# Questioning Complacency: Climate Change Impacts, Vulnerability, and Adaptation in Norway

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Article
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Most European assessments of climate change impacts have been carried out on sectors and ecosystems, providing a narrow understanding of what climate change really means for society. Furthermore, the main focus has been on technological adaptations, with less attention paid to the *process* of climate change adaptation. In this article, we present and analyze findings from recent studies on climate change impacts, vulnerability, and adaptation in Norway, with the aim of identifying the wider social impacts of climate change. Three main lessons can be drawn. First, the potential thresholds and indirect effects may be more important than the direct, sectoral effects. Second, highly sensitive sectors, regions, and communities combine with differential social vulnerability to create both winners and losers. Third, high national levels of adaptive capacity mask the barriers and constraints to adaptation, particularly among those who are most vulnerable to climate change. Based on these results, we question complacency in Norway and other European countries regarding climate change impacts and adaptation. We argue that greater attention needs to be placed on the social context of climate change impacts and on the processes shaping vulnerability and adaptation.

## INTRODUCTION

Climate change in Europe has been framed as a global problem that mandates regional actions to reduce greenhouse gas emissions (1). Although climate change mitigation is the foremost objective of European climate policy, some climate change appears inevitable and is likely to have impacts on European society (2, 3). Climate change may alter natural ecosystems; influence the productivity of agriculture, forestry, and fisheries; increase the risk of floods, erosion, and wetland loss; and result in increased costs to the insurance industry (4, 5). Regionally, it appears that southern Europe will experience disproportionately negative impacts through increased risks of water shortage and fires; decreased crop productivity; negative impacts on winter ski resorts; and negative health effects including heat stress, respiratory illnesses, and vector-borne diseases. The impacts in northern Europe generally appear to be less severe and in some cases even advantageous, with agricultural productivity likely to increase, and tourism and outdoor activities assumed to benefit (6).

Most European assessments of climate change impacts have been carried out on sectors and ecosystems (4, 5, 7, 8). For example, the A Concerted Action towards a Comprehensive Climate Impacts and Adaptations Assessment (ACACIA) report for the European Union examined climate change impacts for different sectors and ecosystems using scenarios generated by global circulation models (4). A recent study by the European Environmental Agency likewise assessed sectoral climate change impacts and considered the long-term implications (5). Although these assessments identify numerous potential adaptation measures, adaptation often appears as an afterthought, with an emphasis on technological solutions. Seldom do such assessments consider how adaptations will be implemented, by whom, and why. Although there have been some national efforts within Europe to promote stakeholder-led discussions on adaptation, notably through the UK Climate Impacts Programme (UKCIP) (9, 10), these represent exceptions to the general picture described above. The majority of European-wide studies demonstrate the nature and extent of the climate problem, but provide an insufficient understanding of what climate change really means for European society (7).

This limited perspective on climate change impacts, vulnerability, and adaptation generates complacency. Complacency can be described as a lack of awareness of potential dangers and an accompanying self-satisfaction that no action is needed to adapt to climate change. This is manifested in many parts of Europe as inertia in terms of local, national, and regional actions to address the impacts of a changing climate on society. Although there may be several reasons underlying this complacency, a sectoral or narrow investigation of impacts perpetuates complacency by failing to capture critical aspects of climate change impacts and adaptation.

In this article, we present and analyze findings from recent studies on climate change impacts, vulnerability, and adaptation in Norway, a rich country that is expected to experience relatively "benign" climatic changes in a European context (4, 11). We integrate the findings with the aim of identifying the wider social impacts of climate change. Three main lessons can be drawn: First, the potential thresholds and indirect effects may be more important than the direct, sectoral effects. Second, highly sensitive sectors, regions, and communities combine with differential social vulnerability to create both winners and losers. Third, high national levels of adaptive capacity mask the barriers and constraints to adaptation, particularly among those who are most vulnerable to climate change. Based on these results, we question the commonly held view that Norway is "safe" from climate change and can easily adapt to impacts. We argue that within European research, greater attention needs to be placed on the social context of climate change impacts and on the processes shaping vulnerability and adaptation.

## CLIMATE CHANGE IMPACTS IN NORWAY

In Norway, many potential impacts of climate change are assumed to be positive or less adverse than in other regions, such as southern Europe or sub-Saharan Africa (6, 12). Although the petroleum sector has emerged as the most significant contributor to the Norwegian economy, the economy remains dependent on climate-sensitive sectors such as agriculture, forestry, fisheries, aquaculture, and hydropower. From a national perspective, some of these sectors could seemingly benefit from climate change. Where negative impacts will be experienced, a high national adaptive capacity is assumed to enable adaptation. As a nation, Norway scores well in factors that determine adaptive capacity, including

wealth, technology, education, information, skills, infrastructure, access to resources, and management capabilities (13). Well-developed disaster compensation funds have contributed to a perception that the government will cover the costs of extraordinary climate events (14). As a consequence, adaptation has received little research and policy attention in Norway. This is exemplified by its peripheral treatment in Norway's national climate change research programs and its near absence in the Government White Paper on Climate Policy (15, 16). Norway thus serves as a good example of climate change complacency in the wider European context.

Although no comprehensive country study of climate change impacts, vulnerability, and adaptation has been carried out in Norway, a collection of individual studies was undertaken to examine the socioeconomic impacts of climate change using diverse methodologies. Some of the studies were based on quantitative methods involving the statistical analysis of aggregated county-level data, mapping of municipal indicators of vulnerability, or econometric modeling. Other studies employed a qualitative approach, focusing on local-level analyses of vulnerability and adaptive capacity. Studies of region- or community-specific climate hazards over the last 10–15 years focused on coping strategies and long-term adaptation to climate variability. Below, we examine what these studies reveal regarding the different ways that climate factors influence groups, sectors, and regions within Norway.

## Modeling Results

Improved techniques for downscaling global climate models make it possible to gain an understanding of the differential exposure to climate change at the regional scale (17). Downscaled models for Norway project an increase in annual mean temperatures of between 1°C and 2.5°C for 2030–2049 as compared to 1980–1999, with the greatest warming occurring inland and in the north (18, 19). The same models project an increase in precipitation during autumn in the western part of Norway and during winter in the southern part (18).

Nevertheless, large uncertainties remain regarding future climate conditions both at the regional and local level, particularly for extreme climatic events not easily captured by downscaled models (20, 21). Norway's mountainous terrain and geographic location in a frontal zone present particular challenges to climate modeling. Preliminary results from downscaling based on different global models indicate considerable regional differences in predictions within Norway (22). Such uncertainties and discrepancies make it difficult to identify specific impacts and adaptations at regional and local levels. Nonetheless, the models demonstrate that climate change will vary considerably across Norway (13).

## Sectoral Studies

Just as climate change will manifest differently across regions in Norway, it is also likely to affect some sectors of Norwegian society more than others (13). Sectoral studies can be undertaken to identify potential impacts, based on general circulation model scenarios or analyses of current climate variability. The impacts of climate change on four sectors that play a prominent role in maintaining rural employment, livelihoods, and settlements are highlighted below. These sectors include agriculture, coastal infrastructure, transportation, and tourism.

*Agriculture*. Research has shown that agricultural production and incomes from certain crops are sensitive to interannual climate variability (23, 24). Studies also show that increased future warming may lead to a longer growing season and positive impacts on agricultural yields, with an increased effect progressing from the south to the north (24–27). Applying a regional climate change scenario from the RegClim project (28) in a statistical model, Torvanger et al. (24) predicted a 25%–30% increase in potato yields, with the largest increase in northern Norway. Using the same climate scenario coupled to crop yield models of Norwegian agriculture, Gaasland (27) calculated a 14% increase in wheat yields in the most productive agricultural areas of southeastern Norway. Forage grasses and potato yields were also found to increase. Applying an economic equilibrium model, Gaasland found that the current degree of self-sufficiency can be achieved with less state support (−15%) and higher economic welfare. However, challenging the positive results is the potential increased risk of incidents of pests and diseases, soil erosion, and nutrient deficiencies resulting from climate change (29, 30).

*Coastal Infrastructure*. Norway has an extensive coastline, along which more than 40% of the total population is settled, some in very small and isolated communities. Linked systems of roads, tunnels, bridges, ferries, electricity supply, and lines of communication are vital to these communities. Although sea-level rise is not considered a serious threat for Norway, Aunan and Romstad (31) concluded that it may have some negative impacts on infrastructure, particularly along the western and northern coastline. The possibility of an increase in the frequency and magnitude of storms, including storm surges, is indeed a concern along Norway's coast. On the first of January 1992, the western part of the country was hit by the strongest storm on record in Norway, resulting in damages estimated at 2 thousand million Norwegian Kroner (NOK), or approximately 300 million US dollars (32). Most of these damages were covered by private and government insurance schemes (33).

*Transport*. The mountainous geography and harsh climate of Norway pose challenges to regularity in transport, both in north-south and east-west directions. In recent years, an increase in just-in-time production and centralized storage facilities has raised the importance of inexpensive and timely transportation, both within Norway and internationally (34). Closed mountain passes, train delays and cancellations, road detours and other interruptions of transport activities impose economic costs that can negatively affect national supplies, as well as Norwegian exports. The transport sector has traditionally shown remarkable flexibility and adaptability when faced with climate-imposed irregularities. The state spends a significant amount of resources to maintain transport infrastructure, and alternative routes and modes of transport are usually available. Using the impacts of current climate variability on road transport as an analog, Askildsen (35) estimated the economic impacts of extreme weather events on goods transport. For example, heavy snowfall in northern Norway in the winter of 1997 imposed an estimated additional cost of NOK 23.9 million on the transport sector. These large costs were absorbed by transport companies, rather than the producers of goods or export products. Increases in the frequency or magnitude of extreme weather events may amplify these costs and potentially exceed the capacity of both transport companies and state authorities to cope with climate extremes.

*Tourism*. Recreational activities are deeply rooted in the cultural identity of Norwegians, and much of winter tourism focuses on snow-dependent cross country and Alpine skiing. Summer tourism is also focused on climate-dependent outdoor activities, including mountain hiking, fishing, rafting, and traveling to view fjords and glaciers (36). The tourism industry may gain or lose from changing climate conditions, but little research has been conducted in this area (37). Nevertheless, potential impacts of climate variability and change on tourism can be examined by looking at recent trends. For example, the

snow conditions in many areas have already been deteriorating as the result of higher winter temperatures. The number of days with acceptable snow conditions for cross-country skiing has been more than halved in Nordmarka, a popular skiing area of 300 $km^2$ situated just outside Oslo (38). Continued warming is likely to worsen skiing conditions in Nordmarka and other low-lying recreational areas.

## QUESTIONING COMPLACENCY

The sectoral impacts described above suggest that climate change may create significant but not insurmountable challenges for Norway, and in some cases benefits. However, additional impacts of climate change on society become apparent when the social context is investigated and when results are examined from a holistic, integrated perspective. Below, we present some lessons gleaned from Norwegian studies by posing three critical questions. The findings indicate that climate change impacts in Norway may not be trivial and that there will be challenges to climate change adaptation, whether to ameliorate negative effects or to take advantage of positive effects.

### What Are the Wider Impacts?

Indirect and unexpected effects of climate change created by the interaction between social and physical processes may be greater than the direct and linear projected sectoral impacts. Although sectoral studies provide snapshots of impacts at a particular point in space and time for a given change in climatic conditions, the full extent of impacts are inadequately represented by such studies (13, 39). This is not a new finding; many of the assessments of climate change impacts, vulnerability, and adaptation in developing countries emphasized integration of both methods and results to capture exactly these points (40). What is remarkable is that the emphasis in Europe remains skewed toward direct sectoral impacts, such that the wider impacts are often ignored or understudied.

Norwegian findings suggest that indirect impacts in a sector may be more important than the direct economic impacts. Aaheim and Schjolden (39) show that changes in demand for goods and services in one sector resulting from climate change will also affect other sectors. Linkages between sectors of the economy could create positive or negative side effects of climate change. For example, increased precipitation may not only affect the energy sector directly through increased hydroelectric production; increased temperatures may simultaneously result in reduced energy use in most economic sectors, in turn decreasing demand for energy. As a result, the positive gains from climate change in this sector may be less than expected. These linkages are seldom taken into account in sectoral studies (39).

Focusing only on the direct effects of climate change also ignores synergies and misses some of the larger and perhaps more serious impacts. For example, in the Barents Sea ecoregion of northern Norway, climate change may directly affect keystone species such as cod, capeline, or herring (41, 42). However, climate change will also influence the transport sector as ice cover is reduced in the Barents Sea (43). The effects of increased maritime transport of oil and other goods may lead to greater pollution, an increased risk of oil spills, and competition from new species introduced through ballast water, the latter effect further exacerbated by increasing ocean temperatures (44). Climate change impacts will thus result from interactions between fisheries *and* transport, as well as from each sector alone.

Within the tourism industry, Teigland (36) similarly found that although the direct effects of increased temperatures or rainfall on summer tourism appear negligible, the indirect effects, such as changes in biodiversity and altered landscapes, are potentially more important. Tourism in Norway is strongly linked to experiences of nature, thus such changes are likely to affect the patterns of tourism considerably more than the changes in temperature or rainfall alone (36, 45). Such synergistic effects are difficult to take into account through studies of the direct impacts on one particular sector.

In addition to indirect effects, climate change may lead to impacts that are nonlinear in nature (46, 47). Even if gradual changes appear insignificant and variability in conditions is tolerable, there may be thresholds of vulnerability, beyond which the impacts of climate change (both positive and negative) become evident and potentially irreversible. Although a potential collapse of the North Atlantic thermohaline circulation is the most obvious threshold of concern for countries like Norway that benefit from the warming influence of the Gulf Stream, other nonlinear effects have been identified in recent studies.

For example, above some threshold of temperature farmers in Norway may shift from cultivating one crop per year to two crops. Such a decision may also be linked to changes in winter snow cover, since below a certain threshold there may be increases in soil erosion or frost damages on exposed lands. A recent study indicates that soil erosion in agricultural fields in Norway could increase considerably with climatic changes due to increased number of episodes of freezing and thawing combined with intense rainfall (30). Within the tourism industry, Teigland (48) found that impacts tend to escalate once certain climate thresholds are passed. When a ski resort has experienced a threshold number of snow-free winters, it may no longer be considered an official destination for ski tourism. If ski tourism disappears, destinations risk losing their summer tourism as well, since many tour operators seek locations with year-round activities. Studies elsewhere in Europe have shown that the ski industry is particularly vulnerable in the years subsequent to snow deficits, as people tend to adjust their travel behavior based on past snow conditions (49).

For Norwegian agriculture, the direct effects of climate change on yields are probably less important than Norwegian agricultural policies. Policies to maintain "multifunctional agriculture" are aimed not at high yields, but at maintaining high levels of land use and rural employment (50). From a production efficiency point of view, Gaasland (27) estimated the economic surplus for agriculture to increase by NOK 1.4 thousand million, and state subsidies were estimated to decrease by NOK 2.2 thousand million under climate change. However, the gains were far lower, and potentially negative, when multifunctional agriculture is taken as the objective. The agricultural sector is currently struggling with several problems to which climate-induced production gains are unlikely to provide any direct respite. Not only are real incomes from farming dropping, the farming population is also aging and many among the younger generations migrate to the cities or find nonagricultural forms of employment (27). Despite its protectionist agricultural policies, Norway has experienced a drastic reduction in the number of farms over the past decades (23, 51, 52).

The above findings suggest that vulnerability and adaptation are dynamic characteristics that can (and will) change over time as the result of the interaction between socioeconomic, political, and physical processes. Increased trade liberalization, commercialization, export orientation, and specialization of agricultural production form part of increasingly globalized economies (53, 54). Many regions, sectors, and social groups both in

developing and developed countries are "double exposed" to the processes of climate change and economic globalization, and they will have to adapt to both processes simultaneously (55). A reduction in agricultural subsidies to rural communities related to the World Trade Organization (WTO) Agreement on Agriculture might, for example, exacerbate vulnerability to climate change.

## Who Wins and Who Loses?

Climate change, even if "beneficial" on a national or regional scale, is likely to create both winners and losers. The assumption that climate change will not be a problem for Norway becomes dubious when vulnerability is assessed at smaller scales (13). The combination of differential exposure, sensitivity, and adaptive capacity means that vulnerability to climate change will vary greatly within Norway (13). Even if some economically and socially important sectors—such as hydropower, fisheries, aquaculture, agriculture, and forestry—experience net gains in productivity, the benefits are likely to be unevenly distributed. Climate change is likely to have the largest impacts on the "Achilles heels" or weak points of societies and ecological systems (56). These include communities or individuals living in marginal areas or operating under marginal conditions. The complex regional and social distribution of winners and losers is concealed by aggregated sectoral analyses that ignore indirect and nonlinear impacts.

O'Brien et al. (57) mapped exposure to climate change as a composite index consisting of variables considered important to Norwegian agriculture. The indicators included autumn precipitation, spring precipitation, length of the growing season, frost/thaw days in spring and autumn, and winter snow depth. The index was first calculated for the current climate and then adjusted to account for changes under $2 \times CO_2$ conditions, based on results from RegClim (28). The results were applied to Norwegian municipalities using an interpolation function. The resulting map (Fig. 1) illustrates the differential exposure of agriculture to the impacts of climate change, based on the results of one climate model. Agriculture along the west coast of Norway, which is projected to experience increased precipitation, is likely to be more exposed to climate change than agriculture in eastern Norway.

In addition to uneven exposure, some areas in Norway are more sensitive to climate change because agriculture and related activities play a larger role in local economies. Furthermore, some communities have a higher adaptive capacity than others, depending on economic wealth, social structures, and previous experience with climate variability. O'Brien et al. (57) used some basic indicators of employment, demographic, and economic conditions in Norwegian municipalities to map adaptive capacity. The resulting map shows a clustering of municipalities in mid-Norway with lower adaptive capacity (Fig. 2). Even if climate change leads to positive benefits, these municipalities are likely to be less able to meet the challenges of changing conditions.

As a result of differentiated impacts, climate change may threaten important or desired goals in society, such as the viability of rural communities, cultural heritage, and social equity. In particular, it may influence regional equity and undermine Norway's regional policies at a time when these

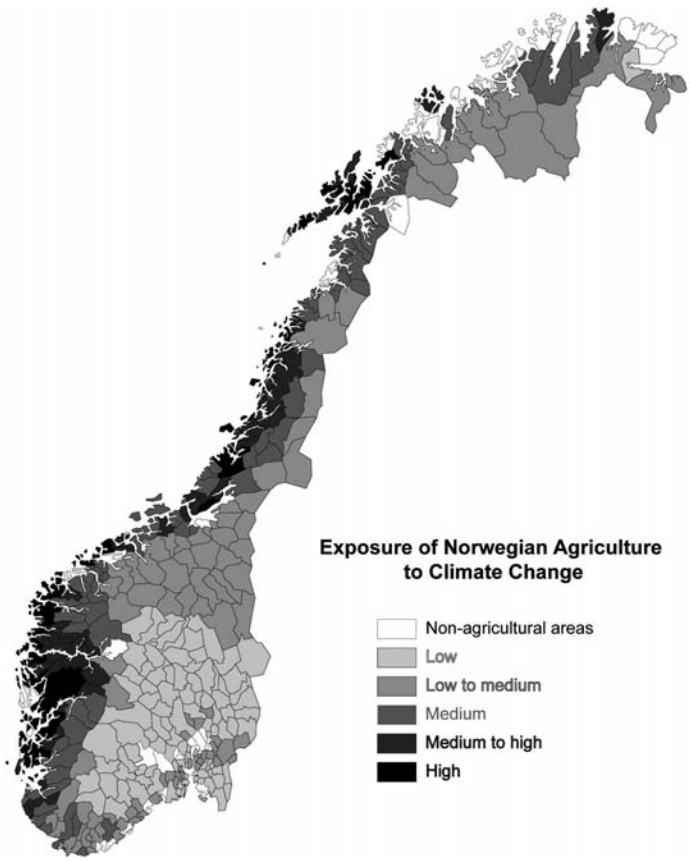


**Figure 1. Composite index of exposure of agriculture to climate change in Norway. The index is compiled from RegClim projections for spring and autumn rainfall, spring and autumn frost/thaw days, the length of the growing season, and average winter snow depth. The indices were calculated as absolute changes between the periods of 1980–2000 and 2030–2050. All indicators were equally weighted in the composite index.**

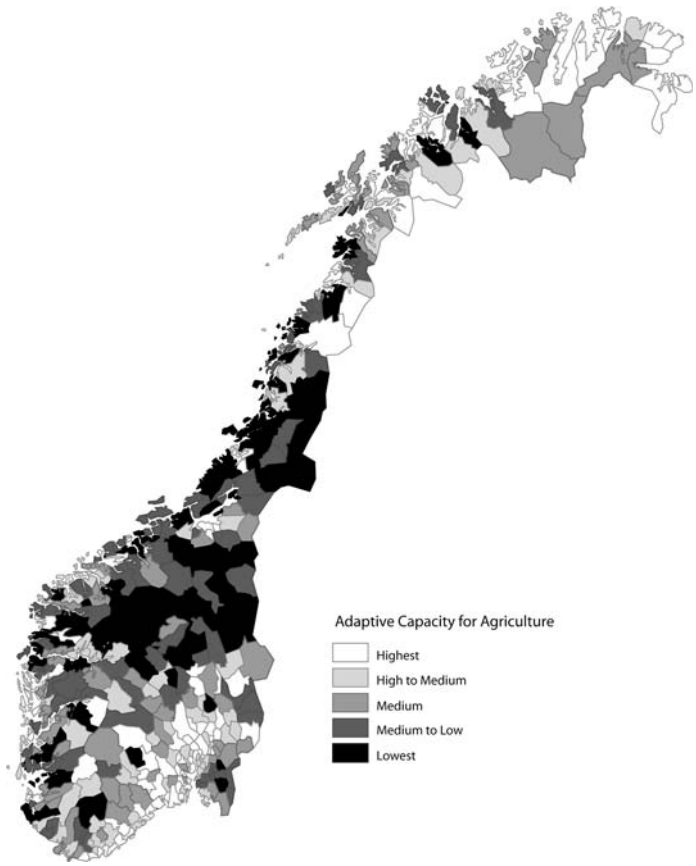


**Figure 2. Index of adaptive capacity in Norway. The index consists of municipal-level data representing socioeconomic sensitivity (the percent of the population involved in agriculture); economic factors (per capita income, state transfers per capita, employment prognoses); and demographic factors (age structure of the work force, migration rates, and percent of dependents—young and old—in the population), with each factor given one-third weight.**

policies are already being challenged by neo-liberal trends. Norway is an oil-rich country with a well-developed social welfare state, and about 35% of Norway's state budget is allocated to social programs, including social security and health services. Despite the assumed universal nature of social welfare benefits, there remains uneven coverage and growing inequity within Norwegian society. Although absolute poverty is virtually nonexistent, relative poverty exists, with large regional differences (58). Although Norway currently has a fairly homogenous population that enjoys a relatively high standard of living, it will, according to the Organisation for Economic Co-operation and Development (OECD), have to reform social policies and transfer programs to maintain the growth of the economy (59). With significant regional and social differences in adaptive capacity, the assumed ability to adapt to all change at all scales is not likely to hold. Oil wealth and high economic development have not leveled off these differences in the past, nor are they likely to do so in the future.

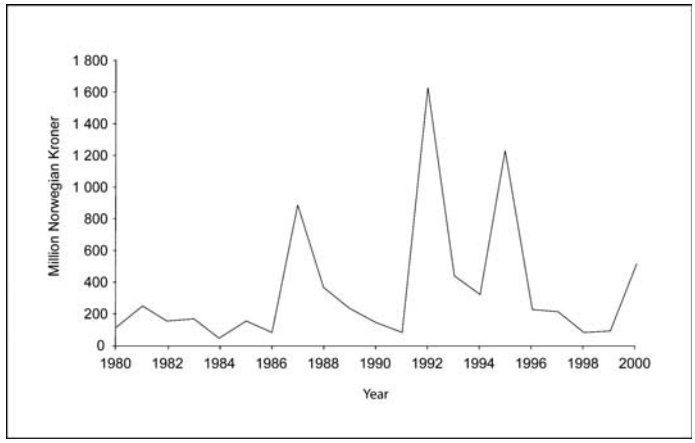


**Figure 3. Insurance disbursements for climate-related damages in Norway, 1980–2000, Norwegian Pool of Natural Perils (in NOK million). Source: Aandahl (65).**

### Is Adaptation Inevitable?

Adaptation to climate change may be neither inevitable nor automatic, even if impacts and adaptation options are well known and widely documented. Social processes also affect current and future adaptation to climate change, widening or narrowing the range of climate variation society can cope with (60, 61). The *process* of climate change adaptation has so far received little attention in Norway. In fact, most impact studies undertaken assume that adaptation will take place automatically, once the sectoral impacts are known.

There are several examples in Norway of situations where the capacity to adapt to current climate variability is flawed or may be narrowing. A flood in eastern Norway in 1995 caused massive damages and was in some areas the largest in 200 years (62). Despite considerable efforts to improve flood management after 1995, there are cases where municipalities have allowed new construction in affected areas without special measures to prevent future flood damages. A recent study of institutional responses to the 1995 floods concluded that current institutional frameworks provide weak incentives for proactive flood management at the municipal level (63). Pressures from powerful interest groups to develop business and residential housing often lead to construction in areas that are known to be exposed to floods, avalanches, or mud slides. Such findings support the need for more comprehensive studies of institutional factors determining sensitivity and mediating adaptation at the local level. Maladaptations are likely to occur if national adaptation measures are not developed in consideration of local conditions, including an understanding of the processes that shape vulnerability at the local level.

Further, the building sector is experiencing a loss of, or disregard for, traditional building techniques. During a severe storm in western Norway in 1992, most of the damages were caused to new buildings, whereas almost all old buildings survived with minor damages. Despite the existence of locally adapted knowledge regarding construction methods as well as, arguably, new technology and knowledge, housing structures are becoming less robust in the face of extreme events (15). In general, reduced incorporation of local knowledge in formal institutions and procedures, such as through employment of local "road guards," has constrained the ability to foresee climatic triggered events such as avalanches and landslides (14).

Many of the potential impacts of climate change will be experienced through changes in the magnitude and frequency of extreme events. So far, most of the costs associated with extreme climatic events have been covered by public and private insurance systems or absorbed by the private sector. Figure 3 shows that insurance reimbursements in Norway are highly correlated to the magnitude of extreme events, with the years 1987 (floods), 1992 (storm), and 1995 (floods) most notable. The principle of equal insurance premiums regardless of the natural hazard risk remains strong in Norway, but may be subject to increasing pressure with climate change (64). With a continued increase in reimbursement claims under climate change, one indirect effect may be an increase in insurance premiums. Alternatively, insurance companies may simply refuse to insure certain areas (e.g., flood zones), or demand compensation from municipalities if damages are incurred because regulations were not followed. Any changes to this climate "safety net" that is currently taken for granted can influence vulnerability in Norway.

Actual adaptation is dependent on a number of institutional, economic, social, and cultural conditions. There are often conflicting objectives among interest groups at the local level, and adaptation may not be a primary objective in society, isolated from other societal developments and goals (64). Indeed, adaptation considerations may be overridden by increasing cost effectiveness, migration, and economic globalization, in some cases leading to maladaptation. Faced with budgetary constraints, local governmental bodies are likely to be pulled between various power groups. Næss et al. (14) showed that institutional changes may restrict local flexibility and decision-making capacity and reduce incentives for proactive adaptation measures at the local level. Local power structures often favor economic, rather than environmental or adaptation-related considerations when making strategic decisions. For adaptation measures to be effective in individual sectors, they must be considered alongside ongoing societal and institutional changes (15).

## CONCLUSIONS

We have used Norway as an example of complacency toward climate change in Europe. Some national programs within Europe, notably the UKCIP, discuss the processes through which adaptation may be facilitated (9, 10). However, the general picture remains that studies of climate change impacts in Europe have disproportionately focused on direct impacts on biophysical systems and economic sectors. Indirect effects and differential vulnerabilities are often ignored through such studies. Furthermore, adaptation options have usually been discussed as add-on features, with little consideration to their feasibility in a societal context and little understanding of the processes through which adaptation occurs. This consequently

contributes to a widely held belief that climate change impacts are not a great challenge for most European countries.

However, the findings presented in this paper from studies of climate change impacts, vulnerability, and adaptation in Norway suggest that there is a need to focus on the social context and particularly on the processes shaping vulnerability and adaptation. Although the specifics of climate change and social contexts differ across Europe, the main implications of the Norwegian findings are likely to be important for other European countries. Similar to Norway, ongoing economic, social, demographic, and cultural changes in many European countries are likely to interact with climate change, creating critical thresholds that may not be evident when considering sectoral impacts alone. Climate change may threaten important goals of society, exacerbate existing inequalities, or trigger changes in communities already under stress from other social, economic, or demographic trends.

Further, the research shows that relationships between adaptive capacity and actual adaptation are complex, and there is little evidence of a direct, positive relationship. The high adaptive capacity of Europe compared with other regions is assumed to translate more or less automatically into required adaptation. However, the Norwegian case demonstrates that in many sectors or areas, adaptation is unlikely to occur without institutional and financial support. Conventional, scenario-based impact studies alone fail to capture key elements of vulnerability, impacts, and adaptation, thus perpetuating a view that "Norway is robust and resilient, and can deal with climate change." Faith that technological adaptations will be available to address sectoral impacts rests on a disregard for the social, economic, political, and institutional factors that contribute to vulnerability and adaptability. We thus argue that to evaluate and address climate change impacts in European countries such as Norway, the indirect effects, critical interactions, thresholds, and relative vulnerabilities need to be better understood. Adaptation in Europe is not inevitable, and thus demands attention in terms of both research and policy.

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