

Legal Regulation, Resilience and the Complexity of the Eutrophication in the Baltic Sea Region

Brita Bohman¹

(Faculty of Law, Stockholm University)

ABSTRACT:

In this paper I discuss the advantages and disadvantages of applying the concept of *resilience in social-ecological systems* to law, in particular to the legal regulations on eutrophication. The purpose is to review and present some perspectives regarding to what extent and in what ways such a concept could change our understanding of how to control and reduce eutrophication – which thus also have implications for the legal methods and measures needed to adapt to continuous environmental change – as well as discuss the potential conflicts with the inherent features of the rule of law. To accomplish a good environmental status and sustainable development regarding complex environmental problems in any ecosystem, these perspectives on the legal analysis will help to understand what role law should play in environmental governance.

[Acknowledgements: This paper was presented at the International Conference “Climate Change, Economy, Law and Society – Interactions in the Baltic Sea Region, 2012” in Szczecin, Poland 28-30 May 2012. It is written within the work of a PhD project on the subject *Transboundary Pollution Control in the Baltic Sea Area*, pursued at the Faculty of Law of Stockholm University, Sweden, since September 2010. The project is financed as part of a transdisciplinary research program called the Baltic Ecosystem Adaptive Management (BEAM), <http://www.smf.su.se/beam>]

1. Introduction

The ecosystem composition and structure of the Baltic Sea is continuously changing because of over-fishing, toxics and other human induced pressures, but not least also in the light of the climate change. The ecosystem of the Baltic Sea is as an effect increasingly threatened. One main cause is the continuous and quite heavy load of nutrients that are being discharged from all the surrounding drainage areas as a result of human activities. This load is likely pushing the Baltic Sea ecosystem towards new tipping-points that ultimately can create fundamental changes to the ecosystem functions of the Baltic Sea (inter alia; Elmgren 1989 and Österblom et al. 2007).

For the regulation of eutrophic substances and run-offs in the Baltic Sea area we find today a net of ambitious legal frameworks and policy documents. However, conflicting interests in perspectives on governance and the role of law, lack of knowledge on how to reduce the run-offs through regulation, in combination with a lack in compliance control mechanisms, have made effective implementation and the enhancement of measures difficult to achieve.

Together the regulatory frameworks for the protection of the Baltic Sea environment create a ground for the work towards a more sustainable and resilient marine environment in the Baltic Sea region. They all call for a more integrated regulatory approach and contain ambitious aims and objectives in achieving *good environmental and ecological status* and in embracing the so called *ecosystem approach*. *The Marine Strategy Framework Directive* (Directive 2008/56/EC) (the MSFD) in combination with the *Water Framework Directive* (Directive 2000/60/EC) (the WFD),

¹ Brita Bohman is a Doctoral Candidate in Environmental law at the Faculty of Law, Stockholm University, brita.bohman@juridicum.su.se

and the *Baltic Sea Action Plan*² (the BSAP) - which was adopted by the parties under the *Helsinki Convention*³ in year 2007- also provide new incentives and ways to integrate the work done through measures in all of the Baltic Sea coastal countries. However, the gravity and complexity of the problems and threats remaining imply a need to enhance and further specify the measures. These rather new regulatory frameworks are also a result of this increased urgency to take further measures.

While these regulations are including aims and at least some apparent tools for a more dynamic approach to legal regulation of environmental and ecosystem governance, one fundamental question still is how to accomplish that. The strategies and concepts discussed within scientific research on governance of *complex environmental problems* and especially within the research on *resilience in social-ecological systems* (first presented in Gunderson and Holling 2002 and Berkes and Folke 1998) are poorly elaborated on within legal research. As a result we know little about what legal mechanisms or tools that are compatible and best contributing to effective and dynamic environmental governance, or how this can be combined with the other roles of law, such as compliance control, institutional stability and rule of law. The purpose of this paper is therefore to review and present on a general level, some perspectives on how the concept of governance of resilience in social-ecological systems could contribute to and change our understanding of how to legally control and reduce *eutrophication*. Thus why we should elaborate and explore the meaning of social-ecological resilience in a legal context. It lies within the reign of environmental law itself to include knowledge and information from other disciplines in the legal analyse. A new understanding of the regulatory frameworks for the Baltic Sea from a resilience perspective, and the kind of legal approaches it could imply, will also bring light on the implementation of the regional regulatory frameworks for the Baltic Sea.

2. The Concept of Resilience in Social-Ecological Systems

The Resilience Concept

The concept of resilience thinking was originally developed by ecologists as a theory to describe mainly the complex changes and interactions of ecological dynamics (Levin 1998). Resilience in this context is the ability of a system to endure or absorb disturbances and external shocks, in a way that makes it possible for the system to still maintain its particular dynamics and structure. The structures needed for the system to retain its basic functions, to be able to continue to develop and to keep producing ecosystem services (On the concept of Social-Ecological Resilience see for example; Berkes and Folke 1998, Biermann et al. 2012, Carpenter 2009, Duit et al. 2010, Folke et al. 2002, Folke 2003, Folke 2006, Folke et al. 2010, Gunderson and Holling 2002, Scheffer et al. 2001).

Within resilience research the threats to the resilience of a system is usually discussed in terms of threshold effects and tipping points. It is found that ecosystems can appear to be stable and endure continuous pressure – as in the Baltic Sea, stand a large input of discharges over a long period of time – but then suddenly as a result show very rapid and irreversible changes to its dynamics i.e. the system is considered to flip and go into a regime shift (see for example Österblom et al. 2007). When this happens we cannot know what the new regime will entail. It will also, due to the inter-

² Adopted by the parties to the Helsinki Convention, at the HELCOM Ministerial Meeting on 15 November 2007 in Krakow, Poland.

³ The Convention on the Protection of the Marine Environment of the Baltic Sea Area, first signed in Helsinki in 1974 was revised and resigned in 1992 and then entered into force on the 17th of January 2000.

connectedness between all systems, affect the dynamics of the systems connected to it or being dependent on it. Thus a change in one system will cause a chain of shifts. Most likely it will affect the ecosystem services and hence could have severe effects also on the social systems, since the human social systems to such large extent are heavily dependent on all kinds of ecosystem services. To establish resilience and govern the ecosystems in a way that make them stable and productive, plenty of strategies has been researched and discussed. The essence of these governance strategies are focused on capacity to adapt and respond to the dynamic change, through either active or passive transformations. The strategies discussed hence mostly involve flexible mechanisms and open institutional frames that can adapt both to abrupt unexpected changes in prerequisites for governance, as well as through reassessing the measures taken continuously.

Social-Ecological Systems

The perspective of social-ecological resilience mirrors the complex relationship between the human social systems and the natural ecological systems, and the dynamic and constant changes that this interplay gives rise to and reflects (Berkes and Folke 1998). The resilience perspective entails that the ecological and social systems are nested and inter-connected, it focus inter alia on the fact that the impact of human activities on the ecological systems are significant. Hence this human impact cannot be disregarded in discussing ecological change, governance and management strategies. The human impact is today integrated into the biosphere, thus there are more or less no pristine and untouched areas of nature left, rather, all ecosystems are shaped by human impact. The amount of people on earth makes it impossible, or at least, meaningless to regard the ecosystem dynamics without considering the impacts of human pressure on the ecosystem processes. They are complex interconnected social-ecological systems. Hence, the resilience concept includes aspects of geographical or demographical differences with consequences for the pressure put on the environment (Ellis and Ramankutty 2008, Turner et al. 2003). It is furthermore significant when discussing governance strategies according to the resilience concept, that the resilience concept can be applied on different levels of implementation or within different geographical or institutional scales, entailing somewhat different approaches (Bodin and Tengö 2012).

An important aspect when discussing the social-ecological resilience concept is that the social system perspective needs to be further acknowledged and elaborated. Since the social systems have such crucial part in the ecosystem governance, it is essential to understand and focus not only on how to govern the ecosystems but also on how to govern the social systems. The Social systems are also in some aspects showing similar unpredictable behavior as ecological systems if not governed well. In order to maintain basic social needs, in parallel to healthy and productive ecological systems. We need to learn more about how to establish institutional structures that will provide for both the social and the ecological sides of governance and how they are linked (See Adger 2000, Duit and Galaz 2008, Young 2011).

It is an increasingly noticed issue that social-ecological systems need both a stable base for trust-building and continuity in inter-actions within the social systems and at the same time provide for flexible governance of ecological systems (Duit et al. 2010). This entails the kind of structures that contain the prerequisites to follow and adapt to the natural and continuous changes, as well as with new knowledge on effective governance strategies. This can be accomplished through a multitude of institutions with flexibility in decision-making, as well as through self-organizing at small-scale level, where people can adhere to being directly in contact and dependent

on the ecosystem and its services (Duit and Galaz 2008: 321-322, Galaz et al. 2008). These kinds of institutional multitude and flexibility can though to some extent and at some levels be in conflict with the fundamental features needed for the governance of social systems, and thus also with rule of law and general legal principles. On small scale level it is even stated that law and legal regulation could be contra-productive (Galaz et al. 2008: 160), however, with new features and designs law can usually also manage to balance flexible mechanisms with rule of law (Ebbesson 2010).

The Role of Law for Social-Ecological Resilience

As a contrast to flexible governance for resilience of ecosystems, central ideas for governance of social systems are constitutional stability, liability, and legitimacy. Those main issues for social systems are also central in the role of law and the legal system, as features to be withheld by law. Some of the things that have been emphasized as representing societal resilience or at least stability in a social system are for example, clear institutional frameworks, institutional and political stability, social and economic welfare. As a main factor in social systems stands the traditional features of rule of law, which then provides for the features mentioned (Adger 2000, Ebbesson 2010). Stable institutional frames and rule of law could hamper and contradict the wish for flexibility and adaptability. However, these functions are still important to ensure compliance also within adaptive law. It points to the importance and urgency to strike a balance and find appropriate levels and ways to regulate. Except for withholding rule of law on a basic level, law will always have different functions and roles on different levels of implementation. In some aspects law has to be and is very detailed as well as practice strict compliance control. In others law is soft without strict control and increasingly common is legislation through framework legislation, not least within the EU. Soft law, common in international law, and framework regulations leaves much space for interpretation as well as on measures of implementation to the individual state. These kinds of regulatory instruments thus in a way also give room for flexibility for the states, although possibly at the cost of compliance control since not providing binding and clear regulations (see also Duit and Galaz 2008, Ebbesson 2010, Galaz et al. 2008).

I believe, as a consequence, that an aim to investigate what appropriate levels and ways to regulate implies that it is necessary with an evaluation of law in regards to environmental governance and resilience. For an evaluation of environmental law and the analyzing of legal regulations it would be necessary to extract some recurrent main points or principles of core value for resilience governance. Such principles could then provide guidance for what effective legislation has to embrace.

Against the background of what has been discussed here previously one main feature within these principles could be; flexibility and adaptability from knowledge based management, i.e. to have space for continuous assessments, adjustments, change of strategies and on-going reviews. Other significant features or principles for management would be to review institutional frameworks and organizations as well as incorporating mechanisms for trust-building. Those features have also been elaborated as principles for effective governance within theories on resilience management and are, among other aspects, point that would be interesting to assess from a legal point of view. These terms or principles are vaguely discussed within the resilience concept as regards how they could be implemented in practice, hence elaborating on this could be fruitful not only for the understanding of legal mechanisms and instruments but also for the further resilience research. In summary these main point of concern are principles to focus on as necessary for adaptive resilience governance that has to be investigated in a regulatory law perspective:

- Flexibility and transformability (Adaptivity),
- Multi-Level Governance,
- Institutional coordination and bridging organizations,
- Stakeholder participation,
- Trust-building (including monitoring and sanctions).

If these principles could be translated into legal terms and principles, they could create part of legal tools and structures, incorporating the prerequisites for legal regimes. As such, they could then provide structures and pathways towards legal mechanisms that embrace the kind of management that is creating good social-ecological resilience management. I thus believe that analyzing these terms or concepts further is the best way to understand how to accomplish the kind of matched governance structures and regulations, needed and called upon for effective environmental governance. To accomplish the kind of structures and regulations that has the features needed to completely comply and operate across scales in a resilience management way.

3. Laws for Environmental Governance

Environmental Law and Transdisciplinarity

Environmental law has gradually become its own discipline, with area-specific principles, norms and legislation techniques (Bodansky et al. 2007). Because of the nature and focus of environmental law and the dynamic problems it aims to solve, it also lies within the environmental law concept itself to include knowledge and information from other disciplines in the legal analyse. Environmental law has in addition developed in an era where also a multiplicity of norm-giving institutions and processes has arisen. Thus it has become a natural part of the discipline of environmental law to have a wide concept of acknowledged sources of law. Instead of holding on to more traditional or dogmatic approaches it is necessary to be open to other and possibly more flexible concepts of law. In this the multiplicity of principles, norms and concepts could play a part (Sadeleer 2002 generally, Bodansky et al. 200: 21).

Relevant information for the understanding of a legal concept can be found elsewhere than within traditional legal disciplines. The discipline of environmental law does thus in itself provide a natural opening to transdisciplinary research and to integrate new theories and perspectives in the approaches to the protection of ecosystems. Within environmental law today it is largely acknowledged that the legal approach to environmental issues also has to be holistic with the perspective on the dynamic and interlinked nature of the environmental problems. (Bodansky et al. 2007, Tarlock 2007).

Legal Protection of Ecosystems and Resilience

It is not a new thing for law to protect ecosystems. However, as the view of ecosystems and how to govern them has changed, then so have also the legal approaches. The main aim of environmental law, to protect nature and ecosystems, makes it a natural consequence that environmental legal methods should be adapted with new scientific approaches to governance in its ambitions to do so (Tarlock 2007). The resilience concept provides a dynamic approach to the continuous environmental

change, furthermore it lies within this concept also to acknowledge the impact and role that social systems have.

In our efforts to narrow and enhance measures in environmental law in general, it is important to find a way to match legal measures and mechanisms with the environmental problem in addition to the inclusion of the most accurate scientific theories on environmental governance. If we succeed in the ambitions to do this, then we will also know what legal tools that are needed and which will be most effective. The concept of resilience in social-ecological systems, for managing environmental problems and governing ecosystems are well developed theories that could provide a good base.

As mentioned above, the resilience theories furthermore have a holistic and broad system approach, this includes such as aspects of geographical or demographical differences with consequences for the environment and the distribution or intensity of run-offs, as well as an approach that aims to grasp also the unforeseen changes. As these theories emphasize the importance of scales and acknowledge a differentiation between different levels of governance, this makes them compatible with general legal approaches. Law could also be seen as a multi-level layered and inter-connected system, with different roles and functions depending on where it is applied. The resilience concept also acknowledges that one system is connected to others and part of a bigger whole, in the end to the entire earth-system. In addition, significant in this context, is that it also includes the view that the dynamics and the interplay relevant is not only that within the ecosystem, but also within the social systems and not least in-between the social and ecological systems. Thus, issues on governance of social systems, including legal governance, are important and fundamental issues. (Inter alia; Adger et al. 2005, Bodin and Tengö 2012, Duit et al. 2010, Folke et al. 2010, Galaz et al. 2008, Young 2011).

Traditionally it has been assumed that the components of an ecosystem could be managed individually and independently. That it is possible to find an optimal balance between supply and demand for each component, and that other attributes to the system stays more or less constant over time. However instead it has been shown that ecological systems are extremely dynamic. This also relates to concepts of sustainability and the challenge of servicing current system demands without eroding the potential to meet future needs. (Walker et al. 2006: 9-10). Law could have a significant role in steering towards resilience in social-ecological systems, as a driver through adaptive legal management. Well-designed legal approaches could create space for resilience structures while still maintain basic features for law and compliance. Thus help the development of resilience strategies in environmental governance. The resilience perspective would also introduce new aspects of the environmental problems and how to approach them in terms of legal regulation, and thus at the same time take legal thinking, environmental law and its applications further. One shift in focus is already starting to take shape in the emerging efforts to base law on the ecosystem prerequisites. Such approaches are accepting that the ecosystems have to set the conditions and limits for the kind of measures or management strategies necessary, rather than administrative or institutional structures. Furthermore it challenges, or perhaps supplements, our view of sustainability and the actions taken to accomplish sustainable development.

4. Legal Protection of the Baltic Sea Environment

The Regulatory Frameworks

The continuous amounts of discharges have a particular severe effect on the Baltic Sea as it is a semi-enclosed sea with little inflow. The ecosystem and the dynamics of the Baltic Sea are also particularly sensitive due to the complex and quite unique composition that the brackish water imposes. As the sea is also divided into different areas or basins that affects the water flow, this entails that the discharges from certain areas end up concentrated in quite specific areas (HELCOM 2010:2).

There are a large number of legal regulations applicable on activities regarding, or related to, the environment of the Baltic Sea and the eutrophication. They all in some ways contain aims for a dynamic approach to regulation and protection of the ecosystem. The most significant regulatory frameworks are the Helsinki Convention and the BSAP and the EU WFD and the MSFD. The Baltic Sea was also appointed a Particularly Sensitive Sea Area (PSSA), by the International Maritime Organization (IMO) in year 2005. This is appointed to sea areas that are especially vulnerable and hence need special protection. This affects the vessel traffic but unfortunately not any other kind of dangers to the Sea (IMO Resolution A.982(24) 2005).

While the Helsinki Convention and its action plan are adopted by all the coastal states in the Baltic Sea region and the EU, the directives are only binding on those coastal states that are members of the EU, i.e. all coastal states except the Russian Federation. These are relatively new regulations with ambitious goals of achieving good environmental and ecological status and they have adopted the ecosystem approach. The WFD and the MSFD also indirectly includes measures taken in other directives regulating eutrophic substances, such as the Nitrate Directive (Directive 91/676/EEC) (the ND) and the Waste Water Treatment Directive (Directive 91/271/EEC) (the WWTD) and thus have a broad scope on land-based activities. The MSFD and the WFD furthermore relate to each other insofar that they are complementary in scope and partly overlap. While the WFD primarily is focused on land-based activities and inland waters (see articles 1 and 2), the MSFD concerns the marine waters (see articles 2 and 3). Though, the MSFD still refers also to the measure in the WFD since the marine environment to large extent is a result of land-based activities. About 75% of the nitrogen load and at least 95% of the phosphorus load enter the Baltic Sea via rivers or as direct waterborne discharges (HELCOM 2007).

The Helsinki Convention was the first common regulation for the Baltic Sea, and has been regulating the protection of the Baltic Sea environment since 1974.⁴ The Convention provisions are binding on all parties but it has been debated whether the recommendations issued by the Helsinki Commission (HELCOM) are to be considered as binding or not. The Convention promotes principles that attempt to grasp both adaptability⁵ and precautionary approaches (the Precautionary Principle and the Polluter Pays Principle are found in article 3(2) and 3(4) respectively) but also leaves considerable space for the parties to make their own interpretations. Hence, although it has been regarded as a modern forerunner and a good example of environmental regulation, both the agreement from 1974 and the one signed in 1992 have been lacking in implementation and compliance control (see for example Ebbesson 2000: 38). Despite that the measures taken within the Convention aspires to be knowledge based and that it includes these important environmental law principles, it has not

⁴ The Helsinki Convention for the Protection of the Baltic Sea Environment was first signed in 1974, but later revised. The new and current version was signed in 1992.

⁵ The Principles of using Best Available Technique and Best Environmental Practices, found in article 3(3) of the 1992 Helsinki Convention, could be seen as examples of a formalized adaptability.

quite been able to meet the dynamic conditions that the complex ecosystem of the Baltic Sea demands.

While lacking in competence to review compliance, the most significant contribution by HELCOM has been to provide a base of science and technological knowledge on which new recommendations to the parties have been issued (see HELCOM 1999 Rules of Procedure and article 20 of the Convention). The Helsinki Convention together with the new efforts taken by the coastal states with the adoption of the BSAP and not least in the regulations found in the EU directives however opens up for new approaches. The adoption of the Helsinki Convention by the EU also creates new possibilities for defining and narrow interpretation of its provisions. The nest of regulations and the mixture regulatory regimes that the addition of the EU and its directives add to the picture, also provide significant and new possibilities (See for example Ebbesson 2007).

Coherence and Integration of Measures

The BSAP were developed to match the MSFD in terms of objectives and design (HELCOM 2010:1). The BSAP in combination with the MSFD creates a new basis and more focused foundation for integrated cooperation and implementation of measures, as well as a focus on ecosystem based management strategies. The aim is good environmental and ecological status. To accomplish this the member states are according to MSFD, to follow a set timetable for the implementation of measures (article 5). The MSFD was established to increase the coherence between different instruments. It emphasizes that member states should cooperate within the region and integrate the measures taken, also by cooperating with other states and non-EU countries within the marine region and concentrate the work to regional organizations (Articles 1(4), 2(1) and 6(1)). It is stated that the parties should develop a program of measures designed to achieve or maintain good environmental status (articles 1 and 5). They should also further their measures already taken on, in relation to what is deemed to be necessary. This is evaluated against assessments made by the coastal states in accordance with the BSAP and the MSFD, to evaluate the water status in relation to the quality assessment goals set up in the annexes to the MSFD and the BSAP. The BSAP in addition contains set maximum targets for each country as regards eutrophic substances. From these assessments and the targets set it is clear that it will take a lot of effort to reach the goal of good environmental and ecological status to have minimized human-induced eutrophication (HELCOM 2012).

The design and interplay of these frameworks shows an attempt to flexible and open regulation. It is a combination of central regional regulations that still to a large extent is decentralized leaving space for each state to make the assessment of what is effective and necessary in terms of measures. MSFD then as mentioned also refers back to measures within the WFD. The WFD is also aiming at flexible and decentralized regulation and measures insofar that its framework design leaves a great space for individual estimations done by the state and contains structures for regulations specified by each drainage area. Bothe the MSFD and the WFD are ambitious attempt to have flexible regulation with focus on ecosystem. The WFD has however also been criticized for being too complex for effective implementation and for not being as flexible and adaptive as it aims to be (see for example Lee 2009).

Dynamic approaches for regulation of the Baltic Sea

It might be questionable whether the aims of the regulations for the Baltic Sea will be accomplished by a fragmented approach. An approach in which, due to the

territorial division, measures are only taken within each state. The loose regulations found in the framework structure of both the BSAP and the EU directives, as well as in the self-reporting compliance mechanism within HELCOM, leave a large portion of the estimations of what measures to take to the parties. The structure of especially the framework regulations is, as mentioned, possibly creating space for a kind of flexibility as called upon in the governance and resilience concepts.

The HELCOM system of issuing new recommendations as the technical and scientific knowledge develops is also an adaptive approach (The Helsinki Convention article 20). However, since neither the BSAP nor the HELCOM recommendations can be claimed to be directly binding they are still problematic from a legal point of view, as implementation is harder to enforce. These loose structures also make compliance control more difficult and thus create obstacles for trust-building in the region, which then might also restrain the wish by the parties to take extra measures. Compliance control and liability in this sense are important both for the rule of law, fundamental features of the social system structures, and not least for guaranteeing effectiveness of measures, as well as for the concept of resilience. It lies within this leeway of taking measures and interpreting the regulations also an open question as to what are actually effective and appropriate measures on this level.

The net of regulations could be seen as part in the institutional multitude that is claimed to provide conditions for flexible and adaptive management for resilience, however there is also a risk of uncertainty in regard to what rules to follow. For example EU directives and the Helsinki Convention to some extent have different demands maximum on discharges levels regarding eutrophic substances. This might end up with states choosing the easier way, higher allowed discharges, instead of going further in their efforts to abate pollution. At least this was the situation in 2003 (see HELCOM 2003).

This net of regulations and regulatory regimes also contradicts the need for clear institutional frames and leadership, which has also been proposed as important aspects for social systems within the resilience research (Galaz et al. 2008). Not least do this nested mix of regulations and the regional level of implementation risk a fragmented approach if not carefully assessed. It is important to find a regulatory approach that can bridge the territorial and sovereign division created by international law, so that the measures taken all together is the best possible from a governance perspective (See also Ebbesson 2010). In this aspect the EU can have an important part with its supranational regimen, but also HELCOM could play a more significant role in this aspect.

The Ecosystem Approach

The ecosystem approach is an acknowledged concept within the regulatory frameworks for the Baltic Sea that is significant when discussing legal regulations and resilience. This approach is included in the provisions of all the legal frameworks. The ecosystem approach has primarily been developed within the regime of the Convention on Biological Diversity (CBD) (CBD 2000, CBD 2004). To large extent it corresponds to the main principles of resilience governance strategies, and thus the resilience concept could possibly help implement and interpret the implementation of the ecosystem approach (Österblom et al. 2010).

The CBD operational guide and the so called Malawi Principles (CBD 2004) states a number of principles for governance according to the ecosystem approach which are similar to the resilience concept, and to the principles for resilience management identified above (in section 2.3). Some principles worth mentioning here are; multi-level stakeholder participation bridging society inequities; and providing

public participation in decision-making; furthermore it is stated that regulation and decision-making should be handled on the lowest suitable level, which is effective and more flexible to specific ecological conditions; careful environmental assessments and technical expertise – feedback systems – should be implemented. As a principle for ecosystem approach is also stated that conservation of ecosystem structures and functions should be pursued in order to maintain ecosystem services. In addition the importance of implementation according to spatial and temporal scales is mentioned – managing large marine areas may require new institutional mechanisms to engage stakeholders across administrative border and different levels of administration. Furthermore, long-term perspectives; acknowledging continuous and inevitable change through implementing adaptive governance; considering all kind of relevant knowledge and information relevant, are clearly similar to the resilience concept. Even though the principles adopted within the CBD are not directly transferable to other regulations, they do bring some light on what this approach entail, and can provide guidance on how the Baltic Sea Frameworks should be implemented.

The ecosystem approach thus signifies a view on management that takes the ecosystem, its functions and dynamics, as stepping stone for regulation. An approach where the state of the ecosystem itself is used as indicator by which the measures and actions needed for proper management is identified. It is challenging not least from a legal point of view, since it necessitates a broad knowledge base, deep and systematic understanding of the environment and the ability to address complex environmental problems in a new way. It includes a question on how to adopt this dynamic approach within the more rigid structures. Hence, an elaboration and analyse of the interpretation of the resilience concept for the legal sphere of regulation, would also enlighten our understanding of the ecosystem approach.

The importance of this approach should also be seen in contrast to the earlier forms legislation regulating each sector separately. Although this concept started to take shape already at the time of the Stockholm Conference on the Human Environment in 1972 (the Stockholm Conference) there is still no universal definition. However, the parties to the CBD have agreed on the most elaborate formulations of the concept. They have agreed that the ecosystem approach “...is a strategy for the integrated management of land, water and living resources, promoting conservation and sustainable use in an equitable way...” (CBD 2000).

The Helsinki Convention has also endorsed the ecosystem approach in 2003 at the joint HELCOM/OSPAR Ministerial Meeting. The BSAP is the most significant step within HELCOM towards a legal instrument permeated by the ecosystem approach. HELCOM has also developed its own definition of ecosystem approach:

“The comprehensive integrated management of human activities based on the best available scientific knowledge about the ecosystem and its dynamics, in order to identify and take action on influences which are critical to the health of marine ecosystems, thereby achieving sustainable use of ecosystem goods and services and maintenance of ecosystem integrity.”

(http://www.helcom.fi/projects/on_going/details/ecoqo/en_GB/definitions[November 2011]).

Although challenging, this concept is vital for the development of environmental marine management and thus the environmental legal frameworks. It is vital as it provides a base for legal frameworks with adaptive mechanisms that can meet the kind of complexity that the environmental problems of the Baltic Sea represent, and bridge administrative and territorial boundaries. However one major challenge is how legal mechanisms can be adaptive without compromising effectiveness and compliance. This is also the most significant step towards a less static way of regulating ecosystem concerns, that traditionally might be seen as the reason why environmental law generally has not been able to match environmental or ecological complexity. To a large

extent this approach is similar to and invokes a great deal of the principles that could be extracted from the social-ecological resilience concept. Thus this could be seen as tool to go further in extracting the resilience perspective and applying it to the legal frameworks protecting the Baltic Sea.

Evaluation of Measures and Scales for Implementation

These relatively new regulatory frameworks for the Baltic Sea have the aims of achieving good environmental and ecological status and to have minimised human-induced eutrophication (BSAP Eutrophication Segment and the MSFD article 1). In the efforts that they give rise to, as an attempt to take the measures for successful environmental governance further, we also come across the question how to implement these effectively. The concepts and different principles found within these regulatory frames do to a large extent seem to aim at flexible and adaptable management and hence provide the prerequisites for legal enforcement of the structures presented within the concept of social-ecological resilience. However, as discussed previously there are inherent conflicts here in the role of law in this context. Furthermore and even more significant is that there has been little research on these concepts in terms of legal regulation and how to operationalize them into concrete practices. In relation to this, we need to analyse whether the legal mechanisms and measures suggested in these regulations are fit to accomplish the aims. There is furthermore a need to discuss spatial and temporal scales also in relation to legal regulations and implementation, to evaluate whether the regulations found are also implemented in a way that where the institutional levels are fit to the environmental problem.

The complexity and nest of legal regimes and rules could be beneficial when it comes to strengthening the legal conditions and in providing flexibility, in terms of institutional multitude and openness. However these regulations also risk to be contradicting and contribute to a general confusion on what measures that should or have been adopted etc. Furthermore, the nest of regulations might also be ineffective since some of the most significant aspects for the abatement of the eutrophication might still be regulated in other set of regulations that have other aims. For example is a large part of the agriculture, and hence the use of nutrients, regulated within the EU Common Agricultural Policy (CAP), that does not primarily aim at environmental health (See for example Markus et al. 2011: 61). Although the MSFD partly aims at create coherence between these kinds of shattered regulations, it needs to be faced, as it will be a huge task to accomplish. In general it seems important to straighten out what parts the different pieces of law and regulation plays in this setting and not least to view the interplay in-between national, international and supranational laws. This is important to be able to match the scales of environmental governance on different levels and find out how to create the kind of flexible and adaptive measures that the resilience concept imply. In this process the resilience perspective could provide guidance as to what is the primary ecosystem functions and dynamics, setting the prerequisites.

The Baltic Sea environment is as mentioned under enormous pressure, it is increasingly threatened. According to the scientific research, the Baltic Sea could be considered to already have shifted ecological regimes a couple of times and at least once then turned into a new state of resilience, i.e. gone through a true regime shift. It is argued that these ecological shifts in the Baltic Sea are a consequence of human impact and activities. The main regime shift is that it has gone from an oligotrophic to a eutrophic state, a state that is presumably maintained partly by continued high anthropogenic nutrient loads (Österblom et al. 2007). Such knowledge might also have to change our regulatory aims, the ultimate aim of environmental governance can no

longer be balanced or pristine ecosystems, since such systems might not be definable. To accomplish the goals set in the legal frameworks for regulating the eutrophication in the Baltic Sea, it could be a good tool to apply these perspectives to the legal analysis. This would be a way to better understand and perceive what legal mechanisms that is effective and compatible with the ecological and social prerequisites. It would also likely be a way to evaluate whether the existing legal frameworks owns the legal tools that are needed for effective ecosystem governance in the Baltic Sea regarding the eutrophication. Instead of just imposing on the states to take the measures that are deemed to be appropriate, legal measures or mechanisms necessary could then be reviewed in the light of the latest scientific ecosystem management approaches as suggested. It would be a way of assessing the potential of the legal instruments at hand and a possibility to create or at least create room for more specified legal mechanisms and measures.

5. Conclusions

It is important to bridge the transboundary differences in the regulations of eutrophic substances in the Baltic Sea region since it is important to act from the perspective of the whole Baltic Sea as one ecological system and hence take unified measures in abating the problems. Here law has a fundamental role, since international law builds on cooperation and the creation of common norms between sovereign states, and since the foundations of environmental law to have a wide concept of what signifies sources of law, i.e. to be open to other and possibly more flexible concepts of law. In this the multiplicity of principles, norms and concepts could play a part.

To accomplish the goals set in the legal frameworks for regulating the eutrophication in the Baltic Sea, it could be a good tool to apply the perspectives of the concept of social-ecological resilience to the legal analysis. This would be a way to better understand and perceive what legal mechanisms that is effective and compatible with the ecological and social prerequisites. It would also likely be a way to evaluate whether the existing legal frameworks owns the legal tools that are needed for effective ecosystem governance in the Baltic Sea regarding the eutrophication. Instead of just imposing on the states to take the measures that are deemed to be appropriate, legal measures or mechanisms necessary could then be reviewed in the light of the latest scientific ecosystem management approaches as suggested. It would be a way of assessing the potential of the legal instruments at hand and a possibility to create or at least create room for more specified legal mechanisms and measures. By linking these environmental regulations to the concept and frames of resilience thinking we will have a more concrete frames and references for interpretation and implementation. In addition researching and elaborating these ideas and terms within a legal context would also take the concept of resilience further.

It is important to analyze the legal frames all the way top down from a regional level to find the balance between stability, adaptability and flexibility within different scales and at different levels. From such approach we could properly evaluate the regulations and the regional agreements all the way down the local implementation. Thus find out if these regulations manage to leave appropriate space for local and national collaboration, creativity and flexibility that signifies adaptable environmental governance and the resilience concept. Law at a regional level, if well designed could also function as an activator for change in the region. Legislation needed for resilience management also have to create space for self-organization processes (Galaz et al. 2008: 179), which is typically provided by international law. However, well-designed regional frameworks also have to entail mechanisms for transformations and steering towards certain measures and management as well as entail mechanisms that can

review compliance. This would require a nested and adaptive and complex institutional structure connected to the ecological processes. A structure that manage to operate across temporal and spatial scales. It could also be valuable to make these kinds of assessments to not risk having unclear regulations that could make a complex environmental problem more difficult to abate.

The legal frameworks applicable to the Baltic Sea include prerequisites for a dynamic regulatory approach. It is also urgently called for enhanced and more effective measures to establish a better environmental and ecological status in the Baltic Sea, to come to terms with the eutrophication. All the legal instruments constitute their achievements of their aims on the environmental quality of the marine waters, and thus prescribing ways to assess and include the status of the marine ecosystem in the legal measures. In addition, as previously mentioned, they all also emphasise the need to include the ecosystem approach in the implementation of these regulations and legal measures. This implies measures that link the resilience concept to legal regulation. However, it still not investigated how to implement these concepts in relation to compliance mechanisms that can guarantee effectiveness and coherence with general principles of the rule of law. We do not know what the resilience management strategies would imply in terms of legal mechanisms and concrete measures. A crucial issue to elaborate is how to accomplish an appropriate balance between all these demands for flexibility with the other roles of law, generally interpreted as need for stability, liability, foreseeability, clear institutional structures and effectiveness.

Just as the resilience concept can be applied and have different roles on different levels, law is also divided and applicable differently on different levels. Thus legal regulations could perhaps represent or follow the scales of resilience management. Furthermore law could be significant in leading the way for active and intentional transformational change, adapted to the continuous ecological dynamic changes. In large scale decoupled social systems, that are not as immediately connected to or affected by the ecosystems or just lack the knowledge needed, law is needed at some level to direct towards environmental governance. Law can have a significant role in steering towards resilience in large-scale approaches.

The main focus within the governance theories and the resilience thinking is primarily on how to accomplish the most effective environmental governance. Within this also lies an ambition to create space for flexibility and adaptability within the system and one aspect of this is also to have a framework of a multitude of institutions and the freedom to self-organize on the local level. From this perspective law has a very double and somewhat conflicting role. Since law cannot only be strictly steering towards certain environmental goals but also has to strike a balance between the different parties concerned as well as within the institutional frames. Whatever legal measures taken, they have to be legitimate for all and it is also a purpose and task within rule of law to provide institutional stability as this is a basic prerequisite as well as a possibility to review compliance. Thus it is not only an important task to manage this combination of perspectives and theoretical frames, it is also a challenging one. However, if successful law can as such be a tool to over-come and bridge differences that could otherwise become an obstacle to effective measures and pollution-reductions.

The increasing complexity of environmental issues today in addition to the complexity of institutions and legal regimes, confronts the legal system with new challenges and opens up to other spheres of regulation. In the connection between social and ecological systems, law could play a vital role as a driver for change. This is though dependant on whether it is possible for law to meet the complexity and dynamics in the ecological system and still balance the demands that this implies with the general principles of law. The resilience concept implies that the regulations we set

up in the aim to manage a social-ecological system – in this case to accomplish good environmental status in the Baltic Sea – have to be able to adjust to dynamic changes. They as well as the legal mechanisms then have to be adaptive and flexible, open to change and new knowledge. However, in parallel they have to be in accordance with the rule of law and not neglect the parameters for social resilience. Against the backdrop of the main principles of the resilience concept presented above and the features of the legal frames, it seems as an urgent and natural path for environmental law to elaborate and explore how these principles would mean in practice when implementing legal tools and mechanisms.

Bibliography

- Adger N. W., Hughes T. P., Folke C., Carpenter S. R. and Rockström J. (2005), "Social-Ecological Resilience to Coastal Disasters", *Science*, 309: 1036-1039.
- Adger N. (2000), "Social and ecological Resilience: are they related?", *Progress in Human Geography* 3 (24): 347-364.
- Berkes F., Folke, C. (eds) (1998), *Linking Social and Ecological Systems: Management Practices and Social Mechanisms for Building Resilience*, Cambridge University Press, Cambridge.
- Biermann F., et al. (2012), "Navigating the Anthropocene: Improving Earth System Governance", *Policyforum, Science*, 335(6074): 1306-1307.
- Bodansky D., Brunnée J. and Hey E. (2007), "International Environmental Law: Mapping the Field", in: Bodansky D., Brunnée J. and Hey E. (eds.), *The Oxford Handbook of International Environmental Law*, Oxford University Press, New York.
- Bodin Ö., Tengö M. (2012), "Disentangling intangible social-ecological systems", *Global Environmental Change*, (article in press), accepted in 26 January 2012.
- Carpenter S. R., Folke C., Scheffer M., and Westley F. (2009), "Resilience: Accounting the Noncomputable", *Ecology and Society*, 14(1).
- Duit A., Galaz V. (2008), "Governance and Complexity – Emerging issues for Governance Theory", *Governance: An international Journal of Policy, Administration and Institutions*, 3(31): 311-325.
- Duit A., Galaz V., Eckerberg, K. and Ebbesson J. (2010), "Governance, Complexity and Resilience", *Global Environmental Change*, 20 : 363-368.
- Ebbesson J. (2010), "The Rule of Law in governance of complex socio-ecological changes", *Global Environmental Change* 20: 414-422.
- Ebbesson J. (2007), "Implementing and Enforcing the Baltic Sea Convention Through European Community Law", in: Führ M., Wahl R., and von Wilmowsky P., (eds), *Umweltrecht und Umweltwissenschaft - Festschrift für Eckard Rehlinger*, Schmidt Erich Verlag, Berlin.
- Ebbesson, J. (2000), "A Critical Assessment of the 1992 Baltic Sea Convention", *German Yearbook of International Law* 43: 38-64.
- Ellis E., Ramankutty N., (2008) "Putting people in the map: anthropogenic biomes of the world", *Frontiers in Ecology and the Environment*, 6(8): 439-447.
- Elmgren R. (1989), "Man's Impact on the Ecosystem of the Baltic Sea: Energy Flows Today and at the Turn of the Century", *Ambio*, 6(18): 326-332.
- Folke C., Carpenter S. R., Walker B., Scheffer M., Chapin T. and Rockström, J. (2010), "Resilience Thinking: Integrating Resilience, adaptability and Transformability", *Ecology and Society*, 4 (15): 20-28.
- Folke C. (2006), "Resilience: The emergence of a perspective for social-ecological systems analyses", *Global Environmental Change* 16: 253-267.
- Folke C., Colding J. and Berkes, F. (2003), "Synthesis: building resilience and adaptive capacity in social-ecological systems", in: Berkes F., Colding J. and Folke C.,(eds), *Navigating Social-Ecological Systems: Building resilience for complexity and change*, Cambridge University Press, Cambridge.
- Folke C., Carpenter S., Elmqvist T., Gunderson L. H., Holling C. S., and Walker B., (2002), "Resilience and Sustainable Development: Building Adaptive Capacity in a World of Transformations", *Ambio*, 5(31): 437-440.

- Galaz V., Olsson P., Hahn T., Folke C. and Svedin U. (2008), "Analytical Themes: The Problem of Fit among Biophysical Systems, Environmental and Resource Regimes, and Broader Governance Systems: Insights and Emerging Challenges", in: Young O.R., King L. K., and Schröder H., (eds.), *Institutions and Environmental Change - Principal Findings, Applications, and Research Frontiers*, the MIT Press, Cambridge
- Gunderson L. H. and Holling C. S., (eds.) (2002), *Panarchy: Understanding Transformations In Human And Natural Systems*, Island Press, Washington DC.
- Lee M., (2009), "Law and Governance of Water Protection Policy", in: Scott J., (ed.), *Environmental Protection: European Law and Governance*, Oxford University Press, Oxford.
- Levin S. A., (1998), "Ecosystems and the Biosphere as Complex Adaptive Systems", *Ecosystems* 1(5): 431-436.
- Markus T., Schlacke S. and Maier N., (2011), "Legal Implementation of Integrated Ocean Policies: The EU's Marine Strategy Framework Directive", *The Journal of Marine and Coastal Law*, 26: 59-90.
- Ostrom E. (2009), "A General Framework for Analyzing Sustainable of Social-Ecological Systems", *Science* 325: 419-422.
- Sadeleer N., (2002), *Environmental Principles – From Political Slogans to Legal Rules*, Oxford University Press, New York.
- Scheffer M., Carpenter S., Foley J. A., Folke C. and Walker B. (2001), "Catastrophic Shifts in Ecosystems", *Nature*, 413: 591-596.
- Seixas C.S., Berkes, F. (2003), "Dynamics of social-ecological changes in a lagoon fishery in southern Brazil", in: Berkes F., Colding J. and Folke C., (eds.), *Navigating Social-Ecological Systems: Building resilience for complexity and change*, Cambridge University Press, Cambridge.
- Tarlock D., (2007), "Ecosystems", in: Bodansky D., Brunnée J. and Hey E., (eds), *The Oxford Handbook of International Environmental Law*, Oxford University Press, New York.
- Turner B. L., et al. (2003) "Illustrating the coupled human-environment system for vulnerability analysis: Three case studies", *PNAS*, 14 (100): 8080-8085.
- Walker et al., (2009), "Policyforum; Looming Global-Scale Failures and Missing Institutions", *Science*, 325(5946): 1345-1346.
- Young O. R. (2011) "Effectiveness of international environmental regimes: Existing Knowledge, cutting-edge themes, and research strategies", *PNAS*, 50 (108): 19853-19860.
- Young O. R. (2010) "Institutional dynamics: Resilience, vulnerability and adaptation in environmental and resource regimes", *Global Environmental Change* 20: 378-385.
- Österblom H., et al. (2010), "Making the ecosystem a roach operational – Can regime shifts in ecological- and governance systems facilitate the transition?", *Marine Policy* 34: 1290-1299.
- Österblom H., Hansson S., Larsson U., Hjerne O., Wulff F., Elmgren R. and Folke C. (2007), "Human-Induced Trophic Cascades and Ecological Regime Shifts in the Baltic Sea", *Ecosystems* 10: 877-889.
- Walker B., Salt D. (2006), *Resilience Thinking - Sustainable ecosystems and people in a changing world*. Island Press, Washington DC.

Reports and other materials:

- the Parties to the Convention on Biological Diversity, May 2000, in Nairobi, Kenya, (CBD, COP 5) Decision V/6.
- CBD (2004), *The Ecosystem Approach - Operational and Implementation Guidelines*, Seventh Ordinary Meeting of the Conference of the Parties to the Convention on Biological Diversity, February 2004 in Kuala Lumpur, Malaysia, , (CBD COP 7), Decision VII/11.
- HELCOM (2012), *The Fifth Baltic Sea Pollution Load Compilation (PLC-5) – An Executive Summary*. Baltic Sea Environmental Proceedings, No. 128A.
- HELCOM (2010:1), Report; *Implementation of EU MSFD in the North Sea and the Baltic Sea – Role of the Marine Conventions HELCOM and OSPAR*, Supporting document of the 2010 HELCOM Ministerial Declaration.
- HELCOM (2010:2), *Ecosystem Health of the Baltic Sea 2003–2007: HELCOM Initial Holistic Assessment*, Baltic Sea Environmental Proceedings, No. 122.
- HELCOM (2007), *Overview; Towards a Baltic Sea Unaffected by Eutrophication*, Background document for the HELCOM Ministerial Meeting in Krakow, Poland, 15 November 2007 elaborated by the HELCOM Secretariat.

HELCOM (2003), Document 24/2003, *Compliance with the requirements of the Convention and HELCOM Recommendations*, HELCOM 24th Meeting, Bremen, Germany 2003.

HELCOM (1999), *Rules of Procedure* adopted by the Extraordinary Meeting on 7 September 1999; and revised by the 21st meeting of the Commission in 2000, by the 22nd meeting in 2001, by the 23rd meeting in 2002 and by the 29th meeting in 2008, at: http://www.helcom.fi/helcom/rules/en_GB/procedure/ [2012-07-06].

http://www.helcom.fi/projects/on_going/details/ecoqo/en_GB/definitions [2 November 2011]

IMO (2005) Resolution A.982(24) Revised guidelines for the identification and designation of Particularly Sensitive Sea Areas (PSSAs), adopted on 1 December 2005