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The role of governance in community adaptation to climate change

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Abstract

The capacity to adapt to challenges such as climate change can be seen as largely determined by socioeconomic context or social vulnerability. This article examines the adaptive capacity of local actors in response to globalization and climate change, asking: how much of the desirable adaptation can be undertaken at a local level, and how much is determined by actors at other levels, for instance, when resource conflicts occur? Drawing on case studies of fishing in northern Norway and north-west Russia, the paper shows that adaptive capacity beyond the immediate economic adaptations available to local actors is, to a considerable extent, politically determined within larger governance networks.

Vulnerability has been seen as susceptibility to change, and is often defined as the sum of the sensitivity to exposure to change and the capacity to adapt to the impacts of change. Adaptive capacity has been conceptualized as the capacity to cope with or adapt to change, with adaptive capacity determining the adaptations that may be undertaken (Smit & Wandel 2006). Recent work on climate change has focused on the need to view the impacts of concurrent stresses together: for instance, by examining adaptation to both climate change and globalization (O'Brien & Leichenko 2000). Attention has also been drawn to the importance of studying the underlying resources for adaptation to changes, or what may be called "social vulnerability" (Adger 2006). These approaches have gone a long way towards starting to approximate the real-life situations within which stakeholders have to adapt, which are complex contexts, with several stresses and limited resources. However, the way in which the concepts have been implemented has long exhibited a rather instrumental and management-oriented view of adaptation in social systems, and has excluded the role of power and politics in the process of adaptation (Brooks 2003; Thompson et al. 2006).

Multilevel governance, or broader decision-making networks, can here be seen as comprised of government and private actors, with the latter including the market and civil society (Keohane & Nye 2000). The concept of multilevel governance can be used to highlight the fact that decisions on resources and resource distribution,

which may support adaptation, are not made at a single level only, such as the local level or the national level. In addition, the concept underscores the fact that decisions affecting adaptation are not only made by actors that may be democratically accessible to local citizens: they are also made by market mechanisms, with price-setting and the demand for certain products or services possibly determining the resources available to different groups. Adaptation at the local level may therefore be limited by national and international regulations that determine, among other things, the legal rights to resources, levels of resource out-take, and support or compensation mechanisms. Adaptation may also be limited by conflicts over the interpretation of regulation, limited enforcement of regulation, which may distribute resources unequally to different groups, and conflicts among actors—even locally—that may send mixed messages to decision makers on the actions to be taken. In addition, channels for such communication between levels may not exist, or may be monopolized by certain interests at other levels. This situation signals that it cannot be assumed that resources for adaptation are distributed on the basis of need, relative to exposure to stresses, but may instead be determined politically or economically by the strengths of interest groups and the composition of the decision-making system (see Adger et al. 2005). Here, adaptive capacity becomes a question of "who is adapting to what" (Smit & Wandel 2006), as actions that may increase the adaptive capacity of certain actors may reduce the

adaptive capacity of others. The distribution of power between individuals and groups of actors at different levels is thus fundamentally important as an outcome of political and economic processes, and as a determinant of further adaptation.

It may therefore be relevant for a vulnerability study to attempt to delineate this decision-making network, or the space available for adaptation (see Berkhout et al. 2006), including the constraints placed upon it. The understanding of governance as a multilevel phenomenon that may largely determine resources for adaptation locally may also have considerable impact on work in community adaptation. Although much vulnerability assessment work has taken place at the community level to identify (necessarily case-specific) determinants of vulnerability (such as climate change exposure, depending on location, sensitivity to exposure, depending on natural conditions, and resources for adaptation locally), the network and possibilities for adaptation may need to be seen explicitly in a broader perspective (see Næss et al. 2005). Local studies may serve as the starting point for determining what the relevant governance network is in a particular case (locally or sectorally). In addition, studies that encompass actors at different levels (for example, those defined by local actors as important decision makers) may support the identification of the governance network that is impacting on adaptation.

The division of adaptations depending on type might thus distinguish between two categories: the first comprises adaptations that can be undertaken and decided on by the actors—most likely on an individual or household level—and includes strategies or modifications of strategies for economic or market-based adaptation that may be common among economic actors; the second embraces adaptations that require larger-scale interactions and change within a broader governance network, in particular the political network (and may be more uncertain or even unlikely to be undertaken). Adaptive capacity is thus fundamentally differentiated depending on the capacity of the actors to work within or influence the relevant systems, which may sometimes act to fragment or unite local communities. At present, this overall situation, often defined as actors' social vulnerability (Adger et al. 2005), defines the context for any adaptation taking place specifically in response to climate change.

This paper illustrates the role of governance in determining capacities for adaptation and the extent to which adaptation can be a polarized issue, with the capacities determined by the distribution of power in systems. We utilize two cases that target stakeholders' experiences of the factors that have an impact on adaptation to existing stresses and to anticipated climate change: coastal small-

scale fishing in northern Norway and north-west Russia. The main question addressed in the paper is: to what extent is the adaptive capacity available at the local level dependent on decision making at higher levels?

As a study of adaptation at the community and individual levels, this paper, among other things, questions the focus on community adaptation as a specific unit (Ford & Smit 2004; Smit & Wandel 2006). Community adaptation has been a primary focus in the literature on the local understanding of climate change, with the rationale that the local level represents the scale where climate changes will appear, and where these changes must be adapted to (Ford & Smit 2004; Smit & Wandel 2006). Even though interdependency with other levels is recognized, a multilevel focus has seldom been integrated in practice in community adaptation work, beyond the inclusion of an argument that local concerns should be included, or "mainstreamed", in regional policy (Ford & Smit 2004). The present study augments the focus on community adaptation by illustrating how adaptation to local concerns on the community or local scale may be only possible to a very limited degree. The research thus problematizes the possibilities for mainstreaming, identifying limited access to regional or national levels of decision making that cannot be assumed to take local concerns into account. The marginalization of local concerns may also be a result of power structures, where the prevailing situation benefits other groups (in other localities or broader interest groups). Any changes in the existing situation may thus transfer vulnerability to other actors, and are likely to be resisted by actors with greater power. The study also places in perspective the assumption—prevalent in much of the Arctic literature—that local communities typically have a subsistence economy (see Keskitalo 2004a). Although subsistence economies may be of great importance in other regions, this paper illustrates the substantial integration into the international market economy and economic decision making that characterizes most sectors in the north of Europe (including, for instance, reindeer husbandry; see Keskitalo 2008). In these areas, the broader economic and market context, rather than local conditions, may determine a large part of the adaptive capacity for localities.

Methodology

We draw upon case studies of small-scale coastal fishing in Finnmark, northern Norway, and Arkhangelsk Oblast, north-west Russia (Fig. 1). The fishing in both of these localities impacts greatly on community viability: much of it is an indigenous or traditional practice carried out on a small scale, but has considerable economic importance for

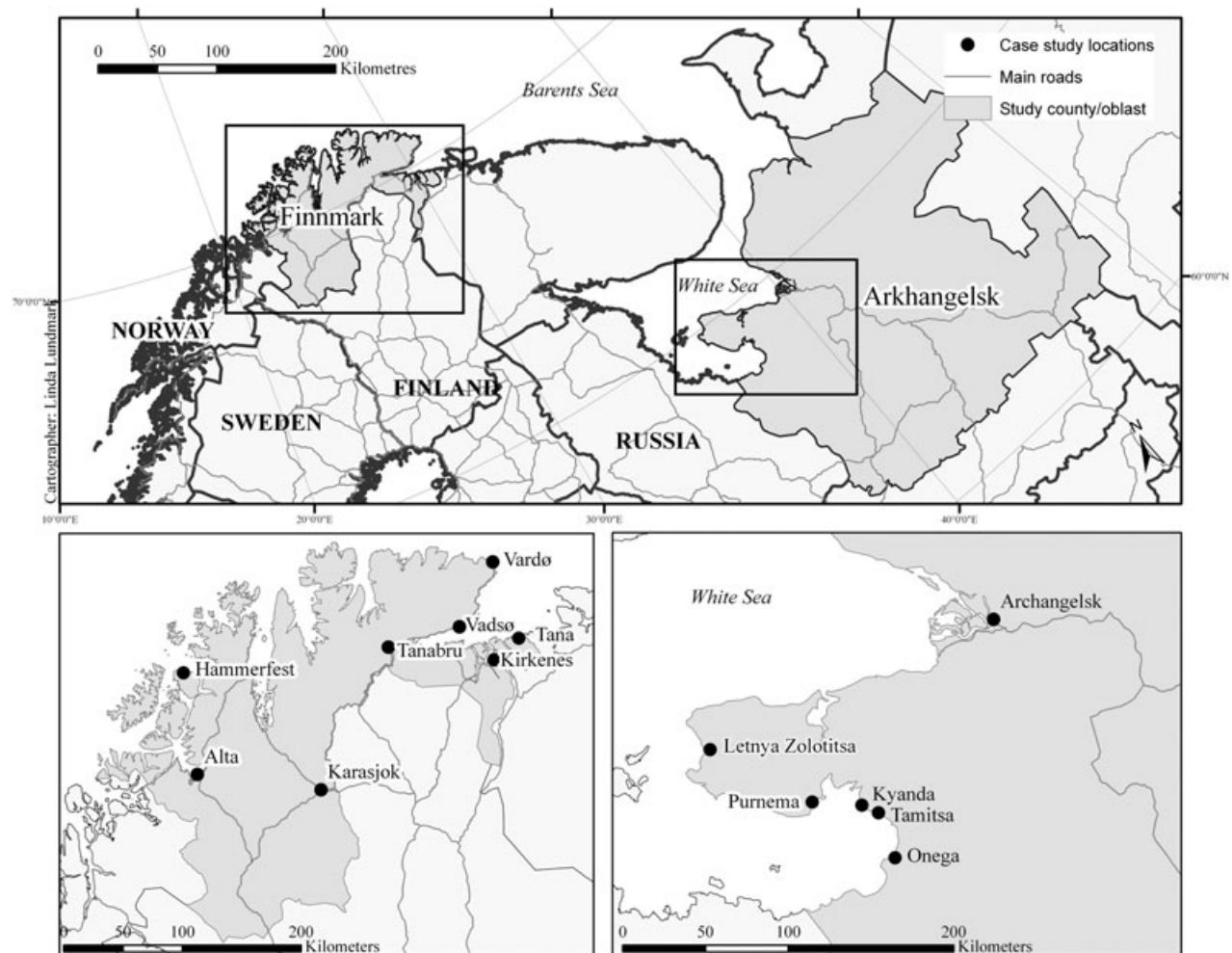


Fig. 1 Case-study areas in Norway and Russia. (Graphics courtesy of Linda Lundmark.)

the community. The substantial differences in social and legislative systems between the two countries make it possible to deduce important similarities that may apply more widely to small-scale fishing. Some of the characteristics of the regions are described below. In northern Norway, in contrast to locations further south in the country, fishing is relatively small in scale. In Finnmark, fishing vessels are small, many of them less than 15 m in length. Also, fishing is traditionally important, both for the ethnically Norwegian segment of the population, which has lived in the area for a long time, and for the indigenous Saami inhabitants. A large part of the Saami community defines itself as “Sea Saami”, who have traditionally been dependent on fishing rather than on reindeer herding. In the Arkhangelsk region, the fishing industry and fish cooperatives (kolkhozes) also have a great importance regionally, especially in social and cultural terms, as they support coastal villages that uphold

the traditional Pomor culture connected with fishing. Coastal fishing is, however, often practised farther from the shore than in Norway and uses bigger vessels, as kolkhozes may pool their quotas (Vilhjálmsen & Hoel 2005).

Methodologically, this study draws on semistructured interviews. The number of interviews conducted and the interviewees were selected to represent a cross section of the sectors: the basis for the selections was thus strategic, rather than an attempt to achieve a representative sample of the sort required in a quantitative study. In a qualitative methodology such as that chosen here, the validity of the data lies in the same information being provided by very different types of actors, rather than in the data representing the population proportionally. The interviewee selection process is described in detail below. The people interviewed were selected through a stakeholder analysis of who the relevant (here, sectoral) actors were

in the focal areas, and included responsible organizations on the regional and local level (see Mostert 2002; Keskitalo 2004b), the aim being to ensure representation of the main occupational groups active in the sector. Interviewees were also chosen from formal decision-making bodies in the area, such as local government and administration, which could be expected to influence adaptation and decision making. These criteria resulted in a wide range of communities being visited. To encompass the desired categories of interviewees, some 15 interviews were undertaken in the Norwegian case-study area in 2004–05, in communities in Finnmark (including the Tana region, such as Tana and Tana Bru, Vadsø, Vardø, Kirkenes, Hammerfest and Alta). The interviewees were mainly men, reflecting the composition of the workforce in the fishing sector. For the Russian area, the study draws upon interviews with stakeholders in local communities that are part of the fishing kolkhozes (cooperatives) that remain on the Arkhangelsk White Sea coast, on the Onega Isthmus, in the Onega and Primorsk districts (the kolkhozes Red Banner [Krasnoe Znamya], Forty years of October [40 Let Oktyabrya], In Lenin's Name [Imeni Lenina] and Magus on the White Sea Coast [Belomor]). The interviewees also include pensioners, representatives from local and regional administration, hunters and fishers, and people who are registered as unemployed who make their living on individual subsistence farms in the villages of Purnema, Tamitsa, Kyanda and Letnya Zolotitsa. Within these groups, we focused on selecting companies and people who have been active longest in the area, and who could therefore describe change over time. The interviews were held in 2005–06, and included 32 people between the ages of 30 and 86 years. In general, for all interviews, the interviews were held in the local language (Norwegian or Russian), were about an hour long and were transcribed in their entirety (i.e., word for word). All the translations of stakeholders' comments into English below have been made by the authors. The interviewees were not paid for their participation.

To ascertain the general social vulnerability of the interviewees, the interviews were structured in terms of the following four themes: (1) the general socio-economic situation of the interviewees, including present problems and possibilities, and perceived trends or changes during their working life, as well as the decision-making or governance network that they regarded as affecting them; (2) the interviewees' possibilities for adapting to the changes they had identified; (3) the interviewees' perceived sensitivity to specified climatic changes (elicited through questions such as, "How would it impact you if spring came earlier?") and the environmental changes that they identified; and (4) the interviewees' possibilities for

adapting to such changes (see Keskitalo 2008; Keskitalo & Kulyasova in press). The questions aim to illustrate the current situation of the interviewees, their perceived possibilities for adapting to change, as well as the institutional network that impacts their adaptations: these considerations make it possible to define which actors at different levels the interviewees perceive as having the most impact on themselves, and at which level adaptive actions would need to be undertaken in order to make local adaptation possible. The interviews were analysed using qualitative content analysis with inductive coding (derived from the empirical material rather than pre-defined theoretical codes). The coding was undertaken manually or using ATLAS.TI software.

The description of the empirical results below will focus primarily on the social vulnerability and adaptive capacity that interviewees described on the local level, relative to other levels, and on the decision-making network they mentioned. A lesser focus will be placed on the economic, political or environmental (including climate change) sensitivities that the actors noted. The stressor of climate change is seen as a potential—and in some cases already existing—hazard that represents a "specific" vulnerability in relation to the social vulnerability described overall by the interviewees (see Adger et al. 2004). Regarding climate change, interviewees were presented with and asked to respond to statements on projected climate change derived from a literature survey including international (Intergovernmental Panel on Climate Change), regional (International Arctic Science Committee, Arctic Climate Impact Assessment) and national climate change projections, such as RegClim for Norway, as well as the projections found in international and national research programmes, and impacts and scenario literature in general. Given the focus of the study on interaction with local people and on their experiences, the projections were not used more specifically than to determine broad trends, such as the range of temperature change that would cause a shorter or longer winter season. The projections were used to define specific interview questions, for instance, "How would it impact you if winter became shorter?" As a follow-up to such questions, the impact of changes of different duration was discussed; interviewees were asked, for instance, how much shorter would winter have to become before they experienced problems, in order to illustrate their experiences of change, and the risks of continued or potential changes (rather than the specific data from climate projections). The general projected changes in temperature and precipitation that interviewees were confronted with included a more temperate climate, with a delayed autumn, milder, shorter winters with increased precipitation and warmer, possibly drier, summers (INCFCCC 1994; Guisan et al.

1995; Høgda et al. 2001; Sygna et al. 2004). Interviewees were asked to comment on statements about these impacts, and to say if, and how, such changes would impact them. They were also asked if, and how, possible larger variations in weather would impact them; in addition, some of the interviewees were asked specifically how geographical shifts (mainly northwards) in species, with possible increases in fish biomass and growth, as a result of warmer temperatures, would impact them (INCFCCC 1994, Norwegian Ministry of the Environment 1994; Guisan et al. 1995; Heal et al. 1998; Watson et al. 1998; Høgda et al. 2001; Sygna et al. 2004; Loeng 2005; Vilhjálmsson & Hoel 2005; see also Kattsov & Källén 2005), whereas some interviewees themselves discussed the geographic reach of their fishing activities. For climate change, this paper concentrates on the perceived implications for fishing, although interviewees often described larger contexts, such as changes affecting subsistence farming or livelihoods more generally.

Multilevel governance of local fishing: interactions between market mechanisms and state regulation

This section describes the changes in the fishing sector over time as interviewees described them. It shows that the last generation has seen wide-ranging changes, including increased competition for and control over resources in both northern Norway and north-west Russia. Fishing in northern Norway has seen large changes, especially since the introduction of the quota system in 1990, which imposed a maximum catch per boat. The combination of fishing and hunting, berry-picking and household logging was relatively common for a long time in the areas studied, but has decreased dramatically since the 1960s, with the fall in the number of small-scale fishers. As frozen fish and fillet production became less dependent on locality than previously, i.e., fish could be processed far away from where they were caught, the profitability of fillet production fell, given the high costs of employment in Norway compared, for instance, with China and Russia. The focus shifted instead to fresh fish production, and some fishers have diversified into tourism or fish farming, with a major restructuring of the northern Norwegian economy as a result. Northern Norway, traditionally characterized by relatively small-scale fishing and combination subsistence, is now changing towards larger-scale practices and a rationalization of fishing (Keskitalo 2008). The high level of social security in Norway, however, means that trends such as depopulation and economic marginalization may take less of a toll on the standard of living of individuals than is the case in regions such as Russia.

The contemporary problems facing the fishing industry and fishing communities, as well as state policy in this field, have been analysed for Russia (Titova 2006), and the management of natural resources has been examined for the Barents region (Averkiev & Šilin 2004). In the Russian case-study area, fishing kolkhozes were first established during the Soviet era as a cooperative form of village economy, funded by the income from fishing. This made it possible for remote villages to maintain collective farm agriculture and an infrastructure that, among other things, supplied milk and meat to the villages. Kolkhozes were also responsible for social security and infrastructure in villages. Fishing kolkhozes undertake fishing from large trawlers, and also pursue subsistence ice fishing close to the shore. However, the quota system has had a large impact on the system, especially with the practice of quota auctions. Units such as collective farms are awarded a certain quantity to catch free of charge, and for their own consumption, but since 2001 they have had to compete for additional quotas in auctions. This in effect decreases the resources available to small-scale collective farms with limited economic resources, and the quota available to each collective farm may now be half of what it was before the auction system was introduced. This has meant that villages often lack access to infrastructure such as summer roads or common electricity lines, and local access to agricultural farm products. Instead, villagers rely on winter roads or travel by boat in summer, and have to make do with subsistence farming and local power stations running on oil (making the use of electric appliances and computers impossible). The fish caught are most often sold for export, for instance, to Norway or to other European states, or to Asia, as export prices are higher than those on the domestic market (four interviews with the chairs of the fishery kolkhozes mentioned this fact).

This ongoing change in the fishing sector is reflected in changes and conflicts on the political and organizational level, primarily regarding the controversial quota distribution systems. Interviewees related, however, that the problems with the quota systems do not lie in the limitation of fishing as such, but in the way the rights to fishing are distributed. Norwegian interviewees engaged in small-scale fishing perceived the state system as giving preference to larger vessel groups while providing incentives to decommission smaller vessels; Russian interviewees pointed to the system of quota auctions that gives preference to those with larger economic resources to compete for the quotas. Because of their limited economic resources, collective farms can not obtain bank loans to support their competition with companies for quotas, and are thus unable to gain access to resources that would enable them to survive economically. The

political organization of fishing on different scales, from the local to the international, can be seen as driving different fishing policies, from support for small-scale fishing to a larger-scale policy. Here, local and regional government and organizations conflict with national interests. National interests have the largest impact on policy, although the local and regional levels are significant in supporting small-scale fishing, and in developing a relatively united regional interest in both Finnmark and Arkhangelsk.

Perceptions of fishing rights in Finnmark, northern Norway

In Finnmark, the control of fishing rights through a saleable quota was by far the issue most often discussed by interviewees. To maintain fish populations, the quota system limited access to fishing as an occupation. There has been sharp criticism of the regulations by which this has taken place. In order for fishers to gain a ship quota after 1990, they had to have caught a certain quantity of cod in the previous three years (relative to boat size, among other things). This resulted in difficult situations in Finnmark, as eastern Finnmark had seal invasions in the 10 years before the introduction of quotas, which limited the catch size during those years. Many people lost their fishing rights after not acquiring a quota because of their limited catches in the years preceding the quota system. This loss of rights, in this instance, and more generally, was emphasized by many interviewees. As one noted: "The largest change as I see it is the rights. They are disappearing. The biggest mistake . . . that was the quota system in cod fishing . . . for the fjords" (coastal fisher, Norway).

The concerns of interviewees thus centre on the right to catch fish, how fishing rights should be distributed, and how it can be guaranteed that the region and its inhabitants will retain the legal and moral right to fish. Criticism was directed at national policy on larger-scale fishing in the so-called "Kondemneringsordningen" (decommission order) for phasing out boats under 15 m in length (see NMFCA 2006), which was seen as disadvantaging Finnmark, with its majority of small vessels. The order to phase out small boats was instituted to increase profitability and to modernize the fleet (NMFCA 2006), and operates such that fishers who sell their quota back to the state get a tax-free compensation for the quota, worth almost a year's salary in some cases. The boat is destroyed, or sold as a recreational vessel (with somewhat lower compensation paid to the fisher), and then the quota is sold back to the state for redistribution. Many actors also emphasized that this situation, in which larger boats catch more fish, also affects where fish are

brought to port and employment on land. Large-scale fishing often brings its catches to port further south, with impacts on regional employment and infrastructure. Additionally, as quotas can be bought by fishers in other regions, depending on their economic means, there is a concern that fishing rights may disappear from Finnmark, even with the enactment of regulation to limit the devolution of quotas from the north.

Local and regional actors are relatively united against what is seen as a national policy disadvantaging local, small-scale fishing in Finnmark. Many of the actors further noted political aims to change the quota distribution, and thereby reverse the lagging recruitment situation in fishing. The Finnmark County Council discussed, for instance, the development of collective quotas (*samfunnkvoter*), where

[o]ne way of retaining the rights in the area is to start a resource company that buys a quota and rents it to fishers. There could be regional quotas managed by the county or a similar organization to keep the rights to fishing in the county and its areas.

(Finnmark County Council, Norway)

One of the results of these ambitions is a local project, the Tana Fjord Project (Tanafjordprosjektet), which includes both local and regional policy efforts, and places "considerable importance on this with a resource rights protection law for fishing because that is something that is rather deplorable today" (interviewee from a fishing-interest organization, Norway). The local and regional lobbying efforts have also had some success in influencing policy, and, especially where special rights for Finnmark are concerned, developing a body of law known as Finnmarksloven.

Thus, interviewees see northern Norwegian fisheries as being regulated to a large extent by state decisions, made in committees with larger interest groups, that are only somewhat influenced by local and regional interests. International norms regarding indigenous rights are one of the authorities that interviewees refer to in their aim to secure rights for Finnmark. The International Labour Organization (ILO) Convention no. 169 on indigenous peoples' rights, which Norway has ratified, is seen as one particular means for influence.

Northern Norway, especially the fjords but partly the coast as well, these are Saami areas and that also means that the indigenous peoples' rights that are set out in ILO Convention no. 169, for instance, [are valid]. Even though there has been debate about whether the Convention is valid for lake and sea areas, most legal experts are probably in agreement that it is.

(Interviewee from a fishing interest organization, Norway)

For instance, the Saami Parliament strongly emphasizes that fishing rights should remain in the area. Here, the Saami Parliament does not distinguish between fishing rights for the coastal Saami (the so-called Sea Saami) population and other residents, but instead argues for fishing rights in the region as a whole. “We have fought for those who live here to have the right to fish” (interviewee from the Saami Parliament, Norway).

[A]ll of those who live in the area have equal rights . . . when it comes to defending these rights you may say that it can be based on Saami history, but when it comes to it [rights] in the area these are shared equally

(Interviewee from the Saami Parliament, Norway)

Actors also noted that the distinction between indigenous and local is often difficult to make, as large sections of the population have long traditions in the area, and are often of unclear or mixed descent. Although the justification for fishing rights is seen as based in indigenous rights, it is ultimately applied to the area and population as a whole, depending on the involvement in small-scale fishing. Accordingly, some interviewees stated that the inclusion of these rights in national legislation, which is something they felt had not yet taken place to the extent that they wished, would support the region vis-à-vis the state. “One has [in Norway] . . . supported what conventions there are to secure indigenous peoples and minority interests, but the formal legal and regulation framework is entirely disregarded” (interviewee from a fishing interest organization, Norway).

Perceptions of fishing rights in Arkhangelsk, north-west Russia

In the Russian case-study area, the kolkhozes focus on the possibilities for attaining rights to fish resources, as their limited economic resources makes it difficult for them to compete with companies for quotas. As an economic adaptation, kolkhozes have united in associations in order to pool quotas, trawlers and financial resources for purchasing quotas at auctions. This development has also taken place in response to restrictions on the permitted fishing zone, which specifies that ships with quotas of less than 600 tonnes are not allowed to go beyond the 12-nautical-mile fishing limit to fish. As a result, collective farms are attempting to unite resources in order to purchase a vessel and then split the profits: about 1000 tonnes is required to secure the livelihood for a village, and to provide social security at the level of the collective. This process has also resulted in fewer, but larger, collective farms. Many kolkhozes have also received offers from large fishing enterprises to join joint-stock companies or holding companies, but have most often rejected these

offers, as it would mean a loss of independence and a change in the role of the kolkhozes in the local community.

Some kolkhozes have investigated the possibilities of claiming indigenous rights based on Pomor traditions. According to Russian law, indigenous peoples are entitled to resource rights in their own territories. Possible approaches are to try to become recognized as an indigenous people, on the basis of traditional habitation and time of habitation, or to otherwise establish local rights to the land. The fishing collective Belomor, along with three villages, has recently officially registered itself as an indigenous community. So far, the communities have addressed the issue at local administrative levels within Arkhangelsk, but not at the international level, even though they recognize that similar battles are being fought by indigenous peoples elsewhere. However, like some actors in Norway, they note that the privileges should be given equally to all of those engaged in traditional subsistence, whether they are indigenous or not: “the state should [take the] approach that if you live in absolutely identical conditions, it is equally difficult for you to survive in a remote village” (kolkhoz chair, Russia).

Even if indigenous resource rights are granted, however, the requirement that resources be given to indigenous people only allows access to bioresources for personal consumption, and not for sale.

The Law of the Sea speaks about economic independence of coastal communities. We should [be able to] catch fish, sell it and live on this money the whole year . . . [it requires] recogni[tion of] the priority right to reception of these resources and in a sufficient volume to survive economically.

(Chair of the Belomor cooperative, Russia)

Comparisons of perceptions of fishing rights in Finnmark and Arkhangelsk

Despite the large differences in social and governance systems, interviewees in Finnmark and Arkhangelsk highlight similar general trends: an increasing limitation of resource access through the introduction of quota systems, a view that state legislation is limiting local access, and that there are increasing attempts to gain local resource access through, most prominently, indigenous movements. In both Finnmark and Arkhangelsk there is an understanding that local people—both indigenous groups and local residents in general—are living under similar conditions. The development in Norway of the Tana Fjord Project, for instance, is also an example of the attempts to develop more extensive resource rights for the region. Such regional rights do not currently exist for Arkhangelsk. In the Arkhangelsk region, people from

costal fishing communities have the same rights as anyone from the city. The increasing control of fishing in recent years has led to large penalties for people from Pomor fishing villages, who fish in the traditional way for their own subsistence.

Climate change

In both areas, interviewees said that in the last few years the weather has fluctuated outside of what they considered to be the normal range: winters have become milder, with less snow, and autumns have become longer. Most interviewees also described some unusually warm recent years; this is consistent with the observation that 2005 was globally the warmest year in the instrumental record (beginning in 1880), with the Arctic making a large contribution to this warming (Richter-Menge et al. 2006). Temperature is one of the main factors that determine the distribution of fish stocks and species: cod—of considerable importance locally—haddock and herring would be expected to move northwards under the projected climate change scenarios (Loeng 2005). Warming at high latitudes should result in an increase in the total biological production, with longer growing periods, increased growth rates and, ultimately, an increased general productivity and a higher volume of fish (Watson et al. 1998; Anisimov et al. 2007). Consistent with such predictions, the interviewees noted that sea temperatures might rise, and that this might have an impact on where fish populations occur, and thus on their availability to fishers with small boats. Changes in the behaviour of individual species as a result of climate change could interact with fishing patterns to increase variations in fish stocks. Warmer temperatures are seen as changing fish migration patterns. However, apart from specific case-study results, the literature does not detail the potential adaptations that this may result in for fishing communities. For instance, an Intergovernmental Panel on Climate Change report notes that:

Currently, little is known about how communities and individuals, indigenous or non-indigenous, differ in the way risks are perceived, or how they might adapt aspects of their lives (e.g. harvesting strategies) in response to negative change.

(Anisimov et al. 2007: 673)

The results below evidence a strong interconnection between climate change and changes in the economic and market context, as well as the regulative and technological context, e.g., the type of quota permit, the coastal reach of small-boat fishing, and existing fishing industry technology and traditions.

Changes towards warmer temperatures could be positive in increasing fish stocks, but this would not necessarily have a direct positive effect on fishing quotas, and the economic situation of fishers and their livelihoods. “[That there will be more fish] that might well happen, but if . . . the quota increases with it we do not know . . . if it will reach the fisher in the boat” (interviewee from the Norwegian Fishermen’s Sales Organisation).

On the other hand, potential problems are also noted. If the prevalence of fish parasites, even those that do not reduce quality, increases, this may affect the market.

It can cause a great deal of damage in the market and in getting people to eat fish and such . . . one [time] in the 1990s . . . the saithe had . . . *kveiste* [parasites], and the entire German market dried up in just one day.

(Interviewee from the Norwegian Fishermen’s Sales Organisation)

For many interviewees, a more severe impact would be a change in the geographical distribution of fish species, a development seen as being likely (Loeng 2005). This scenario in particular illustrates the regulative character of environmental systems in fishing. If, for instance, the more southern species such as mackerel were to become more common off the northern Norwegian coast—something that some interviewees perceived was already happening—it would not necessarily be something that northern Norwegian fishers could benefit from.

We have not needed a fleet for fishing for mackerel and herring . . . That requires capital and all of that, also permits . . . you need to have a mackerel quota. You need to have a thick wallet if you are going into herring and mackerel fishing.

(Interviewee from the Norwegian Fishermen’s Sales Organisation)

An additional problem would be if the geographic distribution of fish species overall were to change, and fishing were to become less accessible to coast-bound fishers. In the Russian case-study area, interviewees noted that the warming of the seawater has resulted in a somewhat different distribution of fish, with cod moving northwards. Because of this non-conventional distribution of fish, and the fact that the ice has receded to the north, the last three years have brought benefits to trawlers. However, such changes in fish distribution may mean that coastal fishers, who are not allowed to transgress the 12-mile limit (except for fishing from ice floes and near the shore), may not be able to access their target species. For instance, the head of the fishing collective farm Red Banner notes that “quotas are defined by different species of fishes—cod, haddock, halibut, herring. Our vessels only have the equipment to catch bottom-feeding species

of fish—cod and haddock”. Any change in the distribution of species could thus potentially have a large impact. Interviewees also observed that storms and strong winds may become more frequent, further impacting small boats in particular.

In Norway, similar impacts have been perceived: “if the fish don’t come to the coast due to the temperature of the water, the small-scale fishing fleet does not have a chance” (interviewee from Finnmarks Fiskarlag, the fishers’ association of Finnmark). Small boats find it more difficult to cope with storms, do not have the equipment for fishing out at sea, and are prohibited by regulation to fish further from the coast than some 10 nautical miles. Moreover, some consider that the fishing industry in northern Norway does not have the equipment to handle new species, or a tradition of smaller-scale mackerel processing, for instance. A change in fish species (Loeng 2005; Anisimov et al. 2007) would also require different sales networks.

These potential problems are consistent with descriptions by Vilhjálmsson & Hoel (2005) that indicate changes in migration patterns may result in different resource availability to different groups of vessels, potentially aggravating political conflicts between ocean-going fisheries and coastal fishing-dependent communities, which are already vulnerable because of depopulation and economic marginalization. Given the increased global competition for scarce resources, Norwegian industries may be negatively affected because of their high labour costs. Although the industry, as well as the management regimes, are used to adapting to the availability and accessibility of fish stocks, the crucial unknown is whether climate change may cause change beyond familiar levels, and beyond potential coping or adaptation scales (Vilhjálmsson & Hoel 2005). Moreover, it is very difficult for the interviewees to gauge the likelihood of different changes, given the considerable uncertainties involved.

Conclusion and discussion: local adaptive capacity in the context of social and climatic vulnerability

The description above has illustrated that the adaptive capacity for coastal fishing is to a large extent dependent on regulation, legislation and market mechanisms that are situated beyond the local community. Market mechanisms have resulted in increased competition, and changes in the economic and employment structure of the regions: as an example, the production structure in Finnmark has changed from the once-dominant frozen fillet production to fresh fish production as a result of the high social costs in Norway. In the Russian case-study area, the situation for small-scale fishing can to a large

extent be seen as a result of resource rights being assigned under a market system, thereby reducing the possibility of local units to provide the social security that to date has been their responsibility. The main political or regulative adaptations would, according to interviewees, fall under national-level changes in regulations that would afford northern small-scale fishers greater economic leeway. Examples might be changes in the decommission order (Kondemneringsordningen) and quota distributions, which could be effected by changing decision-making structures or Finnmarksloven (Norway), changes in the system for quota distribution by auction and acknowledging rights to bioresource use for local communities, with respect to not only subsistence but also income from sales (Russia). In both case-study areas, interviewees also place themselves in the context of governance frameworks beyond the state, such as the ILO Convention no. 169 or the 1982 Law of the Sea, and the implications these could be interpreted as having on their states. Adaptations to climate change are also seen within the context of a governance system in which the quota system and regulations for coastal fishing restrict responses to fish-stock migration and new species. Fishers generally note that they have relatively little influence on this decision-making system. Interviewees thus pose the question of whether the present management is sustainable, and suggest that local small-scale fishing would need to be a political preference to create the prerequisites for adaptation in the sector, and to secure its existence as a viable industry.

Community adaptation on the local scale can only deal with adaptations that fall within the economic remit of the regulative and legislative framework set by, in this case, the state. A focus on governance highlights and problematizes the possibilities of adapting to climate change, which are, among other things, the result of limited access to higher levels of decision making. The present marginalization of local concerns may also be a result of existing power structures, where the situation benefits other groups (at other localities or broader interest groups). The study also illustrates that in these areas the larger economic and market context, rather than local conditions, may determine a large part of the adaptive capacity for localities (in contrast to the community adaptation examples provided by, for instance, Ford, MacDonald et al. 2006; Ford, Smit et al. 2006; Smit & Wandel 2006). The case of fishing communities in north-west Russia also illustrates the higher vulnerability to climate change among local societies that are dependent on subsistence resources (see Ford, MacDonald et al. 2006), in comparison with societies where technology and well-developed physical and social infrastructures can be used to reduce dependency on the environment

(for instance, by cold storage, central heating or developing technologies such as fish farming that lessen the dependency on fish-stock fluctuations). This limits the possibilities for local adaptation overall.

Especially in the Russian case, given the dependence of local communities on the social infrastructure supported by local income, state-determined limits on resource use, which focus on the market for distribution of resources beyond a certain level, are a determining factor, creating a catch-22. This applies to a number of features, including the lack of capital available to collective farms, which are unable to obtain loans, and thus the resources necessary to purchase quotas, and thereby fail to gain access to electricity or to possibilities for improving infrastructure. Fishing kolkhozes are losing out in competition for quotas on account of the social and community costs that they need to bear, severely limiting the resources for adaptation to change in the area. As a result, the governance or decision-making framework set by the state for determining access to resources, as well as the terms of social services, is a main determinant of social vulnerability and adaptive capacity. Many of the perceived problems and adaptations suggested for dealing with these hinge on the regulative framework at the state level, which determines resource rights, and thereby also determines the economic opportunities available (e.g., bank loans for competing economically within the system). The main resource problems lie in the conditions for supply, and not demand, as the necessary sales networks and business connections are already in place.

On balance, local coastal fishing in both case-study areas may be considered as relatively vulnerable, particularly in comparison with other actors in fishing. The limited provision of social security in the Russian case makes small-scale fishing particularly limited in its possibilities for adaptation. Local vulnerability is differentiated on the individual level, depending on fishers' access to quotas, but is limited generally by what is seen as an unfavourable policy framework that is influenced by a complex of large-scale interests, especially on the national level, including financial and economic interests. Environmental feedback, economic feedback and the increasingly competitive demands of the world fish market are filtered through this regulative system.

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