Towards improved environmental risk governance of the Baltic Sea

RISKGOV Deliverable 11

Reporting period: September 2011 to December 2011

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LIST OF ABBREVIATIONS

BSAP	**Baltic Sea Action Plan**
BSRAC	**Baltic Sea Regional Advisory Council**
CBD	**UN Convention on Biological Diversity**
CFP	**EU Common Fisheries Policy**
EAM	**Ecosystem Approach to Management**
IAS	**Invasive Alien Species**
ICES	**International Council for the Exploration of the Seas**
MSFD	**EU Marine Strategy Framework Directive**
NGO	**Non-Governmental Organisation**
HELCOM	**Helsinki Commission**
RAC	**Regional Advisory Council (linked to EU fisheries management)**
REACH	**Registration, Evaluation, Authorisation and Restriction of Chemicals (EU's chemicals regulation)**
TAC	**Total Allowable Catch (linked to EU fisheries management)**
WFD	**EU Water Framework Directive**

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Summary

Large marine ecosystems including regional seas such as the Baltic are subject to heavy pressures from human activities. Even though much effort has been put into mitigating negative environmental effects in the Baltic Sea, it is still one of the most polluted and heavily exploited marine ecosystems in the world. Three major problems in current marine environmental governance are, firstly, how to link the management of different natural resource uses and their environmental effects across sectors, secondly, how to more actively deal with ecological uncertainties and risks connected to human resource use and thirdly, how to involve stakeholders in management, in particular on regional and transnational levels.

In recent years, ecosystem management as a holistic and integrated approach to management is increasingly seen as the way forward to deal with the complex and severe environmental problems and risks. However, how to actually implement the ecosystem approach to management, still needs more attention. The Baltic Sea, as a multi-use, multi-cultural region, with a relatively enclosed and low diversity ecosystem provides a challenging case study for applying an ecosystem approach to management. In this region, there are a number of recent initiatives, based on ecosystem management ideas such as the HELCOM Baltic Sea Action Plan, the EU Common Fisheries Policy, and the EU Marine Strategy.

The project *Risk Governance in the Baltic Sea* (RISKGOV) hence focused on marine environmental governance at the *regional Baltic Sea level*. The project aimed to develop a more comprehensive understanding of structures and processes that shape the governance of environmental problems and risks on a regional scale. This document presents an interpretation of the key findings and messages that emerged from the RISKGOV project and make suggestions for possible improvements to facilitate the implementation of an ecosystem approach to management in the Baltic Sea. Written for a non-specialist readership, it is nevertheless consistent with the more detailed documents of the project work packages reports and can be read in conjunction with these.

In practice RISKGOV compares five main environmental problems and risks in the Baltic Sea, (eutrophication, overfishing, invasive alien species, chemical pollution, and maritime oil discharges) focusing on:

- How governance is structured in terms of, policy context, regulatory institutions, forms of decision-making, collaboration and participation.
- The science-policy interface, relating to how environmental problems and risks are assessed and managed, in particular, management approaches addressing uncertainty and multiple lines of scientific evidence and knowledge.
- Current and developing practices and conditions for stakeholder communication and participation at the regional level.

Moving towards sustainable ecosystem governance practices is potentially a complex and time consuming endeavour. The RISKGOV project identified three main governance challenges linked to implementing an ecosystem approach to management in the medium to long term time span (*i.e.* years to decades), that, if adequately addressed by actors and stakeholders, could help improve the governance of environmental problems and risks in the Baltic Sea ecosystem. Firstly, fostering a move towards reflexive and adaptive governance structures and processes by improving regulatory coordination, cross sector collaboration and forming spaces for interaction and dialogue. Secondly, strengthening the regional and ecosystem basis of knowledge generation and management is needed, including integration of various forms of scientific knowledge, stakeholder input, and increased attention to interdependencies among environmental problems and risks to better address uncertainties and disagreements. Thirdly, to develop a more integrated system of stakeholder input and communication, *e.g.* in the form of a "regional marine advisory council", to face issues of inclusiveness, create a common concern for the Baltic ecosystem, improve the motivation and capacity, and improve coordination across scales and sectors.

1. Aim and scope

Large marine ecosystems including regional seas such as the Baltic are subject to heavy pressures from human activities (Duda and Sherman, 2002). Even though much effort has been put into mitigating negative environmental effects in the Baltic Sea, it is still one of the most polluted and heavily exploited marine ecosystems in the world (Elmgren, 2001; HELCOM 2010; Gilek *et al.*, 2011a). A range of human activities from a multitude of sources results in a complex mix of effects on the ecosystem. In particular, the mid- and long-term effects on ecosystem functioning and resilience of a particular human activity are often very difficult to predict, if at all. Three major problems identified in marine environmental governance are, firstly how to link the management of different natural resource uses and their environmental effects across sectors, secondly how to more actively deal with ecological uncertainties and risks connected to human resource use, and thirdly how to involve stakeholders in management, in particular on regional and transnational levels (Gilek *et al.*, 2012; Hassler *et al.*, 2011; Renn *et al.*, 2011; Österblom *et al.*, 2010). In recent years, ecosystem management as a holistic and integrated approach to management is increasingly seen as the way forward. However, how to actually operationalise the ecosystem approach to management, still needs more attention.

The **RISKGOV project** focuses on marine environmental governance at the *regional Baltic Sea level*, motivated by the importance of this level for a sustainable governance of the Baltic Sea ecosystem. The Baltic Sea, as a multi-use, multi- cultural region, with a relatively enclosed and low diversity ecosystem provides an interesting case study for applying an ecosystem approach to management. In this region, there are a number of recent initiatives, based on ecosystem management such as the Helsinki Commission (HELCOM) Baltic Sea Action Plan adopted in November 2007, the EU Common Fisheries Policy (CFP), and the EU Marine Strategy.

The aim of the RISKGOV project was to develop a comprehensive understanding of structures and processes that shape the governance of environmental problems on a regional scale, and based on findings and key lessons suggest possible improvements for implementing an ecosystem–based governance of the Baltic Sea environment.
In particular, focusing on five main environmental problems in the Baltic Sea that also entails risks for human wellbeing and ecosystem functioning and health, (eutrophication, overfishing, invasive alien species, chemical pollution, and maritime oil discharges) the project analysed:

- **Governance structures** in terms of the policy context, regulatory institutions, forms of decision-making, collaboration and participation.
- **Interactions between assessment and management of environmental problems and risks** in relation to the science-policy interface, in particular, management approaches addressing uncertainty and multiple lines of scientific evidence and knowledge.
- **Stakeholder participation and communication** with focus on current and developing practices and conditions for stakeholder communication and participation at the regional level.

This report presents an interpretation of the key findings and messages that emerge from the RISKGOV project. What lessons could be learned from current governance efforts connected with Baltic Sea environmental problems, both in terms of successes and problems? Although the main focus is on the regional scale, conflicting or synergistic effects of regional management arrangements within particularly the national, and EU management levels have also been addressed. The report has been written for a diverse group of experts involved with environmental marine management, nevertheless it is consistent with the more detailed documents of the project work packages and can be read in conjunction with these (available at the RISKGOV website: www.sh.se/riskgov).

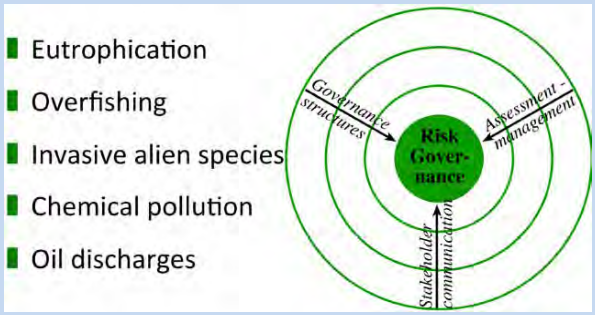
The structure of the report is to first give a background description to major trends in marine governance relevant for the Baltic Sea. In the following sections on key findings and recommendations, we summarize main lessons learned and finally make suggestions for possible improvements to move towards a sustainable ecosystem

management of environmental problems and risks in the Baltic Sea. The suggestions primarily aim at providing ideas on how to improve governance structures and processes in the medium to long term, rather than more specific (short-term) management suggestions. The specifics of the five case studies chosen in the project is summarized in Annex 1 and further described in the case study reports of the RISKGOV project (www.sh.se/riskgov)

Box 1. Risk Governance in the Baltic Sea (RISKGOV)

www.sh.se/riskgov

The **RISKGOV** project focuses on regional environmental governance of in the Baltic Sea by comparing five main case studies (see below) representing different environmental problems and risks in the Baltic Sea. The project is based primarily on document analysis, participatory observations, round tables, and ca100 interviews with stakeholders and key informants from authorities, international governmental organizations, NGOs, industry and science around the Baltic Sea.



This interdisciplinary project is a collaboration between researchers from both natural and social sciences at Södertörn University, Sweden, Åbo Academy, Finland, Gdansk University, Poland, and Dialogik Institute, Germany.

2. Trends in marine environmental governance

Several major changes affecting marine governance in the Baltic Sea have occurred during the last two decades. On the one hand, the enlargement of the EU implies a centralisation to the EU level or larger regions within EU. In *e.g.* the EU Marine Strategy Directive, increased attention is given to marine regions, such as the Baltic Sea, based on geographical and environmental criteria (European Parliament Council, 2008). On the other hand, although, eight of the nine Baltic coastal states now are members of the European Union, national regulations directly or indirectly affecting the Baltic ecosystem vary substantially in scope and intention. In addition, economic prerequisites for costly investments vary significantly between the 14 states in the drainage basin. Hence, current marine governance in the Baltic Sea is characterised by various multilevel interactions among a large set of actors.

Further, the scope of what constitutes an environmental problem has broadened during the last decades. From comparably narrowly framed management problems that in most cases was dealt with by experts and various technical solutions, towards ecosystem-based, multi-dimensional approaches including ecological, as well as social and economic dimensions. An illustrative example of this development is the Helsinki Commission Joint Action Plan (JCP) from 1992 and the recent HELCOM Baltic Sea Action Plan (BSAP) from 2007. While the key part of the first plan was a list of hot spots, typically consisting of pollution point sources to be eradicated one by one, the BSAP mentions no hot spots, but focuses on sustainability and an ecosystem approach to management, involving stakeholders and an adaptive management. As a consequence, assessment and management experience drastic challenges and the governance structure and practices need to adapt to new ways of giving, using and implementing various sorts of advice in their daily operations and decision-making processes in accordance with the EAM.

2.1 The ecosystem approach to management

The ecosystem approach as a holistic and integrated management framework of land and water resources is increasingly recognized internationally in, for example, the UN Convention on Biodiversity (CBD), the HELCOM Baltic Sea Action Plan, EU Marine

Strategy Framework Directive (MSFD) and to some extent in the EU Water Framework Directive (WFD) (CBD, 1998; European Parliament Council, 2000, 2008). For all of the five environmental problems studied in the RISKGOV project, the ecosystem management is identified as a basis for managing marine resources and environmental issues (Garcia *et al.*, 2003; Backer *et al.*, 2010; Curtin and Prezello, 2010).

The scientific base for taking an ecosystem approach to management (EAM) is now strong enough to be widely accepted in policy for managing marine resources (CBD, 1998; Garcia *et al.* 2003; Rice, 2005; Backer *et al.* 2010; Österblom *et al.*, 2010). The ecosystem approach focuses on sustaining functioning ecosystems that can continue to deliver ecosystem services for human wellbeing rather than particular target species or hot spots. A development in this direction can for example be seen in how action plans for the Baltic have developed over time (Hassler *et al.*, 2011).

Ecosystems, such as the Baltic Sea, simultaneously produce multiple ecosystem services that interrelate in complex, dynamic ways. Hence, a key challenge in ecosystem management is determining how to manage multiple ecosystem services across sectors (Bennett *et al.*, 2009; Raudsepp- Hearne *et al.*, 2010). The EAM is formulated to be able to jointly address complex environmental problems and risks in the Baltic as fish stock depletion, hazards emanating from mixtures of different chemicals and the long-term effects of nutrient overload.

EAM also focuses on the capacity of society to cope with, adapt to and shape change (Holling, 1973; Folke, 2006). In the Baltic Sea case studies, uncertainty and ecological complexity is present in all the cases to various degrees even though the character of the individual cases varies substantially (Gilek *et al.*, 2011b). In such cases, adaptive management practices are helpful highlighting flexibility and learning to address change and uncertainties in environmental governance. The EAM further stresses that ecosystem management needs to recognize the diversity of social and cultural factors affecting natural resource use and calls for increased intersectorial communication and cooperation at a range of levels (*e.g.* Curtin and Prellezo, 2010). Hence, stakeholder involvement, adaptive management and decentralization, as appropriate, are key for a successful and sustainable management of social-ecological

systems in the ecosystem management framework (CBD, 1998). This links EAM to the (environmental) governance concept where decision-making is viewed largely as a multi-actor, multi-level process. The ecosystem approach to management has been described as a profoundly new way of thinking about environmental management that requires novel thinking and adjustments in current management systems in the Baltic Sea region and elsewhere (Österblom *et al.*, 2010). The alteration of governance structures, processes and management practices towards an ecosystem management is complex. Careful reflection is required, not only before initiating changes, but even more importantly as a component in a continuous governance process.

2.2. Reflexive governance

A key feature in the Baltic Sea region with 9 coastal states and 14 national states in the drainage basin is the need for transnational collaboration to manage regional Baltic environmental problems, emphasized in for example the EU Water Framework Directive (Hammer *et al.*, 2011). This implies developing transnational forums for communication and decisions including multi-stakeholder participation, and an increased involvement of citizens. Governance thus also involves citizens and stakeholders in network-like constellations emphasizing the importance of 'dialogue'. However, in practice there seem to be many difficulties surrounding these ideal models for participation and interaction in the Baltic Sea (Dreyer *et al.*, 2011). The concept on reflexive governance points to the need for strategic thinking on how to form rules and regulations for governance (Voss *et al.*, 2006). Also, reflexivity involves reflection on the very governance process itself and acknowledges that governing activities are part of wider societal feedback loops and are partly shaped by the (side) effects of its own working. This is in line with the ecosystem approach including an adaptive management approach. A key obstacle for both effective (in terms of problem-solving) and reflexive governance is when the scale of the problems does not match political and administrative scales. Current governance trends in the Baltic Sea region addressing such mismatches include the EU Water Framework Directive by assigning water administration units (River Basin Districts) according to large watersheds. This may have a positive impact from an ecosystem management perspective in connection to how, for example, eutrophication and hazardous

substances are managed (Hammer *et al.*, 2011). Further, like EAM, the perspective on reflexive governance acknowledges links across scales, sectors and arenas of governance, which in turn necessitates co-operation and dialogue among a variety of actors. A key question to address is whether there are arenas, forums and networks that allow for multi-actor, multi-scale as well as inter-sectoral collaboration and reflexivity. On the regional level (Baltic Sea region) this challenge is accentuated even more because institutional structures are traditionally developed within the national state system.

2.3 The science-policy interface in marine governance of Baltic Sea

The main environmental problems dealt with in the RISKGOV-project; eutrophication, overfishing, invasive species, chemical pollution and oil discharges linked to marine transports in the Baltic Sea present contexts of highly, but differently, politicised domains of environmental governance, where the boundaries between science and policy are continuously blurred, *i.e.* political and cultural values influence science and science on the other hand influences policy. Therefore, the cases pose key questions with regard to the changing roles of science, risk assessment and management in the different policy-making contexts of governing the Baltic Sea marine environment. The type of risk is important as it determines for example the potential impact and how responsibilities for the effects are distributed. In the five cases investigated in the RISKGOV, there were large differences in terms of sources, effects, and complexities as well as how different management agencies and stakeholders valued and responded these risks. For example, the management options in the low probability of a large oil spill where impacts may be very high, differs quite a lot from a case with a high probability for long-term environmental effects such as eutrophication. Here, the science–policy interface provides a sphere where science-based advice is generally regarded and used as a primary and trustful source in environmental management and decision-making. At the same time an increasing criticism and concern is expressed towards a sole dependence on scientific expertise, which often is to the detriment of sufficient consideration of knowledge claims, perspectives and values held by other stakeholders such as NGOs, citizens or business actors. Hence, a main challenge is how to broaden the knowledge base and balance

between different types of knowledge, information, and differences in interpretations of risks and effects in governing a complex system such as the Baltic Sea.

3. Key findings and suggestions for improvements

The RISKGOV project identified three main challenges linked to implementing an ecosystem approach to management in the Baltic Sea that, if adequately addressed by actors and stakeholders, could help improve the governance of environmental problems and risks in the Baltic Sea ecosystem. These are:

1. **Lack of reflexive and adaptive governance structures and processes**
2. **Insufficient regional structures and processes at the science-policy interface**
3. **Need for an integrated regional system of stakeholder input and communication**

The remainder of this report presents a summary of key findings and lessons learned in the RISKGOV project related to the three challenges. Finally, we suggest possible improvements for moving towards a sustainable ecosystem management of the Baltic Sea.

3.1. Lack of reflexive governance structures and processes

A general finding is that comprehensive regulatory frameworks, in most of the five cases are in place. It is more a matter of reforming, expanding, and improving existing ones as well as developing connections between fragmented efforts. For example, in the chemicals case, the problem is rather the complexity of regulations, causing confusing overlaps and competition, than their absence (although a large number of potentially toxic chemicals are unregulated). In the invasive species case, relevant frameworks, methods and bodies already exist, but it has a very recent history and much remain to be implemented (Hassler *et al.*, 2011).

From an ecosystem perspective there are more or less strong links and interdependencies between all the five investigated cases. However, in Baltic marine governance, a narrow focus on sector governance, in which cross sector cooperation is still basically absent, were reported or indicated in all case studies. Management relies on a number of different assessment and management techniques (such as the TAC quota system in the overfishing case) that currently are difficult to reconcile with an ecosystem-based approach to management.

Important moves towards a more reflexive and adaptive governance structure enabling an ecosystem management in the Baltic Sea would be to improve coordination and collaboration across different sectors, and different levels, such as EU and national states (Table 1). HELCOM as a multi-issue organisation representing all coastal states, could have an important role in further establishing and forming a political and regulatory space on the regional level, for at least three reasons:
Firstly, it includes all coastal states and serves as an important arena for information sharing, negotiations and policy-making, in particular in linking Russia with the EU in debates and policy-making.

Secondly, HELCOM provides voluntary "soft regulations" in terms of recommendations and can serve as a testing ground for different regulatory measures that later can be transformed to hard EU regulations. A promising, but so far relatively undeveloped strategy is to stimulate initiatives among smaller groups of countries, then further encourage a continued process on the regional level and finally bring it to the EU Commission with the goal of turning soft regional agreements into binding directives. The successful development of the Baltic Sea Action Plan seems to have followed this process quite closely (Hassler *et al.*, 2011).

Thirdly, uncertainty as found to various degrees in all cases means that future consequences related to environmental problems and risks cannot be predicted and that governance needs to be adaptive and flexible. It is therefore important to establish different arenas in order to stimulate reflection, decrease potential lock-in effects and create manoeuvring room for policy-making in the future. HELCOM, and also BALTIC 21 have broad scopes covering several sectors with different kinds of networks involving different sets of experts and type of expertise. Also ICES have

recently started to work with an ecosystem management mindset. Close contacts between these, and other organisations would most likely be beneficial for creation of dynamic arenas for cross-sector reflexivity. It is possible that entering into, for HELCOM less chartered areas, creates opportunities for the adoption of new perspectives, perspectives based on contemporary thinking on sustainability and holistic ecosystem approaches. However, to ensure that this reflexivity interacts with concrete management levels and thereby influences day-to-day governance it is necessary that such arenas and practical management bodies find appropriate ways to communicate (Hassler *et al.*, 2011; Dreyer *et al.*, 2011).

Table 1. Proposed moves towards reflexive EAM governance

Move	**What**	**Why**	**Example**
Coordination	Improve regulatory coordination on the regional level and across levels	Gives synergetic effects and reduces overlaps	Turning HELCOM recommendations into binding EU Directives
Collaboration	Stimulate cross-sector collaboration and integrative policies	Places problem rather than administrative unit in focus	HELCOM Fishing/Agriculture Forums
Reflexivity	Create interaction space for reflexivity	Facilitates institutional, social, and individual learning as well as refined EAM and adaptive governance	Regional Advisory Councils (RACs) in the EU CFP

Further, the trend in EU towards regionalisation as in fisheries, where new bodies (RACs) are set up in response to the acknowledged importance of stakeholder participation, utilisation of different forms of knowledge and decentralisation, may enhance an ecosystem approach to management. Here, the creation of such organisational bodies create space for new thinking and breaking up of organisational inertia, while at the same time previously built up experience and knowledge to some extent may be lost (Dreyer *et al.*, 2011).

Recommendations

Moves towards developing a more reflexive and adaptive governance of environmental problems and risks in the Baltic Sea include:

- Further develop the regulatory coordination both on the regional level but also across levels.
- Stimulate integrative policies and collaboration across sectors.
- Create possibilities and space for interaction, evaluation and reflection on governance structure and processes.

3.2 Insufficient regional structures and processes at the science-policy interface

In all the five cases science–policy interactions are well developed but with large differences regarding how these interactions are shaped. The cases differ substantially in terms of, for example, the complexity of risk sources, available knowledge and uncertainties connected with assessing possible environmental effects as well as the degree of political differences and controversy (Gilek *et al.*, 2011b). For example, invasive alien species, oil discharges and overfishing can be seen as being quite simple environmental risks (in terms of the number of key causes and sources). In terms of uncertainty, a different picture emerges where fisheries management is dependent on assessments of highly variable fish populations with large associated uncertainties. Eutrophication, on the other hand, combines complex changes in the Baltic Sea ecosystem involving a whole array of nutrient sources (*e.g.* agriculture, municipal and industrial waste water, traffic and marine transport) with high scientific uncertainty on long-term ecosystem outcomes (Haahti *et al.*, 2010). Finally, environmental risks connected with chemical pollution are characterized by a vast number of various chemicals and sources of these, and it may not be possible to adequately describe all significant sources owing to lack of data and resources (*e.g.* Karlsson *et al.*, 2011). In such cases alternative precautionary strategies focusing on *e.g.* hazardous properties and activities rather than 'complete' risk description would be more suitable. There are also clear indications that such precautionary strategies (at least partially) have been implemented in several of the studied risk cases (Karlsson *et al.*, 2011). Still, despite the large differences between the cases, our findings indicate

that all the studied assessment –management interactions apply a rather traditional view of risks, with a quite limited consideration of uncertainty in management.

A difference observed in the case studies is connected to various socio-political interpretations of available knowledge and information. In fisheries for example, this has resulted in substantial differences in how risks are identified and evaluated among stakeholders on the type and extent of possible negative outcomes of different fishing strategies and management actions (Linke *et al.*, 2011; Sellke *et al.*, 2010). The substantial amount of uncertainty involved in all five case studies means that environmental risk assessments in traditional terms are hard to envision. Hence, governance modes that focus more on how to handle uncertainties and induce reflexivity than on predicting hazardous effects need to be developed. The role and methods of science-based advice thus need to expand from traditional risk assessment and scientific consensus to also include stakeholder deliberations and precautionary approaches if risks are characterised by high levels of ambiguity and uncertainty. Governance characteristics in general are complex in all five areas. Learning between risk areas can potentially improve over-all environmental safety levels and benefit long-term sustainability. All cases are also characterised by significant amounts of ecological complexity. This makes the assessment difficult, but at the same time means that over-arching governance mechanisms targeting complexity issues in the different areas potentially could be developed.

The findings of the RISKGOV project thus indicate significant differences between the case studies in terms of complexity, uncertainty and ambiguity. This underlines that a reflexive adaptive ecosystem approach to environmental governance, does not mean that “one size fits all”. In line with the EAM, sufficient attention on differences is needed to allow for a plurality of approaches and measures adapted to the problems at hand.

Table 2. Summary of identified challenges and observed science – policy interactions linked to environmental problems and risks in the Baltic Sea (Gilek *et al.*, 2011c).

Case study	Type of knowledge, uncertainty	Assessment-management interactions	Observed assessment-management interactions
Eutrophication	*Uncertainty - Ambiguity*	Strong role of science (co-production)	*Risk analysis based* Diffuse and instrumental
Overfishing	*Ambiguity - Uncertainty*	Highly formalised linked to EU fisheries management	*Risk analysis based* Formalised, towards participatory
Invasive alien species	*Ignorance*	Rather undeveloped	*Risk analysis based* Undeveloped
Chemical pollution	*Uncertainty*	High complexity of interactions	*Risk analysis based* Diffuse and complex
Oil discharges	*'Technical' Risk*	Focus on surveillance and monitoring	*Risk analysis based* Focus on safety analysis

Recommendations

A further development of the regional and ecosystem basis of science–policy interactions in terms of addressing knowledge gaps and developing a regional knowledge management is needed to strengthen regionally-based scientific advice by:

- Further developing the integration of various forms of scientific knowledge as well as mechanisms for incorporating local and practitioner knowledge in assessment and management.
- Developing a comprehensive and coherent strategy for addressing uncertainty.
- Interdependencies among the different environmental problems need to be more systematically addressed and the transparency increased in science – policy interactions.

3.3. Need for an integrated regional system of stakeholder input in the Baltic Sea

The case studies showed that there currently are a large number of different stakeholders involved in environmental governance in the Baltic Sea. Critical questions include who can take part, how and when in the governance process, and in what ways? How are issues framed, and what is defined as relevant to communicate about? A general finding is that the communication policy in regard to the studied environmental cases has changed mainly in two respects over the last decade (Dreyer *et al.*, 2011). Firstly, there are increasing efforts to give relevant stakeholders the opportunity to become involved in environmental risk management, also at the level of the Baltic Sea region. These efforts include HELCOM's Baltic Sea Action Plan through which the Commission's 'observer policy' has been supplemented by a 'dialogue policy'. They include further the setting up of the Baltic Sea Regional Advisory Council (BS RAC) under the 2002 reform of the Common Fisheries Policy (CFP) aimed to improve regulatory compliance in EU's fisheries management. Secondly, mainly in the fisheries field, there are emerging efforts to open up activities in the process of scientific advice production to relevant stakeholders at the intergovernmental level. These efforts, undertaken by the International Council for the Exploration of the Sea (ICES), are closely linked to the revised CFP stakeholder policy and combine an 'observer policy' with first steps towards two-way communication.

As they help to pool different forms of knowledge and values, these changes are favourable to implementation of the ecosystem approach (EAM). Successful implementation of this approach in the Baltic Sea Region would require, however, a more integrated system of stakeholder input, which better takes into account interdependencies among environmental risk issues and also their social and economic implications. Our explorative account shows that setting up such a system, *e.g.* in form of a 'regional marine advisory council', requires mastering several challenges as highlighted in Table 3. Nonetheless, there are still aspects that need further attention:

Firstly, a there is a considerable lack of formal structures for including stakeholders at the regional level as well as for interactions among different stakeholder groups.

An absence of structures for stakeholder participation and communication often results in a lack of coordination among actors. Also, an integrated management does not automatically present an attractive option for all stakeholders; power, resources, and strategic interests may be opposed to it and need to be addressed.

Secondly, the stakeholder participation process can suffer if dominating participants guard specific interests too closely. For example, it was clearly shown in the case studies on eutrophication and over-fishing in this project that sector interests (agriculture and fisheries respectively) made open-ended discussions and long-term strategic thinking problematic. For example, the eutrophication study reported a tight interplay between scientific assessment and management, in which just a handful of people took part and managed to translate science more or less directly into political action and management (Table 2; Dreyer *et al.*, 2011; Gilek *et al.*, 2011). In such a situation a great deal of consensus among the exclusive core policy group is most probably obtained. However, there is also awareness that this system is too fragile because of the lack of broader stakeholder involvement (Haahti *et al.*, 2010). Another example is the Regional Advisory Councils (RACs) in fisheries. They are not organized to allow for the equal representation of all types of stakeholders surrounding fisheries issues. Two thirds are allocated to representatives of the fisheries, whereas one third for other interest groups affected by EU's Common Fisheries Policy, which could be environmental NGOs, consumer groups, or sport fishers. The persistent debate on this two-third dominance of the fisheries sector in the RACs is one indicator of the importance of stakeholder representation that is considered fair and equal.

Thirdly, which phase of the policy cycle or assessment process the stakeholders are invited to take part in is crucial. For example, a general mismatch between the purpose (to include stakeholder knowledge and experience) and the governance stage at which RACs are formally positioned were found in the fisheries case (Linke *et al.*, 2011; Sellke *et al.*, 2010). The revision of the EU's Common Fisheries Policy included the aim to increase stakeholder participation 'at all stages of the policy from conception to implementation'. Yet, in practice the stakeholders could only discuss matters that were already (scientifically) framed by other actors. Accordingly, their activities were "restricted to providing views on pre-defined management proposals

informed by the results of a scientific advisory process [within ICES]" (Linke *et al.*, 2011). The same pattern was observed in the chemicals case. Several interviewees called for more inclusion of economic and societal perspectives already in the assessment phase (Udovyk *et al.*, 2010).

Fourthly, based on the findings from the case studies it is also obvious that the public, generally, is not involved or addressed in the risk assessment phase but rather (if anywhere) later in the risk management or implementation phase.

Table 3. Challenges of setting up an integrated system of stakeholder advise in the Baltic Sea region (Dreyer *et al.*, 2011)

Challenges	**Related findings**
Facing issues of inclusion	Moving towards an integrated system of stakeholder advice requires defining a membership, which 'truly' reflects the range/role of stakeholders making up the different sectors in the BSR and designing an organisational structure allowing for efficient working processes. The persistent debate on the two-third dominance of the fisheries sector in the RACs is one indicator of this issue's importance.
Unclear/insufficient motivation and capacity	Integrated issue management does not automatically present an attractive option for all stakeholders; power and resource strategic interests may be opposed to it and need to be addressed in the pursuit of such an approach.
Creating a common concern	The EAM is not fully acknowledged by all relevant stakeholders in the different cases. Defining it primarily as a participatory management approach could enhance acceptance and thereby increase motivation for joint advice giving on integrated issue management.
Vertical coordination	The pursuit of an integrated advice system requires improved coordination of regional stakeholder advice with stakeholder advice produced at the other political levels.

Recommendations

Steps towards a more integrated system of stakeholder input, which better takes into account interdependencies among environmental risk issues and also their social and economic implications would include:

- Defining a membership which 'truly' reflects the range/role of stakeholders making up the different sectors in the BSR and designing an organizational structure allowing for efficient working processes.
- Emphasizing EAM as a participatory management approach could enhance acceptance and thereby increase motivation for joint advice giving on integrated issue management.
- An improved coordination of regional stakeholder advice with stakeholder advice produced at the other political levels is needed.
- If the aim of stakeholder participation is to enhance the knowledge base of environmental risk management along several dimensions (biological, ecological, social, economic), stakeholders need to be included much earlier in the process; already when the problem is identified and framed.

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ANNEX 1.

The Baltic Sea environmental problems and risks

The Baltic Sea Region is one of the worlds´ largest brackish water bodies, framed by a drainage basin of 1 739 000 km^2, four times the size of the sea itself. Ca 85 million people live in the nine coastal states. The Baltic Sea is a young, non-tidal, semi-enclosed water body with a low species diversity of both marine and fresh water origin. The sea consists of a series of basins with fresh water inputs from the around 200 rivers. The influxes of saline oxygenated water through the Danish straits determine salinity, the temperature stratification of the water column, and affect bottom oxygen conditions in the deep waters.

The most severe environmental problems of human activities in the Baltic Sea include eutrophication, overfishing, alteration of biodiversity, climate change, oil pollution, and contamination by hazardous chemicals (HELCOM, 2010a; SEPA, 2005). Municipal wastewater, agricultural leakage and other sources have loaded the sea with pollutants, phosphorus and nitrogen (Elmgren 2001; Savchuk *et al.*, 2008), which together with intensive fishing and changing climate have contributed to ecosystem regime shifts in some sub-basins (Österblom *et al*., 2010). The goals of *e.g.* the HELCOM Baltic Sea Action Plan are to restore good ecological status in the Baltic marine environment by 2021. In particular, the plan focuses on a Baltic Sea unaffected by eutrophication, undisturbed by hazardous substances, a favourable conservation status of biological diversity and maritime activities in the Baltic Sea carried out in an environmentally friendly way (HELCOM, 2007).

The main sources of nutrient discharges into the Baltic Sea causing eutrophication are agriculture and husbandry, industries, aquaculture, municipal sewage water, river run-off and erosion, atmospheric deposition and nitrogen fixation (Elmgren and Larsson 2001). The first signs of eutrophication in The Baltic Sea stem from the 1960s when oxygen deficiency in the Baltic Proper was linked to consequences of human activities (Jansson, 1997; Elmgren, 2001). However, there was a time lag of ca two decades before the poor status reached public awareness, but increased algal blooms and oxygen deficiency in bottom waters are now well-known effects of the increased nutrient discharges. The Baltic Sea is also one of the best-monitored marine

ecosystems in the world with long time data series (HELCOM, 2009). Because of its semi-enclosed nature, eutrophication of the Baltic Sea is primarily a regional problem. However, as the distribution of negative effects of nutrient discharges are difficult to predict, coastal countries may be unequally affected depending on factors such as shape and length of coastlines, and currents.

Regarding eutrophication, the riparian Baltic Sea nation states and the EU constitute the main regulatory bodies. HELCOM also forms an important part of the governance structure, as HELCOM represents the only regional forum for negotiations where the entire BSR (Baltic Sea Region) is represented, including Russia. The EU regulatory framework can, from an eutrophication mitigation standpoint, be criticised from several aspects. In particular, different regulatory frameworks are to certain extents in conflict with each other. The DG for Agriculture and Rural Development and in particular the CAP (Common Agriculture Policy) contradicts certain aspects of the WFD (Water Framework Directive) and the MSFD (Marine Strategy) (Haahti *et al.*, 2011; Hammer *et al.*, 2011).

Biological diversity on the genetic, species, and ecosystem levels contribute to building functioning and resilient ecosystems and is addressed in primarily the UN Convention on biological diversity (CBD, 1992). In the young brackish Baltic Sea, there is a mixture of species with marine and freshwater origin where practically all have invaded the ecosystem during the last 10,000 years. The relatively low number of species makes the Baltic Sea susceptible to introductions and due to human activities the invasion rate has accelerated drastically from the 1950s.120 non-native aquatic species have been recorded in the Baltic Sea to date, 80 of which have established viable, self-reproducing populations in at least parts of the region. Such intentional or accidental introductions can influence the ecosystem structure and function in many ways, positive and negative. New species can increase taxonomic diversity and species richness of a given area, strengthen and increase functional diversity, provide new ecosystem services, and modify the food webs by adding new or alternative chains/links to the existing food web structure. On the other hand, *Invasive Alien Species* (IAS) can also threaten native biological diversity and ecosystem functioning. New species often enter the Baltic Sea either inside the ballast

water tanks of ships or through biofouling on ship hulls (*i.e.* IAS attached to a ship's hull). IAS inflict massive economic costs to fisheries, industry and other human activities on the global level and economic losses from the damage caused by IAS were estimated to exceed 12 billion Euros over the past 20 years (Shine *et al.* 2010). Even so, the there is not much public attention to IAS in the Baltic and the regulatory framework on alien species in the Baltic is rather fragmented (Lemke *et al.*, 2010).

The larger scale ***commercial fisheries*** in the Baltic Sea relies on just a few species, cod (*Gadus morhua*), salmon *(Salmo salar*), herring (*Clupea harengus*), and sprat (*Sprattus sprattus*), whereof cod is the economically most important. The impact of fisheries on the targeted fish stocks and cascading effects on the ecosystem is seen as a large problem in the Baltic Sea and elsewhere. In the last decades, the cod in the Baltic has suffered from a combination of heavy fishing pressure and degrading habitats, mainly due to eutrophication resulting in oxygen depletion in the deeper waters of spawning areas (Sellke *et al.*, 2010. The exact magnitude of the problems related to overfishing is uncertain due to the multidimensional complexity of assessing fish stocks, although it is clear that the scope is primarily regional depending partly on the brackish water, habitat and migration patterns of the main commercially exploited fish stocks. Even though overfishing of cod could be framed as a regional Baltic problem due to the specific brackish conditions and migration patterns of cod, fisheries management is one of the few areas where member states has given the EU institutions full decision-making power via the Common Fisheries Policy (CFP). The governance of fisheries management is highly dependent on knowledge on the development of fish stocks as well as their interrelations and functions in the ecosystem. Here the International Council for the Exploration of the Sea (ICES) plays a key role. Efforts to include stakeholder participation on the regional level in fisheries include the formation of Regional Advisory Councils (RACs).

The ***shipping traffic*** in the Baltic Sea is estimated to be 15 per cent of the world's total cargo transports and ca 3500-5000 ships are sailing the Baltic Sea monthly, (Jalkanen and Stipa, 2008). The combination of this heavy shipping traffic and the characteristics of the Baltic ecosystem with brackish water, widespread archipelago

areas, comparably cold temperatures and icy conditions make the Baltic Sea especially sensitive to oil spills. In 2008, over 170 million tons of oil was transported. The volume of oil transported on the Baltic Sea has more than doubled during the last 10 years and are believed to increase further by 40 per cent until 2015. During the transportation, oil may be discharged into the sea *intentionally* or due to an *accident.* Each year 120 accidents occur on average, mostly due to grounding or collision and causing pollution in about seven per cent of the cases (Stankiewics and Vlasov, 2009). Even so, the level of shipping accidents has decreased, partly due to a land based monitoring system for ship traffic Automatic Identification System (AIS), which covers the entire Baltic Sea. The regulatory framework of maritime oil transportation can be characterized as a hierarchical structure of governance between global conventions, regional rules and procedures and national legislation (Hassler *et al.*, 2010).

Apart from oil spills, a wide range of ***hazardous chemicals*** and their transformation products still cause severe environmental risks in the Baltic Sea and chemical pollution constitutes a largely uncharted threat to the Baltic Sea. Problems connected with chemical pollution have become acute in the Baltic Sea the last decades. In spite of decreasing environmental concentrations of several chemicals, in particular some persistent organic pollutants such as PCBs, and linked indications of improving health status of some top predators, the latest HELCOM integrated thematic assessment of hazardous substances in the Baltic Sea concludes that almost all assessed open sea and coastal areas have an environmental status implying "*Baltic Sea with life disturbed by hazardous substances"* (HELCOM, 2010b). Regarding in particular new and emerging chemical contaminants, very little information is available on sources, environmental concentrations and environmental risks.

However, also DDT, PCBs, dioxins and other old contaminants are still found in elevated concentrations in the Baltic ecosystem and the causes and sources of many of these are still not sufficiently known. Further, many harmful substances have been detected in Baltic Sea biota like chlorinated terpenes, halogenated paraffins, polyaromatic hydrocarbons (PAH) and chlorinated pesticides, such as chlordane and dieldrin (HELCOM, 2010b). Moreover, the levels of some substances are so high that

for example responsible Swedish authorities recommended women in fertile age, with respect to health risks for their children, to be very restrictive in their consumption of some fatty fish species such as salmon and herring (SNFA, 2008). Thus, there are still challenges connected with the governance of health and environmental risks posed by chemicals.

There are numerous global agreements regarding hazardous substances, however in the Baltic, EU authorities and directives are at the centre of the regulatory framework, such as the REACH Directive (Registration, Evaluation, Authorization and restriction of CHemical substances) that aims to address the complexity and controversy within the regulatory framework of chemicals (Udovyk *et al.*, 2010).

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