The Governance of Fisheries Management in the Baltic Sea: Conflicting or Converging Knowledge Systems between Science, Fisheries and NGO's?

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> *Fish resources are part of our common heritage. Rules are necessary to prevent overfishing by some to the detriment of all.* (Common Fisheries Policy, European Commission)

1) Synopsis

The statement above centrally applies to one of the main ecological challenges for the governance of marine ecosystems like the fishing management in the Baltic Sea (BS). As the main responsible political actor for governing fisheries management in Europe, the European Commission (hereafter Commission) has established seven Regional Advisory Councils (RAC's), which are charged with providing (preferably consensus) advice to the Commission and consist to two thirds of members from the fishing industry and fishermen and one third of other NGO's including environmental ones (s. below).

All parties in the Baltic Sea RAC, founded in March 2006, are obliged to consider scientific data on fish stocks and the status and prognosis for the fisheries, which are

collected, organized and interpreted by scientists, from the International Council on the Exploration of the Seas (ICES) and national research agencies. As preliminary observations from workshops and RAC meetings as well as policy document analyses reveal, all parties involved – the scientists, the fishermen's communities and the NGO's – have contrasting objectives concerning the methods to assess fish stocks as well as to forecast the allowed amount of fishing for sustainable management in the Baltic Sea (BS). Both the negotiations between the three main institutional actors ICES, the BS RAC and the Commission as well as the RAC's internal discussions and reports often fail to reach consensus, as the reports on fishing quota for cod tellingly illustrate.[1]

The study, presented here, investigates the international governance arena for the fisheries management in the Baltic Sea from the perspectives of Science and Technology Studies (STS). Broadly speaking will explore the *role of science* within this international environmental governance regime by using different models from regime theory as well as concepts about the co-production of science and policy from STS. One focus is on investigating the communications and negotiations within and between three policy relevant domains: the advice, given by scientists, the BS RAC's discussions and its need to provide 'consensus' reports and the policy concerns of the Commission. The overall aim is to describe the social arena in which the policymaking processes take place and elucidate the factors that contribute to a successful or unsuccessful implementation of the scientific advices. The crucial question is *why* and *how* do the different stakeholders come to different, sometimes contradicting, opinions about how to establish a sustainable management of fisheries.

The study is part of a larger project, which entails two distinct objectives: In a first instance, it will perform a sociological investigation of the BS RAC or, more generally, of various stakeholders involved in the fisheries management in the Baltic Sea.[2] The

[1] Examples on negociations about different quotas concerning a) scientific advice, b) the BS RAC and c) the Commission e.g. on the TAC's (total amount of catch) for cod in the Baltic Sea will be presented in my talk.

[2] In a first instance the project focuses on the newly established participatory mechanism of stakeholder involvement through the BS RAC, founded in March 2006, as well as its interactions with ICES and the Commission. Over the course of the study attention will also be drawn to address the broader question whether such participatory mechanisms as the BS RAC are accepted by parties, that are not directly involved, e.g. other fishery actors and communities, affected or not affected citizens and other environmental groups etc.

focus of this study is on how the scientific data provided by e.g. the ICES is communicated, understood (valued & judged) and finally used by the different stakeholders involved. A second part of the project, which is beyond the scope of this paper, is concerned with strategies and methods that could be used to improve the understanding and communication of science among the RAC members and other parties to the process.[3]

The following paper outlines the background for the first study and poses a theoretical framework for analysing the role of scientific advice in the BS governance regimes on fisheries management.

2) The Problem of Sustainable Fisheries Managment in the Baltic Sea: The Case to Study

The Baltic Sea is an ecosystem in critical stress due to multiple sources and types of pollution, substantial fishing activity by all bordering states, and the unique characteristics of its physical structure – relatively shallow, constrained exchange with other seas, and brackish water composition. The ecological stress in this region only exacerbates the widespread and difficult problem of managing fishing in a sustainable fashion that has become a serious concern for environmental governance all over the world. According to the scientific estimations, fish stocks of some species like cod have declined near or below the level at which the species can reproduce fast enough to sustain itself and have hence fallen outside of safe biological limits.

In order to manage the common fishery resources for sustainability, the European Commission works through the Common Fisheries Policy (CFP) representing the fisheries policy of the European Union. It sets quotas for which member states are allowed to catch what amounts of each type of fish as well as encouraging the fishing industry by various market interventions. The CFP recently recognized the need for significant stakeholder participation in providing advice to the Commission in support of a successful outcome of the CFP. This has led to the establishment of seven Regional Advisory Councils (RAC's), which are charged with preparing and providing

[3] The entire project is entitled *Facilitating Governance of Baltic Seas Fisheries By Improving Communication Among Stakeholders* and designed to „identify obstacles and improve ways to communicate among stakeholders in the Baltic Sea Regional Advisory Council and its partner organizations in order to facilitate governance of the Baltic Sea Fisheries". It is funded from Baltic 2020 and coordinated by Ilan Chabay, Hasselblad Professor of Public Learning and Understanding of Science (PLUS) and Director of the Göteborg Center for PLUS.

advice to the Commission on behalf of the fisheries sector and other interest groups in its region of oversight. The BS RAC members, two thirds of it representing the fishing industry and fishermen and one third representing other interested non-governmental organizations, including environmental groups, are obliged to consider the scientific data on the status and prognosis for the fisheries in their deliberations. The data is collected, organized, and modelled by scientists from the ICES and national research agencies of the Baltic Member States. The scientists are observers to the RAC, but not members.

Out of their own experience and perspectives, coupled with the scientists' inputs, the RAC members should provide their advice to the European Commission in a consensus report, rather than disparate voices in order to have an influence in the decision-making process of the CFP (Motos & Wilson 2006). As we can see, this process results in mixed interpretations of the scientific data and advice due to different interests and knowledge backgrounds (s. below).

The Governance Arena for Fisheries Management in the Baltic Sea

This case study focuses on the development of environmental governance by exploring the role of science within the international regimes of fisheries management in the Baltic Sea. These regimes have been proven to be highly problematic and unsuccessfully implemented. To elucidate and eventually resolve the governance problems for the fisheries management, new research approaches are required that overcome disciplinary boundaries that so far narrow the various perspectives of fisheries management. Scholars from biology, economy and sociology have jointly addressed the need for broader approaches, because the "improvements in fisheries management will be realized not through the promotion of technical fixes but instead by embracing and responding to the complexity of the management problem" (Degnbol et al. 2006). Such calls for transdisciplinarity are accompanied by claims addressing the need for social science research: "Natural/physical science in the Baltic appears to be fairly well researched, but there is a feeling that it is at the expense of social sciences. Human dimension of fisheries should be taken more into consideration, as fish has been too much the focus over the past years."[4]

[4] Conclusions of the reflections on future research needs from the workshop „Baltic Fisheries Research"19-20 April 2007 Vilnius (Lithuania) concerning the question: How well does science address the fisheries problems (incl. ecological and socio- economic) in the Baltic Sea area? See:

The study outlined here will face this desideratum by examining how scientific data, expertise and recommendations are communicated, understood and used by the different stakeholders involved in fisheries management in the Baltic. This governance regime is established and understood as an interplay between the three main players: the ICES, providing scientific data and giving recommendations about the catch quotas for all fish species, the newly established BS RAC and the European Commission as the responsible political actor.

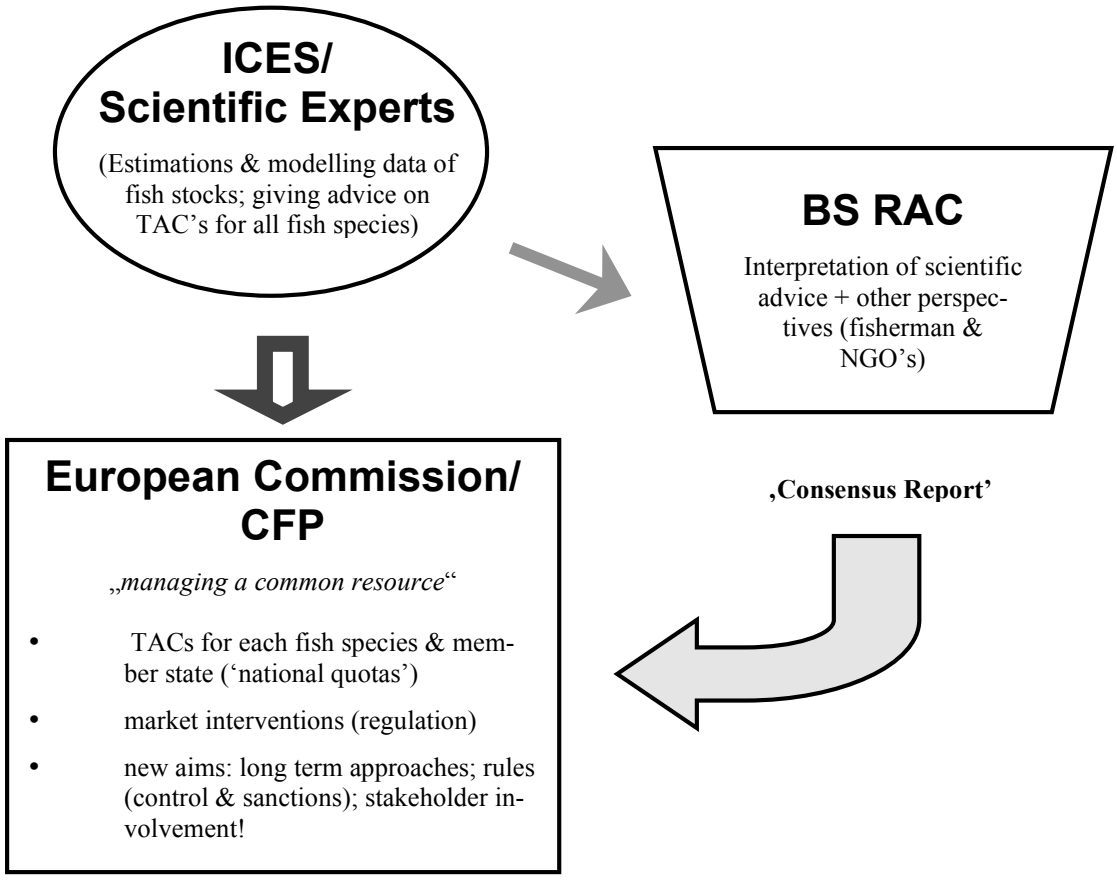

Figure 1: A simplistic model of the information flow within the decision-making processes between ICES, the BS RAC and the EC.

http://www.profetpolicy.info/index.php?option=com_docman&task=doc_download&gid=86 (assessed 21. January 2008).

3) Analysing International Environmental Regimes
(Theoretical & Methodological Perspectives)

The need for environmental regimes

Many of today's environmental problems are transboundary (e.g. air pollution, fishing management) or even global in their character (e.g. climate change & sustainability). They therefore demand some form of international governance. Due to reasons of economic compatibility, employment and other socio-economic issues, environmental problems often inhere a tension between requests to handle them as matters of international priority or as the responsibilities of national politics (Lidskog & Sundqvist 2007, 177). This has become very obvious and highly difficult to control in the case of governing fishing regimes worldwide.

Since the globalisation of environmental problems is constructed through social processes, it is necessary to elucidate *how* certain problems gain political priority (while others do not). Regarding the governance of fisheries regimes or even the environmental management seas in general, many people from inside and outside academia become increasingly concerned with the disjuncture between policy advice and the actual political processes. From a social science perspective it is of primary interest to explain the processes that result in certain representations of who is "in charge", who defines certain problem(s) and adjacent policy-agendas, who speaks, negotiates and finally decides about these issues within the whole process?[5] The task for the sociologist of science is to make visible and explain the contexts (material, social and historically) by which science gets – or fails to get – embedded in society (cf. Lidskog & Sundqvist 2002, 84). This task applies centrally to our modern 'knowledge societies' where science is given a pivotal role in both the knowledge production as well as in policy-making (for the concept of *co-production* see below). However, science does "not only function as an 'alarm bell' or a guarantee for discovering and diagnosing environmental problems – it also suggest solutions and often proposes ways of political action, either explicitly, where scientists consciously try to influence policy-making, or more implicit, by ways of diagnosing and measuring nature thus pointing to the directions of potential solutions" (Lidskog & Sundqvist 2007, 178).

[5] There is a twofold reason for this special problem with environmental cases: first, that the environment has no voice of its own, it is always represented by people and actors (sometimes in a literal sense as in the new Hollywood production *The 11th Hour* from Leonardo DiCaprio) and second, there is no direct access to recognize the ‚health of nature' for the normal citizen (cf. Lidskog & Sundqvist 2007, 177-8).

International Regimes are defined as offering "a forum for cooperation between independent states whose purpose is to ensure that these states do not act purely on the basis of national interests when it comes to transnational issues" (from Lidskog & Sundqvist 2007, 180; cf. Young 2004, 215).

Because of the restricted executive power and limits of using sanctions, international regimes are usually weak institutions and often not successfully implemented as the case of fisheries management illustrates. A growing concern has been to find out under what circumstances regimes are successful tools for international cooperation on environmental issues (Lidskog & Sundqvist 2002, 80).[6] The crucial question concerns the factors, which are responsible for 'regime effectiveness'.[7] Hisschemöller and Gupta define this effectiveness as "the capacity of the regime to solve the environmental problems it is meant to solve" (1999, 152).

A number of factors have been depicted as having impacts on regime effectiveness (in terms of goal attainment) like appropriate institutional and organisational forums, institutional capacity, the development of regimes in neighbouring fields, the development of transnational coalitions and the connection to broader social orders, i.e. the economic and political world order (Hisschemöller & Gupta 1999, 152; Lidskog & Sundqvist 2002, 80). Some researchers focus on the political 'power struggles' and argue that regime effectiveness increases if the issues get limited in scope, therefore recommending to create regimes, which focus on single issues (e.g. Young 1989). Other scholars emphasise the central role of 'consensual knowledge' within the formation and development of regimes (Haas 1992; for the concept of *epistemic communities* s. below).

The Role of Science in International Governance Regimes

In their article *The Role of Science in Environmental Regimes: The Case of LRTAP*, Lidskog and Sundqvist witness an ongoing "scientization of environmental policy" and note that "no valid action is possible without making science a partner" (2002,

[6] Cf. Bernauer, 1995; Hisschemöller & Gupta, 1999; Victor et al., 1998; Wettestad & Andresen, 1991; Young, 1999a.

[7] Young (1999b; see also Young 2004, Young & Levy 1999) points to the importance of the behavioural impact of a regime, activities that work in the right direction, even if they fall short of full compliance with a specific regulatory rule, protocols, etc., when evaluating its effectiveness. [taken from Lidskog & Sundqvist 2002] Young also points out the crucial importance of interactions: „the effectiveness of specific institutions often depends not only on their own features but also on their interactions with other institutions" (Young et al. 1999, 49; cf. Foreword in *Institutional Interaction in Global Environmental Governance*).

78). Despite the huge research-dependency of environmental problems, stated by many scholars, the authors also observe that many discussions on global environmental governance have not yet taken up this rather widespread standpoint.[8] According to Lidskog and Sundqvist, there exists a tension between those social theorists that emphasize the pivotal role, assigned to science, and those discussing how the international governance arena should be organized in order to deal with environmental problems effectively (ibid).

Following Lidskog and Sundqvist, three approaches can be discerned to perceive the role of science in international environmental governance regimes (Lidskog & Sundqvist 2002; 2007). In a first one, the 'institutional model', science is perceived to only change the external environment of the political negotiation processes, whilst in the second, scientific knowledge is seen as having a direct social impact and is able to change the attitudes of the actors involved (Lidskog & Sundqvist 2007, 184). Both approaches have been criticized for resting on a linear-model simplification about the role of science in policymaking processes. This leads to a third attempt, to explore the role of science with concepts from STS proposing a mutual understanding of science and policymaking.

Institutionalism and the interest-oriented approach

According to the interest-oriented perspective, the international political community consists of rational acting nation states, bargaining and trying to achieve their own interests. Regime analysts like Oran Young and Robert Keohane have focused on the actors, their interests and objectives as well as on how regimes should be organised in order to support cooperation among these actors. The role of science in this model is playing a minor role and seen as an external 'input': it well defines ecological vulnerably and gives advice and recommendations, but the negotiating process itself is formed by the self-interested nation states that operate according to pure cost-benefit calculations. The institutionalist approach thus implies that scientific knowledge has the limited but potentially important role of giving input to the political process, where nation states bargain for their own interests. The factual evidence, provided by science, however does according to this model not affect the attitudes or interests of

[8] Iibid, for example in Porter and Brown's *Global Environmental Politics* (1996), science is not included as a key actor in global environmental politics. The same is true of *Re-imagining Political Community* (Archibugi et al., 1998), edited by some of the most well-known spokesmen for cosmopolitan democracy.

the actors, only their evaluation of the environmental issues at stake (Lidskog & Sundqvist 2007, 183). According to Peter Haas, institutionalists have only minimal expectations about environmental cooperation since they "expect to find negotiated regimes whose substance merely reflect the measures tolerable to the least enthusiastic party" (Haas 1997, 196), a pattern that Arild Underdal has formulated as the "law of the least ambitious program" (Underdal 1982).

The Importance of 'Consensual Knowledge' - Epistemic Communities

The institutionalist or interest-oriented approach has been contrasted with the concept of epistemic communities by Peter Haas (Haas 1997, 195 ff). Haas argues, that institutionalists, like Young and Kehohane, "characterize institutional bargaining as the setting in which regimes are created and maintained through bargaining between several distinct types of actors including states and NGO's in an organisational context and subject to uncertainty about the costs and benefits of cooperation" (ibid, 196-7).

Instead of giving the primary importance to such 'power struggles' among self-interested actors like nation states, Haas argues for the importance of knowledge, most of all consensual knowledge, in the operation of international regimes. He sees scientific knowledge as stimulating the processes of social learning and affecting social identities as well as changing discourses. The role of science is thus not only to change the external environment for a state but also to work as a 'learning facilitator' and 'role definer' (Lidskog & Sundqvist 2007, 183). Environmental regimes are, according to Haas, not only driven "by state power, but by the application of scientific understanding about ecological systems to the management of environmental policy issues with which decision makers are unfamiliar" (Haas 1997, 200). Consensual and trusted knowledge has the power to shape the interests of actors and therefore becomes a necessity for successful environmental cooperation (Lidskog & Sundqvist 2007, 183). Haas introduced the concept of 'epistemic communities' as an analytical tool to investigate the role of science in the formation and development of regimes: An epistemic community is a "network of professionals with recognized expertise and competence in a particular domain and an authoritative claim to policy-relevant knowledge within that domain or issue-area" (Haas 1992, 3). The participants of an epistemic community could come from different disciplines/ areas but share a common body of knowledge and also values and policy (e.g. opinions how to enhance human welfare etc., cf. Lidskog & Sundqvist 2002, 82).

The main difference between the epistemic community concept and the institutional model is that in the latter, a regime is basically made up of the bargaining over interests between the involved actors while in the former, scientific knowledge is able to shape the attitudes of the actors involved in the regime. From the perspective of the epistemic community model, consensual knowledge could be applied directly in the policy process, while from the perspective of the institutional model it first has to be negotiated by political parties in order to reach needed compromises (Haas 1997, 206; cf. Lidskog & Sundqvist 2002, 82). Haas argues further that his approach gives a better understanding of how environmental regimes are shaped and work and provides better policy advice because: "…it is not a direct expression of underlying material interests and because it is more likely to be true than advice from other sources ...the knowledge claims are relatively non-biased and have passed a consensus test for truth (Haas 1997, 205-6).

Approaches from STS

The two previously described models leave us with a controversial view regarding the role of science in environmental regimes. Through Haas' criticisms on the institutionalist model, the role of science within the political processes of environmental regimes got contested. While the intstitutionalist model underemphasizes the role of science, Haas might overemphasize it by claiming it to be the driving force for successful policymaking (Haas 1989). The crucial question is still whether scientific knowledge is the most important factor for regime development or if it is only one factor among many others that play a role in the process (Lidskog & Sundqvist 2007, 184).

While both the approaches above have different objectives on this question, they can both be claimed of misunderstanding and simplifying the role of science in international regimes since they lean on an "unproblematic, almost positivistic view of science" (Lidskog & Sundqvist 2002, 83).[9] Institutionalists see science as unproblematic, coming from outside into the negotiation process, while the epistemic community approach claims a strong power of science in shaping the environmental policies. In

[9] See Hovden's (1999) critical examination of regime theory's view of environment, where he claims that it relies on positivistic epistemological assumptions, which to a significant degree explain its lack of critical analysis of environmental issues.

both cases however, science is separated from policy and seen as something produced external from existing political forces in the first place and only thereafter being communicated to the political community (ibid).

To get a more throughout understanding of the role of science in environmental regimes – like the LRTAP convention or the fishing management regime of the Baltic Sea – we have to draw attention to some important concepts from science and technology studies (STS).[10] As Lidskog and Sundqvist emphasize, the important task for the sociologist of science is therefore "to make visible and explain the social and material contexts which have been created in order to move science in society" (Lidskog & Sundqvist 2002, 84).

A number of findings from this discipline appear to be of particular relevance in order to elucidate the role of science in environmental regimes in a more decisive way than in the two previously described models. These findings emphasize the social context of science and relate to the fact that science never moves freely but is bound to the actors, which are involved. My study will focus on the concept that science and policy are always *co-produced*, and that the value of science is the result of negotiations (*boundary work*).

The first and most important idea from STS for the study presented here regards the finding that science and policy are shaping each other in an interdependent process of evolution, generally called the *Co-production of Science and Policy* (Jasanoff & Wynne 1998; cf. Wynne 1996; Jasanoff 1996; 2006). Co-production is functionally comparable to the concept of co-evolution and describes how two or more variables of a system affect and essentially create each other, albeit with respect to different variables operating at different scales. Research on the "co-production of natural and social order" focuses in particular on "…interpretative analyses of the framing of policy problems, the production of scientific claims, the standardization of science and the international diffusion of facts and artefacts" (Jasanoff & Wynne 1998, 74). By making and explicating visible these factors about the interplay of science and policymaking, co-production provides a more "textured and useful account of how scientific knowledge becomes (or fails to become) robust in policy contexts" (ibid).

[10] Since STS is a wide and often rather loosely defined discipline it might at times be more precise to refer to the Sociology of Scientific Knowledge (SSK) as Lidskog & Sundqvist 2002, 83 do: SSK is based on a constructivist understanding of science and has since the early 1970s been devoted to gaining knowledge concerning science's role in society.

Applied to the role of science in international governance regimes in focus here, co-production implies that policy always influences the production and stabilisation of scientific knowledge, while this knowledge at the same time supports and justifies policy. People accept some specific knowledge-claim because it supports their policy strategy while they reject others. Causes and effects hence become functionally inter-related; production of knowledge is also production of policy (Lidskog & Sundqvist 2007, 185). The model of co-production also explicates the crucial importance of the specific policy contexts: "…uncertain or contested science can grow stronger if the policy context is 'right', while on the other hand, a weak policy context can become stronger through the support of science" (Lidskog & Sundqvist 2002, 85). The key is that both science and policy are part of the same culture, cooperating in the domain of policy-relevant research (Jasanoff & Wynne 1998, 16).

Another concept from STS that appears to be of relevance to evaluate the role of science in international governance regimes is called *boundary work*, laid down most compelling and comprehensively in the works from Tomas Gieryn and Sheila Jasanoff (Gieryn 1983; 1999; Jasanoff 1987; 1990). It draws on the notion that the value of science is not given by its content but negotiated by scientists and other actors involved in social processes. The boundary concept has been developed and used to understand *how* the value of science is to be decided (Lidskog & Sundqvist 2002, 84). Gieryn states that, "the boundaries of science are ambiguous, flexible, historically changing, contextually variable, internally inconsistent, and sometimes disputed" (Gieryn 1983, 792). His argument is that we use 'cultural maps' in deciding whom to believe in the processes of demarcation between science from pseudoscience, ideology, faith or nonsense. By looking at historical and current disputes about these boundaries, Gieryn finds no stable criteria that could absolutely distinguish science from non-science: "Science remains a pliable cultural space, flexibly reshaped to claim credibility for some beliefs while denying it to others" (Gieryn 1999). This opens a room for negotiations and, according to Gieryn, not only scientists but all actors involved in a negotiation process do, consciously or unconsciously, some form of boundary work by judging which knowledge should be considered as relevant or irrelevant and hence usable for policy work (Lidskog & Sundqvist 2002, 84). In her work on scientists involved in policy relevant research, Jasanoff describes two kinds of boundary work, one trying to expand the importance of science and one to narrow

it (Jasanoff 1987). Which one is acting depends finally on the context of the specific case in question.

Besides these broadly sketched concepts, number of other important perspectives from STS about the science policy interface as well as from the research field about science policy studies might be exploited for their applicability on the fisheries management in the Baltic over the course of the study.[11]

4) Applying STS to Analyse Baltic Fisheries Management

While Haas and the other theorists of international policy communities, described above, give some competing pictures about the role of science in environmental policy making, the STS concepts, give us important tools for understanding the attributes that make scientific findings useful for policy (e.g. saliency, credibility and legitimacy, cf. Wilson 2007). They aim to describe more decisively the social factors at work that are finally responsible for science to get implemented in political decision-making – or for the failure to do so.

From the STS perspectives about the role of science in environmental regimes, Haas' epistemic community model can be criticized for prescribing the role of science in environmental regimes rather than explaining it (Lidskog & Sundqvist 2007). The STS approaches on the other hand emphasise the pivotal role of the social conditions of science. This means that the institutional approach is partly right for its focus on interests, however, to explain science by means of social factors or political interests does not imply that its power has to be reduced to them. From an STS perspective, the interest-oriented approach gives science a too limited role while the epistemic community approach gives it a too important one. Lidskog and Sundqvist consequently propose that, "By means of a dual focus on the importance on both scientific knowledge and political interests – concentrating, in fact, on the interdependence between them – it becomes possible to form an alternative to both the instiutional model and the epistemic community model" (Lidskog & Sundqvist 2002, 85).

The study presented here will follow this suggestion in investigating the role of science in the policy regime of fisheries management in the Baltic Sea. It will evaluate

[11] Among these are most notably the theory of *Mode Two Science* (Gibbons et al. 1994; Nowotny et al. 2001) and that of *Post Normal Science* (Funtowicz & Ravetz 1992; Ravetz 1999; cf. Wilson 2007).

both, the applicability of the two regime theories described above as well as the concepts and analytic tools given from STS. Through analysing existing literature, policy documents as well as newly collected empirical material from observations and interviews of the different actors involved, the institutional model and the epistemic community approach can be contrasted and judged for if and how they can be applied in the BS fisheries regime. How for example can an institutional approach, focussing on the political interests of the different actors, satisfactory explain the governance arena? Within the fisheries regimes there seems no strong epistemic community to be in place that allows 'consensual knowledge' to play a mayor role in the policymaking processes. Compared to other cases like the LRTAP Convention, where a strong epistemic community existed (Lidskog & Sundqvist 2002, 86), it has to be explained why this has not been possible to establish in the fisheries regimes and why the actors in fisheries management seem to not accept a scientization of the issue.

The analyses conducted in this study will look upon how the different actors inside and outside the institutional bodies described above (ICES, BS RAC, Commission) see and evaluate their chances for participation in the governance of fisheries management. The investigations will focus on the social, historical and economic factors that contribute to how the regime was set up and developed, focussing in the first place on the impact of the recently established BS RAC.

The first question is, whether the case can more adequately be described with the interest-oriented approach following Oran Young and others or with the epistemic community model from Peter Haas. Concerning the role of science within the regime, it is however not enough to show *where* and *when* the epistemic community concept can be applied, or more precisely the *moments*, when 'consensual knowledge' plays a mayor role within the negotiation processes in the regimes. If an epistemic community is to be found, it is of crucial interest, to explain the *contexts* (e.g. social, institutional, political & economical), in which has been possible to reach 'consensual knowledge' and got implemented in the system.

At this point, the concept of boundary work can be used as a helpful tool to investigate the negotiation and more generally the governance processes of international fisheries management. Recently emerging ideas about 'boundary organisations' and 'boundary objects' attempting to give concrete forms to structure a well balanced sci-

ence boundary, aiming to facilitate communication along the policy interface and the co-production of science and policy. The use of boundary objects, where scientists, policy makers and other stakeholders work together on common projects has been found to be effective in a number of studies (Wilson 2007). For example, proto type 'boundary organisations' like the EU's *Scientific, Technical and Economic Committee for Fisheries* (STECF) have been suggested to be of paramount importance in this respect. But what about ICES for example, which has for a long time tried hard to maintain itself as an independent science organization? Shouldn't at least some activities of these organizations involve more non-scientists? (cf. Wilson 2007).[12]

Some scholars see boundary objects and organisations as possible bridges between stakeholders and as promising options for future policies in the fisheries management. Others are also stressing the crucial importance of the systemically rooted difference between research-based and fisherman's knowledge, that reflect different interests and scales of observation between the two parties. As Douglas Clyde Wilson states in his literature review about the *Science-Policy Interface in International Environmental Management* with respect to the fisheries management sector (Wilson 2007):

> One of the most basic insights from science and policy studies is that boundary work must be taken seriously. It cannot be treated naively, neither by assuming that the distinction between what is science and what is policy, advocacy or values is easily made in concrete situations, nor by assuming that it does not really exist. Boundary work […] in more participatory decision making processes is called upon to support specific judgments in circumstances where there are checks and balances on its use.

The policy challenge is consequently to identify *indicators* that have both research-based validity and reflect features that correspond to stakeholder knowledge, while relating to shared understandings of objectives and actions. The importance of such indicators, representing the link between objectives and action in management, has therefore been posed as "means of communication knowledge" (Degnbol 2005).

The important question for the Baltic Sea fisheries management is whether participatory attempts to increase legitimacy through additional stakeholder involvement like the BS RAC can on the long run prove to be successful. Critics of such approaches

[12] ICES is currently resphaping ist organisation and tries to adapt to such needs, e.g. increase transparency of the advisory process to enhance credibility (cf. talk from Martin Pastoors at the SAFMAMS workshop *Marine Environmental Management – Developing forms of scientific advice*, 10-11 December 2007 in Gothenburg).

have already stressed that such strategies of adding stakeholders might reduce the relevance by dealing with questions outside of policy makers remits. With regard to democratic 'trade-offs', three key attributes influencing the uptake of science to policy have been identified: relevance, credibility and legitimacy.[13] An EU funded project about *Policy and Knowledge in Fisheries Management* investigated the use of biological knowledge in various parts of the fisheries system, using North Sea cod as a case study. This study revealed that "people from all major stakeholder groups are calling for a more interactive system of producing *a common knowledge base*. Such a system could bring uncertainty from its current marginal role as the leftovers of certainty to the heart of the science process" (Schwach et al. 2006, 798; italics SL).

The main issue in focus for the here proposed study is on how the role of science structures the fisheries management in the Baltic sea case; more precisely on how the scientific data and advice shape the negotiations and decision-making processes within the RAC meetings and in the governance interplay ICES - RAC - Commission. The abatements on cod fishing quotas (TAC) as well as preliminary observations of the RAC meetings show that the interface between science and policy in the Baltic Sea fisheries management is far from being successfully implemented. The above mentioned case of the convention for long range transboundary air pollution (CLRTAP) on the other hand is seen as one of the most science based regimes that exist and is "…considered by researchers as well as politicians an exemplary form of co-operation between science and policy" (Sundqvist et al. 2002, 147). In their study on science and policy in air pollution abatement strategies, Sundqvist et al. (2002) revealed that in the LRTAP regime, actors from different fields have – through a flexible understanding of scientific concepts and models – been able to find and agree upon successful solutions in the negotiations between different scientific concepts.

The "common talk of success" refers, according to Lidskog and Sundqvist (2007), to the "agreements in eight protocols that have been reached without serious conflicts and long time delay, and the explanation of this achievement is that policy is science-based" (ibid, 178).

[13] Cf. Workshop paper from SAFMAMS *Science and Policy Day*; available at http://www.ifm.dk/safmams/ (assessed 21. January 2008).

This 'success story' of science based policymaking in the LRTAP regime, which has been analysed in detail,[14] seems to find a fundamentally different case with the international governance attempts for fisheries management like in the Baltic Sea.[15] The two cases therefore offer a promising option to compare how scientific advice to international environmental governance can "succeed" or fail.

Literature:

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[14] From researchers like Martin Letell, Rolf Lidskog and Göran Sundqvist; for the most comprehensive accounts see Lidskog & Sundqvist 2002/ 2007 and Letell 2006.

[15] = kind of small scale problem, compared to the global issues, reference to articles in the NYT...

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