can be easily used to integrate many stakeholders in decision-making and offers the possibility to evaluate their preferences. It is a powerful tool not only for informing all parties concerned but also for improving societal decision-making (www.offshore-power.net).

The river Odra, and its catchments, constitute an inseparable network of nutrient emissions into the Baltic Sea. Several scientific models have been developed in the past, which consider these areas, separately. Within the project ICZM-Odra, IMPULSE is implementing an integrated computer-aided system, which couples these separated models. The aim of the application is to make data understandable by visualising the geographical coherences within digital topographic maps (www.icbm.de/impulse).

Participation in the "Region Uthlande"[2]

The "Insel- und Halligkonferenz" is a local governmental organisation in the "Region Uthlande", situated in the Wadden Sea National Park in Schleswig-Holstein (www.Inselundhalligkonferenz.de). We aim to push forward the region's development by supporting a large variety of thematic issues and projects.
For our local governments, it is important how the implementation of ICZM will be carried out on regional and local scales. From our view effective ICZM-tools are needed because

- of the concentration of economic interests in the north sea region and the growth of shipping traffic,
- climate change and sea level rise will force the government to adapt the coastal defence concept, and
- the financial situation cannot be expected to continuously grow.

So far, we have to recognise that there are no actions on the way and that there have been little involvement of us, the regional stakeholders. Therefore, at our recent annual conference in October 2006, our members demanded that the government of Schleswig-Holstein inform us about their position and their approach to ICZM. Our position is to insist on the implementation of the national strategy because we are aware of the aggravation of conflicts in the coastal zones. As regional stakeholders we have to handle the consequences of the conflicts.

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Sea level in the "Region Uthlande" (Photo: Daniel Witzki)

Information dissemination

Coastal information and data must be available for everybody, every time and everywhere. To reach this goal, EUCC - The Coastal Union Germany is looking for new possibilities and developed several thematic coastal databases, a web-portal and newsletter for the Baltic region. The target groups are scientists, coastal practitioners, students and the coastal population.

Coastal databases: a new approach[1]

Internet-based databases are merely a technical infrastructure to store and access information. The challenge is the database content, the information and data. It has to be up-to-date, comprehensive and permanently available. The Internet-presentation of the content has to be flexible, user-oriented and reach a large international coastal community. EUCC- The Coastal Union provides databases which include pictures, coastal case studies & projects, events, training & education and coastal experts.

New is the link between the databases and many web pages of organisations and projects and the possibility to show selected, user-driven database contents on these partner web-pages. EUCC takes care of the technical development and maintenance of all databases. Partners have no development or maintenance costs, only the possibility of a seamless integration of the databases into their individual web-page. Partners have the possibility to decide which content of the database will be shown on their web-page and keep full control of their Internet presence. All partner web-pages get access to the database although all entries are only entered into one database. Therefore, all partners benefit from entries of all other users and benefit from improvements and extensions of these databases. Thus, a partner has access to large amounts of existing, up-to-date information and their own information will be available to a large coastal community as soon as it is entered into the database.

Integrating our databases into your own web-page, will increase the attractiveness of your Internet presence. It ensures the dissemination of information towards different and large user communities (http://databases.eucc-d.de/en/).

EUCC - The Coastal Union Baltic: a New Portal for Baltic ICZM[2]

The website "EUCC - The Coastal Union Baltic" (www.baltic.eucc-d.de) serves as a link for the Baltic Region national branches of "EUCC The Coastal Union" (currently Germany, Poland, Lithuania, Latvia, Russia and Finland). The aim is to give an overview about the branches and to promote sustainable development and ICZM of the Baltic Coast.

Visitors to this website can get an overview about ICZM state-of-the-art and the activities developed in the region. A comprehensive database is available where information about projects, case studies, documents, conferences, experts, pictures and training opportunities can be obtained. These are updated regularly with new entries easily noticeable in the starting page. Registered visitors are also invited to contribute to the database with their own entries. Some direct links to other networks and relevant projects are presented as well.

"Thanks and go on" - the German EUCC - Küsten Newsletter[3]

"The German Küsten Newsletter (of EUCC-D) is a valuable medium to keep someone informed about coastal subjects-thank you and carry on with it!"

This statement on the German EUCC Küsten Newsletter - now in its fourth year - was given during an on-line survey, based on 14 questions with almost 11% of the 950 subscribers participating, in spring 2006. It exemplifies the overwhelmingly positive feedback given by newsletter readers: 91% were highly satisfied. The content (91%), choice of subject (86%) and current issues (83%) were especially well received. The subscribers especially liked the sections on background information, international news and the short news items.
Most of the readers work in science (23%), nature (14%), coastal protection (14%), regional and local authorities and ministries (14%), spatial management (9%), tourism (5%), harbour development (5%) and many others e.g. fisheries, media (newsletter@eucc-d.de).

The newsletter, published bi-monthly, offers everyone the opportunity to present background information about their work, their projects or events concerning coastal or marine subjects. The newsletter also collates news on international activities, developments or policies and general news items about coastal and marine activities. Publications, links to websites, events for workshops and conferences complete the issues. More information about the German EUCC-Newsletter is available on www.eucc-d.de.

"Ecology of Baltic Coastal waters" – a new book[4]

This new book, edited by U. Schiewer and published in 2007, presents the first, science-based, comparative description of the high ecological diversity of Baltic coastal waters to a broad scientific audience.

It begins with an overview of the Baltic Sea with a short presentation of the main characteristics of the coastal zones. The ecological case studies that follow concentrate on the 4 main types of coastal waters *viz.*

- the southern coast, *e.g.* Schlei-mouth,
- the eastern coast, characterized by great gulfs influenced by strong freshwater inputs and coastal deltas *e.g.* Gulf of Gdansk,
- the northern coast, *e.g.* the Neva Estuary, and
- the western coast, represented by typical fjords and hard bottoms in Sweden (*e.g.* Stockholm Archipelago) and coastal bights in Denmark (*e.g.* Odense Fjord).

There follows an outline to the main differences with the Baltic Proper and an evaluation of research deficiencies and the common protection measures taken.

Temporal course of eutrophication in Baltic coastal waters (Photo: Baltic Sea Research Instiute)

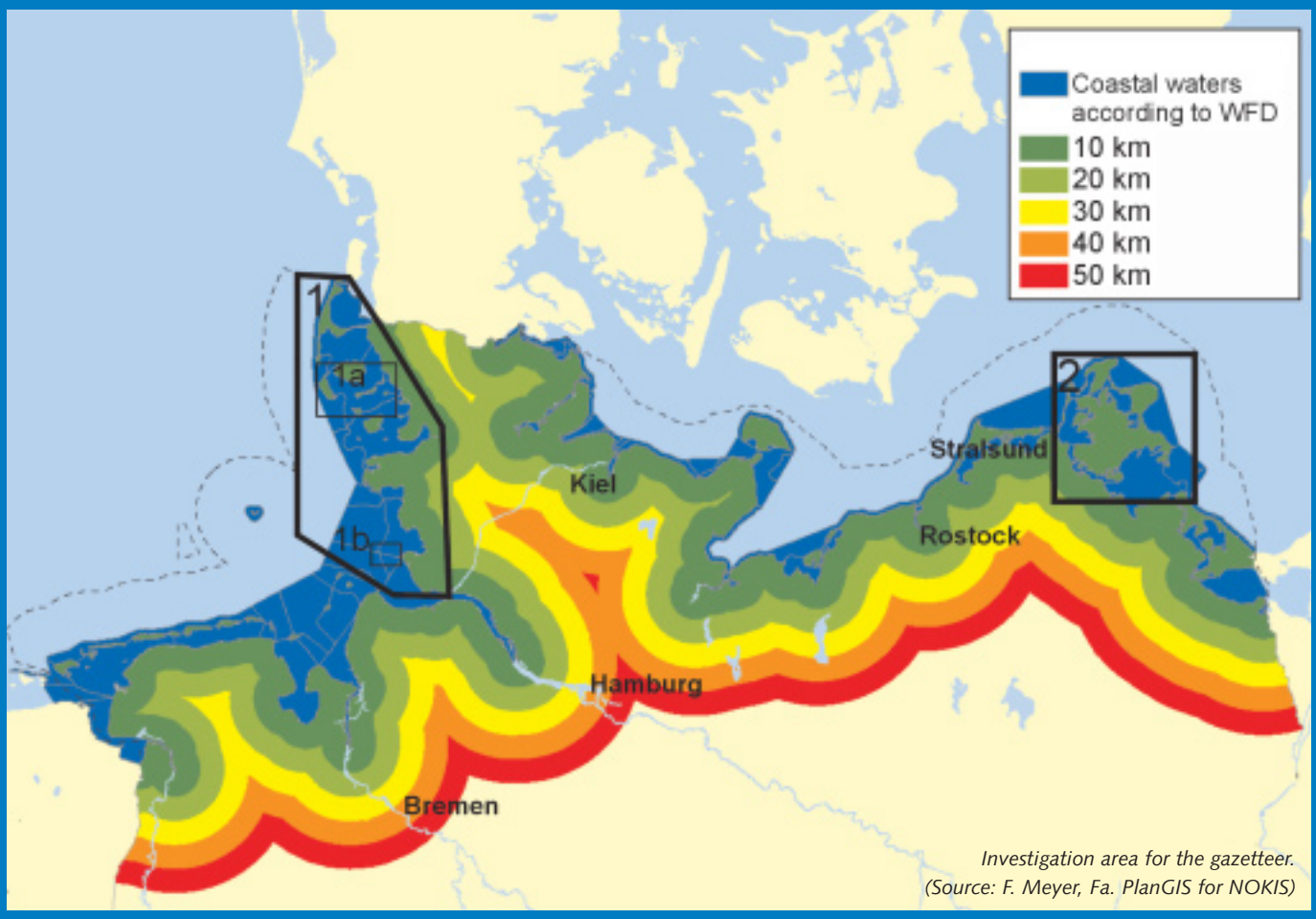
A coastal gazetteer for Germany[5]

NOKIS, the North and Baltic Sea Coastal Information System, has established an information infrastructure for the German coast. As one of its services, a coastal gazetteer will be implemented within the framework of NOKIS++ (www.nokis.org).

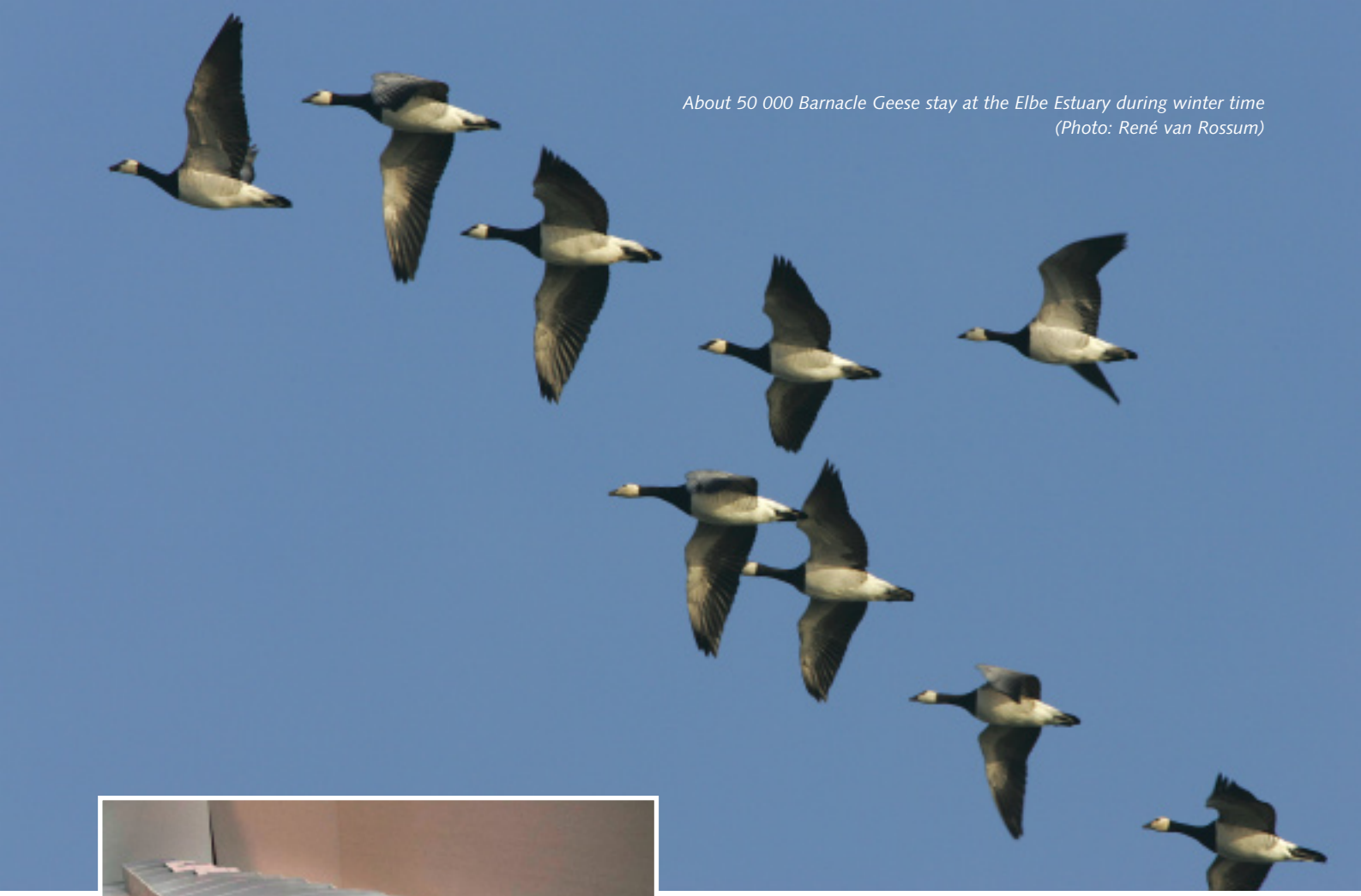
The investigation area of the gazetteer is the water zone of Germany's sovereign territory extending 50 km into the hinterland. A basic network of toponyms is constructed via the digital topographic information system (ATKIS) of Germany's Federal States' land surveying offices and sea charts edited by the Federal Maritime and Hydrographic Agency, and in co-operation with the Federal Cartographic and Geodetic Agency.

In addition to this, information from historical and local sources, as well as names in dialects including the local Frisian language, has been compiled. From this geographic-linguistic fieldwork carried out in prototype areas, a number of toponyms were recovered which are supported by local inhabitants.
The technical realisation behind the user interface is established as a web-service, based on the Alexandria Digital Library gazetteer (ADL). We have added layers to accommodate the temporal dynamics of morphology and to extend the data structure in order to satisfy basic linguistic features as well as to document complex sources.

Data structures and services related to a gazetteer have been established during realisation of the information system NOKIS. So far, only prototype regions have been completely covered, and the NOKIS partners, *i.e.* most of Germany's coastal agencies, would like to realise a complete coastal gazetteer. This could be done in co-operation with international organisations in a European project aiming at a European Coastal Gazetteer.



Investigation area for the gazetteer. (Source: F. Meyer, Fa. PlanGIS for NOKIS)



About 50 000 Barnacle Geese stay at the Elbe Estuary during winter time (Photo: René van Rossum)

Operating model of the planned Coast World centre

Coast World – the first German visitors-centre for coasts and river mouths[6]

The estuary of the river Elbe is one of the largest in Europe with extensive mudflats and the vast banks on the southern shore are wetlands integrated in the Ramsar List of Wetlands of International Importance and include Fauna, Flora & Habitats Directive and nature conservation areas. A number of nationally and internationally protected bird species are observed here in large numbers.

With support of the local authorities, the Natureum Niederelbe Foundation is planning a new centre focused on the natural resources of river mouths and coastal areas as well as their utilization and modification by man. The centre, named **Coast World**, will compare the coastal themes and landscapes locally and internationally and present them in an educational way. It will also be of great importance for tourism and thereby will help to compensate economic disadvantages that especially exist for farmers because of the vast nature conservation areas.

The Foundation already has one environmental education centre, 'Natureum Niederelbe' as well as a Museum of Natural History frequented by 60,000-70,000 visitors yearly. 'Natureum Niederelbe' is situated on an isle in the centre of the wetlands. It is supported by public funds (www.natureum-niederelbe.de).

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Junction of the river Oste with the Elbe mouth (Photo: Peter Paulsen, Stade)

Summerschool
(Photo: Gerald Schernewski)

Education and training: real and virtual

ICZM training and education has become part of the university curriculum all over Europe. At the same time, during the last few years, the internet has become an important source of information and a valuable medium for environmental education and awareness-raising. Nowadays, almost all ICZM-initiatives and projects present themselves on homepages and make basic information available all over the world.

The real world

ICZM education and training programmes[1]

Several very different education and training programmes focusing on ICZM are now available in Germany. In most cases, it forms one module within a Master or Bachelor study course *e.g.* Coastal Geo-sciences and Engineering or Environmental Management/Management (University of Kiel), Geo-sciences and Environment (University of Bremen), Marine Environmental Sciences (University Oldenburg), Geo-sciences and Environment (University Greifswald) and 'Landeskultur und Umweltschutz' (University Rostock) http://eucc-d.de/plugins/kuesten-management/lehrangebote.php.

Several organisations provide training programmes for international students and experts like 'Sustainable Use of Coastal and Marine Resources Training - SUCOMAR 2006' by INWEnt or the regular annual coastal summer schools organised by three major marine institutes in Germany and supported by EUCC – The Coastal Union Germany.

The SUCOMAR training[2]

SUCOMAR (Sustainable Use of Coastal and Marine Resources) is the advanced training programme designed to increase awareness of junior executives to the very complex ecological and social processes of development in coastal regions. The programme has been carried out since 1999 and is organized by InWEnt GmbH (*Internationale Weiterbildung und Entwicklung* / Capacity Building International, Germany). InWEnt stands for the development of human resources and organizations within the framework of international co-operation. Each year some 55,000 persons participate in InWEnt's activities. The courses offered address specialists, executives and decision-makers in industry, politics, administration and civil society.

The aim of SUCOMAR is to acquaint the participants with effective methods of planning, decision-making, controlling and monitoring of natural and socio-political processes related to the use and conservation of coastal and marine resources. After assisting the training programme, participants should be in a position to apply management instruments to aspects of the management of coastal regions in their home countries.

Adult education methods, personal and organisational development are applied in the training. Case studies of coastal management problems are a suitable instrument for problem-oriented learning and participants are requested to bring along a case in which they are involved so that they can be worked further as a pilot project within the course by the trainees.

Excursions to points of interest are part of the training and give an insight into management structures, tasks and responsibilities

of different bodies in Germany and Europe. Two-month internships, in which the participants gain in-depth information on specific interests, are held in the German institutions involved in the programme.

To enhance a sustainable network formed by the participants and their trainers, a "shared workspace" SUCOMAR is being provided at the virtual platform **"GLOBAL CAMPUS 21" (www.gc21.de)** for both, professional and individual communication.

Solution-oriented capacity building[3]

Most ICZM-processes are targeted on scientific and/or technological approaches. At the same time a fair and transparent decision-making process in a social context, including awareness raising, participation, consideration of cultural conditions, planning and controlling capabilities seems to be hampered. Therefore, solution-oriented managerial competence might be insufficient and accompanied by ineffective communication, networking and co-ordination of the stakeholders as well as weakness in the transfer of information to the responsible bodies.

Professional trainings carried out since 1996 by the author's working group (www.riess-biu.de) focus both on providing technical knowledge and on the development of social skills. Case studies are used as excellent instruments for solution-oriented learning. Candidates provide cases of coastal management problems and the trainees then work in interdisciplinary teams in order to develop new solution-oriented perspectives, concepts or approaches.

Based on the participants skills and knowledge of natural sciences, engineering and socio-economics, the trainees become qualified to manage coastal processes according to the specific conditions in their countries and, furthermore, to instruct their colleagues when they return home.

View from Hamburg port (Photo: Le Thi Thanh)

The virtual world

E-Learning via Internet[4]

Distance learning courses have gained importance during the last decade in Germany. The University of Rostock offers the Master-courses Environmental Protection as well as Environment and Education. Both courses include a module on ICZM which can be studied separately as well, including examinations. The basic German version is available for self-studies on the Internet (www.ikzm-d.de/main.php?page=1,40) and can be regarded as a supplement to the international on-line course CoastLearn (www.coastlearn.org) which was aimed at authorities, coastal stakeholders and decision makers. All important

Helgoland (Photo: Le Thi Thanh)

coastal on-line training and information modules can be found in the Internet-portal IKZM-Lernen (http://www.ikzm-d.de/english.html).

EUCC – The Coastal Union Germany has developed the national internet platform IKZM-D LERNEN (www.ikzm-d.de). This is a free of charge and open internet platform which compiles different on-line information, study and training modules relevant to ICZM and the coast in general. The tools focus on regional and national demands and specific ICZM requirements in Germany. They address coastal stakeholders and decision-makers, students and interested citizens. The software tool underlying IKZM-D LERNEN is designed to be used without specific computer programming skills and thus allows for an easy documentation of ICZM case study results. In this manner, several national case studies have been, and will be, presented as best-practise modules *e.g.* the case study "Participation in coastal defence - at Timmendorfer Strand & Scharbeutz". The tools are available in German but, in order to share information with the international community, some of the modules will also be available in English.

Taking a different view: awareness raising on-line[5]

Young nature guides from the German Wadden Sea area provide an on-line information system for tourists about conflicts in the Wadden Sea. In order to raise awareness for human activities in the coastal zone, for problems arising from them and for possible solutions, not only the perspectives of nature conservationists but also the users' perspectives are examined and described. This environmental education project is carried out by EUCC – The Coastal Union Germany in co-operation with the local NGO *Naturschutzgesellschaft Schutzstation Wattenmeer*. It makes use of the software tool IKZM-D LERNEN, which enables the nature guides to design and edit web pages without any training in internet programming. The information system will be available in German under the name of *Wer, Wie, Watt?* in

Participants of Sucomar 2006 (Photo: INWENT, SUCOMAR)

Nature guides are designing online study modules as part of their training (Photo: Philip Bedall, EUCC-D)

the on-line study portal www.ikzm-d.de, as well as www.eucc-d.de and www.schutzstation-wattenmeer.de from spring 2007.

Raising knowledge about Climate Change[6]

Like few other environmental themes, climate change and its possible impacts is a favourite theme for the media. Particularly worst-case scenarios are always good for a headline. However, will those announcements come true? Is climate change serious? As part of the German ICZM training website "IKZM-D Lernen", EUCC-Germany has developed, in co-operation with the climate change research project "ASTRA", an on-line training module. Interested non-professionals will find useful information about climate facts, expected impacts, scientific possibilities and limits in climate prediction.

The training module gives a general overview about climate change but focuses on German coastal areas, especially the Baltic Sea coast of Mecklenburg-Western Pomerania, to give examples of possible and expected climate change impacts within the general public's realm of experience (www.ikzm-d.de/main.php?page=45, also www.ikzm-d.de/english.html). To close the gap for the target group, the on-line module, which is the main element of the whole training module, is accompanied by flyers and posters. Because contact and information flow is needed for the local population as well as tourists, the training module has also been presented at local environmental events. The project also co-operates with environmental teachers.

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A sea cable track is dug in the Wadden Sea near Büsum, Schleswig-Holstein (Photo: Rainer Borcherding, Schutzstation Wattenmeer)

© Photo: Holger Janßen

Status report of EUCC-Germany

During recent years, EUCC-D, the German branch of EUCC, has become an important player in German coastal management. EUCC-Germany provides the basis for the national ENCORA network and works closely with other organisations. The coastal community in Germany has grown together and the close co-operations are of mutual benefit.

Since the foundation of EUCC-Germany in 2002, the national *Küsten Newsletter* has gained substantial recognition among the ICZM community as a means to receive and communicate up-to-date news from science and practice. Almost 1,000 readers receive the newsletter every two months, and every issue in 2006 was downloaded approximately 1,500 times within 14 days after publishing.

Nowadays, the EUCC-D homepage serves as a major source of information for coastal experts (5300 visitors per month). The interactive data bases provided for projects, conferences, training courses and documents are efficient tools to search and disseminate information. Data base co-operations have been established with several projects and institutions such as EUCC-International, CoPraNet and IKZM-Oder. Expert and picture data bases will follow soon and the search possibilities will be extended.

A major aim of EUCC-Germany is to raise environmental and coastal awareness. Therefore, public education and training tools have been developed and linked under the web-page *IKZM-D Lernen*. In 2006, information modules *e.g.* about the Water Framework Directive, Natura 2000, coastal tourism, climate change and a case study about public participation were added. An innovative way of using the tool has been its application with students, during seminars, composing information modules for the public.

Public relation activities that address coastal experts and the broad public have been increased. Staff members of EUCC-Germany presented posters and gave presentations at events such as the national conference AMK 2006 (Wilhelmshaven, Germany), Littoral 2006 (Gdansk, Poland) and the first conference about Marine Nature Conservation in Europe (Stralsund, Germany).

EUCC-D is successfully involved in several projects and has initiated it's own projects as well *e.g.* IKZM-Oder, CoPraNet, the environmental education project "Wer, Wie, Watt?" as well as an awareness-raising project concerning the effects of climate change in Mecklenburg-Western Pomerania which is linked with the INTERREG III B-project ASTRA.

An increasing number of free-lancers, guest scientists and trainees are employed at EUCC-D. The office in Warnemünde has been officially recognised by a co-operation contract with the Baltic Sea Research Institute Warnemünde which kindly hosts the office and supports EUCC-D and its infrastructure. To involve the approximately 90 members in the activities and decisions of EUCC-D, they are frequently approached through a member information letter and an on-line voting system that has been well accepted during the election of the executive board in 2006.

In 2007, additional environmental education projects along the German coast and a magazine for tourists about the Baltic Sea coast is planned, analogous to EUCC's Dutch Kust & Zee Gids. More information is available online at www.eucc-d.de.

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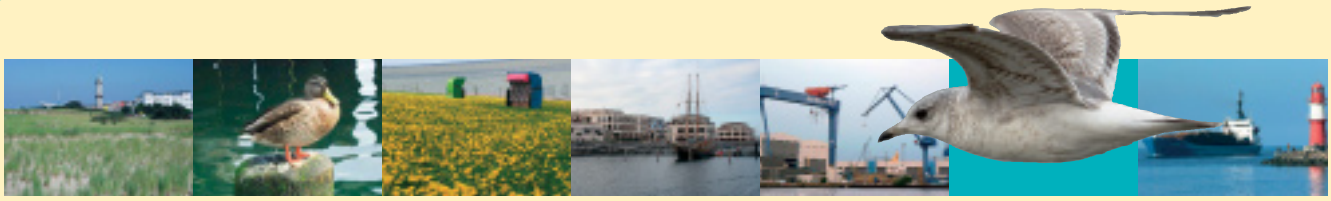
Baltic Sea Research Institute
(Photo: Aude Körfer)

EUCC - Germany Executive and Advisory Board



EUCC-Germany is an association and pays special attention to the involvement of its members. The election and the composition of the Executive and Advisory Boards is illustrative.

The Executive Board is the major body of EUCC-Germany. Besides a representative function, the executive is responsible for financial and strategic decisions. Every 4 years, the six Board members are elected by the members of EUCC-Germany, who have the possibility to vote on-line, if they cannot attend the members' assembly. Each coastal state of Germany (Land) must have at least one representative in the Board. This geographical partition permits EUCC-Germany to promote its actions on a national level and to have a good knowledge of regional coastal management policies. The Board consists of academics, private consultants, engineers and representatives of authorities. This diversity permits the strengthening of the link between scientists and practitioners.

A new Executive Board has been elected in 2006. Gerald Schernewski (IOW, Warnemünde) has been re-elected as president and is supported by new vice-presidents, Kerstin Kruivenga-Kreitsmann (Lower-Saxonia) and Gabriele Gönnert (Port Authority, Hamburg). The three other Board members are Bastian Schuchardt (BioConsult, Bremen), Andreas Kannen (FTZ Büsum) and Horst Sterr (University of Kiel). The practical management is the responsibility of Nardine Löser, who was appointed to Executive Director (for an overview of the staff see www.euccd.de/plugins/eucc_deutschland/mitarbeiter.php).

Similar to EUCC-International, EUCC-Germany established an Advisory Board in November 2006. The honorary Advisory Board members are EUCC members and known experts in specific coastal areas. Their task is to support the Executive Committee and the major concrete activities in EUCC as well as to assist with the strategy and policy development.

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