

# **Knowledge production and political decision making: a framework for analyzing the role of international relations in social-ecological systems**

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## **Abstract**

Scientific knowledge plays an important role in international environmental politics. A study of Arctic climate science and policy has shown that structures of international cooperation in turn affect knowledge production. How science affects politics has been increasingly studied in recent years. However, approaches are needed to also understand the role of international politics in producing knowledge about human- environment interactions. This paper links concepts from studies of the science-policy interface with studies of resilience in socio-ecological systems and by doing so attempts to bridge the gap between social science and natural science studies of environmental change. Analytical themes that are explored include choices of level and scale at which to study and govern an issue, interplay between different scales and levels, regimes, and learning. The paper also discusses how this analytical issues can be applied to the issues of climate change and biodiversity.

## **Introduction**

The role of social institutions for structuring the relationship between human societies and the natural environment has received increasing attention in recent years. Some scholars have taken their starting point in ecology and expanded the sphere of analysis to social-ecological systems, including explicit recognition of the interlinked nature of the social and natural worlds. This scholarship is increasingly framing the analytical issues as one of resilience, which focuses on the capacity of social-ecological systems to absorb shock and still maintain their integrity or their capacity for renewal-reorganization and development . Most studies of resilience in social-ecological systems have a local focus, but there is also an increasing recognition that the “larger environment” can play a role in enabling or limiting the capacity of local decision makers . Moreover, with globalization and many of today’s environmental challenges being both local and global in scope, international relations have been identified as an emergent research issue for resilience research. This interest includes attention to the inescapable role of the nation state in international negotiations processes that determine the governance and use of natural resources at the local level but also attention to transnational corporations and the power issues on their agendas. A research question that has been phrased but not yet pursued is how concepts developed from studies of

local social-ecological systems could be expanded and applied to aggregate political and economic levels .

While resilience researchers have started to take an interest in the international level, international relations scholars have increasingly expanded their focus to also include national and local dynamics and the links between different governance levels . The use of terms such as “glocal” in referring to environmental problems and attention to multilevel governance attest to this interest, as does the attention to vertical interplay and scale and level issues in studies of institutional dimensions of global environmental change . The trend may be especially prominent in studies of environmental governance and appear to be a main feature of the growing scholarship on earth systems governance. Biermann defines earth system governance as “a sum of the formal and informal rules and actor networks *at all levels* of human society that are set up in order to influence the co-evolution of human and natural systems in a way that secures sustainable development of human society” .

When the interests of two research traditions meet, there are new opportunities to link knowledge from different disciplines. However, there is also a challenge of finding a common language, including common analytical concepts, that ensure dialogue between the disciplines. This paper identifies the issue of scale as an analytical focus as one such concept. It then links an on-going discussion on scale in the literature to a focus on regimes as potential cross-disciplinary analytical units. Thirdly, it starts exploring how the analytical themes could be used to illuminate dynamics of social-ecological systems with a focus on climate change and biodiversity.

## **Scales and regimes**

Increasing attention to scale issues, including interactions across scales, appear as a common denominator between resilience research and the scholarship of global environmental governance. By now there is also an growing body of literature defining the analytical issues at hand . I will not attempt to summarize this discussion here, but highlight that the attention to scale and scale dependencies in trying to understand the world also leads to increasing attention to cross-level interactions. In the environmental governance literature, this is illustrated by a focus on vertical interplay among governance levels but also by such concept as politics of scale, highlighting that the choice of perspective can be a matter of strategic political choice .

In the literature on ecosystems, a prominent example of the attention to scale is the Millennium Ecosystem Assessment, which has explicitly tried to analyze dynamics at different spatial scales . Another example is a chapter on terrestrial ecosystems in an assessment of the impacts of climate change in the Arctic . As mentioned in the introduction, scale and scale interactions are also emerging as key analytical issues in the study of social-ecological systems. In retrospective discussion of the problem of fit between ecosystems and institutions, the authors conclude that multiscale phenomena were not really studied as such in the mid-1990s but that the past decade has led to an increased interest in “networks and evolution processes involving such bundles of connectivity” . They also explicitly link the ecosystem perspective with an interest in adaptive governance.

The resilience literature links the issue of scale and cross-level interactions also to non-linear dynamics of social-ecological systems. Research here has shown that driving forces acting at different temporal scales and their interrelations with dynamics at different spatial scales are important factors for explaining how social-ecological systems undergo change, especially changes from one semi-stable state to another. In the natural science literature, the term regime is often used to describe these semi-stable states of a systems, while “regime shifts” refer to the passing of threshold in a way that places the ecosystem into another semi-stable state. A review by Scheffer et al. highlights a number of well-studied example. They include the shift in shallow lakes from clear water and rich underwater vegetation to a turbid state when the loading of nutrients reaches a critical level. This turbid state is not easy to reverse because the whole ecosystem dynamics has change, including the role of different species in controlling the algae that makes the lake turbid. Coral reefs shifting from high to low biodiversity, shifts from woodland to a grassy open landscape, and desertification are other examples. Ecological regime shifts are often the results of loss of resilience, which in turn can be connected to human activities, such as human induced eutrophication or climate change. Regime shifts can be expensive for society. An example is how the Bering Sea changed from an ecosystem with rich and economically profitable fisheries to one that is dominated by sea urchins.

As summarized by Folke, the idea of multiple stable states in ecosystems was initially not recognized in ecology but has now become an area of research that focuses on non-linear dynamics and alternate states of attraction where the interrelations between dynamics at different spatial and temporal scales is at the centre of attention. There is also increasing attention to the mechanisms that trigger regime shifts in ecosystems and how this links to ecosystem dynamics and multiple spatial and temporal scales. The interest in regime shifts among ecologists have also started to include attention to social drivers and dynamics. For example, the research plan for the Stockholm Resilience Centre highlights scholarship on regime shifts in economic systems, in scientific knowledge systems, and in institutions and societies. However, the attention to semi-stable states of the ecosystems in resilience research has so far not been linked to the scholarship on international relations.

In international relations, interests in regimes dates back to the study of international law in medieval Europe and to a belief in international institutions for promoting peace after World War II. After a quiet period with realism as the mainstream theoretical framework, the interest resurfaced with increasing recognition of economic and political interdependence and with a renewed interest in the role of institutions in achieving cooperation among states. International governance became an issue for international relations scholar and much of this debate was expressed as an interest in regimes. A common definition of regimes in international relations is that of Krasner, who defines regimes as “principles, norms, rules and decision-making procedures around which actor expectations converge in a specific issue area”. Within international relations, use of the term regime is by no means clear cut and the concept has been criticized as vague and also conservative in its focus on order and stability and on states as the main actors. However, there appear to be some common denominator in how the term is used. What I find useful in the context of this paper is that it places in focus the structures that shape international cooperation within a specific context. Whether these structures are visible in formal definition may not be as important as long as they define

the range of actions for the actors in this specific context. Defined thus, regimes address the range of actions of the social actors in the social-ecological system.

Combining the attention to regimes in social-ecological research and international relations raises interesting questions. One question that can be posed is how certain social-political regimes relate to ecological regimes. This would also include questions about the role of regime-shifts, i.e. how changes in the social-political structures interact with shifts in the ecological and geo-physical systems. Compared to how regimes have previously been studied in international relations, it places more focus on the potential for change in regimes and understanding the dynamics of such change, not only in the creation of new regimes but also when they transform into something new. One attractive feature of such a focus on regime transformation is that it can be used to link analyses of changes in biogeophysical regimes to changes in the political landscape, which might identify where policy action can have an effect on the environment.

### **Learning as a link**

A link between regimes as the analytical units and the issue of scale perspectives is in how issue areas for political regimes are often defined in relation to its limits in space, in addition to being issue specific. They can be broad or narrow in scope, from global to local, and choices of spatial delimitations are likely to play a role for how issues are framed. In studies of both institutions and social-ecological systems, the issue of fit between the ecosystem and its management has been in focus for quite some time . Recently, this focus also includes an increased recognition that discussions of fit have to take cross-level dynamics into accounts, including complex connections globalization processes . In addition, my own research on the Arctic Climate Impact Assessment highlights how the choice of scale can bring different issues into focus: in this assessment local perspectives often brought attention to complex interaction of both physical and social factors for the impacts and vulnerability of society while global perspectives placed more attention on climate change as *the* factor of importance .

If choice of scale perspective matters and if interactions across spatial and temporal scales perspectives are as important in both socio-political and natural systems as the literature suggest, it becomes important for society to capture and understand these processes, in short to learn. The issue of learning and its relations to environmental governance was on the table already in the mid-1980 but the connection between understanding knowledge production and understanding the environment has gained momentum only in the past decade and has recently come to include discussions about the need to connect across scale perspectives . For example, this has been raised as one of the lessons from the Millennium Ecosystem Assessment .

In this paper I want take the issue of learning across scale perspectives one step further and raise the issue of how governance arrangement may play a role in bringing different perspectives together. Is it possible that certain political regimes and their geographic focus can help or hinder an understanding of cross-level interactions in social-ecological systems? What consequences may the ability to learn across scale perspectives have for the ability to govern and adapt to change? The second question has been raised in relation to research on adaptive governance of social-ecological systems , while the first question touches on insights from the environmental institutions literature that certain regimes can give privilege to certain ways of understanding the world while downplaying others . So far, these question have not been linked but I believe such

linking could provide a bridge between studies of social-ecological systems and international relations.

Common to both bodies of literature is focus on knowledge production and learning. Learning in the context of adaptive governance is about learning as a social process that takes shape through interactions, communications and deliberations and that lead to changes in attitudes and behavior by individuals in social environments . Although so far mostly applied to policy processes, this focus on social learning could well include scientific knowledge production. In doing so it would build on lessons from the sociology of science, including the recognition that science and policy are co-produced .

A goal of this paper is to combine analytical issues from studies of social ecological systems to international relations. With regimes or social-ecological systems as potential common units of analysis, with attention to learning, and with scale perspectives as analytical issue in the forefront of both fields, the following hypothesis that can be formulated: The ability of a regime to include and combine information about processes at different spatial and temporal scales is essential for its ability to learn about and adapt to change. The regime in this context can be seen as a semi-stable social-ecological system of which a political regime may part of the political governance structure but which also encompasses a range of other biogeophysical, social, cultural, and political features.

### **Some initial examples from climate and biodiversity**

This section will explore the hypothesised link between political regimes and society's capacity to learn about the environment in relation to the issue of climate change and with some initial thoughts also on biodiversity. For the climate issue, I will use the Arctic as my geographical focus, as this is the region with which I am most familiar.

As described in detail in Nilsson , the Arctic regional political regime has played a role in relation to climate change that illustrates both vertical interplay and the politics of scale. Scientifically, the Arctic has been of interest to climate scientists since the late 1800s and the First International Polar Year and an issue in climate change research since at least the mid 1980s . However, this interest has mostly been focused on the role of the Arctic for the global climate system. Up until the 1990, there was no Arctic political regime that could take on climate change as a policy concern. However, even when the circumpolar political cooperation emerged, climate knowledge production was not considered a priority for regional knowledge production, with reference to the on-going work at the global level. It was not until observations of climate change in the Arctic became more and more apparent towards the end of the 1990s that this issue really entered the regional policy agenda, in spite of the Arctic regime was a cognitive forerunner in other areas of environmental politics . Moreover, it was only when a growing interest in regional climate impacts became apparent in the global climate regime – especially in the IPCC – that a large-scale regional climate impact assessment got off the ground. This was the Arctic Climate Impact Assessment (ACIA) which was launched in 2000 and concluded in 2004.

When the results of the Arctic Climate Impact Assessment (ACIA) were published , the global perspective of climate change still played a prominent role, especially in the physical sciences. However, and more interesting, this framing had been complemented

with locally based studies of the vulnerability of ecological and social systems, specially in relation to indigenous peoples. A conclusion from this study of the ACIA was that the regional regime brought new knowledge and scale perspectives to bear on the scientific understanding of impact of climate change in the Arctic.

The same cannot be said about policy learning as the accompanying policy process in the Arctic Council did not lead to any significant new climate policy initiatives at the regional level, in spite of the strong message that the climate was changing at a rapid rate. A major reason for the lack of policy response was a preference by strong political actors to frame climate change mainly as a global issue. In relation to the hypothesis it thus appears that an initial framing of climate change as a global issue along with the global context in which the climate regime was built in the 1990s, including its the science-policy interface, has left such a strong preference for global framing that other scale perspectives may have trouble influencing policy making. Added to this should also be the strong political push historically for a global framing of climate change. My observations from the ACIA go along with a delay in the global context of bringing adaptation to the top of the policy agenda, as adaptation up until recently has mainly been seen as a local and national concern.

The ACIA ended in 2004. In spite of an increasing number of scientific studies of Arctic climate change, not least in relation to the International Polar Year 2007/08, there is as yet very little regional political initiative on climate change. This raises a number of research questions to follow up on. They include looking at how other political regimes adapt to take on the challenge of Arctic climate change, which is a question in focus for a forthcoming anthology on climate governance in the Arctic. Other questions include how the lack of political follow-up because of the strong global framing affects the potential for other parts of the social-ecological regime to adapt, including social, economic, cultural and ecological systems.

From the historical context of the Rio conventions, biodiversity could also be framed as global issue. However, although there is a global convention on biodiversity, the global framing has not been as dominating as for this issue as it has been for climate change. First of all, the Biodiversity Convention challenged a previous norm of genetic resources as global common. In practice it has also acknowledged the role of local knowledge traditions to a much greater degree than the Climate Convention. In addition, there are other international regimes that are relevant for biodiversity. Of special interest in looking at scale perspectives is UNESCO's International Man and Biosphere Programme. Here the approach is to coordinate and provide a learning platform for a number of local Man-and Biosphere sites, which places the local perspectives at the normative core of the regime. Rosendal has pointed to the lack of progress in biodiversity politics, in spite of scientific consensus on the need to address the current loss of biodiversity. She also highlights that one problem may be that the Convention on Biodiversity concerns what are essentially domestic resources while most other international environmental regimes deal with resources that are outside national jurisdiction. The history of biodiversity politics and the move of this resource from a global common to the national resource, calls for a further analysis of how scale perspectives play into the lack of action and if lack of action is indeed an accurate description also at other levels than the global. An observation in this context is that the multi-scale perspectives is prominent in the Millennium Ecosystem Assessment, which was aimed to support the biodiversity regime, in contrast to IPCC's reports. Based on

Rosendal's observation of lack of action, this has not yet influenced policy learning, but if it has done so at other levels of governance or if it will do so in the longer run and thus contribute to adaptive governance is an empirical question to be addressed. I believe that such empirical analysis should include looking at social learning in social-ecological systems at multiple scales, including the linkages between them, to understand how regime interplay may affect society's capacity to learn about and take actions against further loss of biodiversity.

## **Next steps**

The sketches above are only an initial suggestion how regimes and scale can be used as analytical tools, which obviously will require a great deal of further empirical work. In addition to testing the hypothesis on a number of cases, there is a need to analyze the factors that may affect the learning capacity or lack thereof, with the potential to test a number of ideas about the role of scientific knowledge in global environmental governance. One such issue is the structure of the science-policy interface, including the role of salience, credibility, and legitimacy as explanatory variables for understanding why science informs policy or not and the role of boundary organizations, boundary objects. Another vein of thinking centers on the role of discourse or framing of issues and related to the constructivist traditions in international relations.

There is also a need to go back to realist international relations theory and include consideration of self interest of various state and other transnational actors. Rosendal points to the malignant nature of the biodiversity issue as one possible explanation for the lack of action, where malignant refers to complex issues involving great and unevenly distributed costs. A similar point can be raised about climate change. In the Arctic cooperation, knowledge production and policy response to climate change have been much more contentious than other environmental issues precisely because of the economic interests at stake. While interplay among regimes that address biodiversity issues has been subject to analysis, I would add a question of how regime interplay in international politics affects scientific and policy learning. This could be at the global level but also include analysis of learning at other levels such as local Man-and-Biosphere sites or in local climate governance. This brings the issue back to one of the questions raised in the introduction about what role the "larger environment" can play for enabling or limiting the capacity of local decision makers.

This paper has not addressed the biogeophysical aspects of regimes and their ability to "learn" and adapt but such issues could of course also be part of a research program that tries to analyze the dynamics of regime resilience and transformations. Many attempts at interdisciplinary research that have aimed at bridging social and biophysical science have failed. As summarized by MacMynowski, social sciences often stop with discussing the "means of interdisciplinarity" without an end in sight whereas the biophysical scientists are ardently promoting an end without deeper considerations for the means involved. This paper explores analytical concepts that physical and social sciences have in common – regimes and scale – with the major ambition to invite to further dialogue.