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Vulnerability to climate change in the High North – a threat to security and safety?

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Introduction

In part, this paper departs from WNRI's research on vulnerability and adaptation to climate change, as our field of research is neither security nor risk management, but climate policy at the local level of government and the adaptation capacity within different institutional systems, among them the civil protection authorities. Therefore, when we include political/national security issues in our discussion of vulnerability to climate change, we may be accused of being 'on thin ice'. Nevertheless, the possibility of abrupt climate change invites to broaden the scope of the concept of societal security, to look beyond the local societies we usually deal with at WNRI, and explore the possible outcome for Norway and our relation to other countries. This was an invitation we could not resist.

Our aim is to discuss the potential of climate change to threaten both security and safety in the High North, with special emphasis on the role of crisis management bodies. The following issues will be addressed in this paper:

1. Can climate change threaten security and safety in Northern Norway and its surroundings?
2. If so, what are the potential implications for the Norwegian system of civil protection, in terms of institutional change?

First we would like to make some comments on the links between security and safety. In his presentation of the scope and variety of the risk and vulnerability research, Hovden (2003) has provided a graphical presentation of the relation between *safety* and *security* (Figure 1). Here, 'safety' refers to unintended events such as natural disasters or accidents, while security refers to intended actions by human beings, e.g. terrorism, sabotage or crime. Hovden has arranged the two concepts at either end of an axis from danger (safety) to threat (security). Furthermore, he has added a second axis which distinguishes between endangered values on different levels: macro values, which pertain to national security, and micro values, which pertain to physical and material relationships, as well as the feeling of safety among the population (Ibid.). In this paper, we have chosen a somewhat different approach. Firstly, we suppose that risk and vulnerability is influenced not only by *events*, but also by gradual processes. In that respect, dramatic consequences of climate change may occur over time, such as rising sea levels (of course climate change can also trigger sudden events, notably at the local level, in the shape of climate-related natural disasters). Secondly, we question the implication of Figure 1 that the concept of security is restricted to deliberate acts. As we will argue in the following, the result of global warming – which we chose to view as unintended – may also have security implications.

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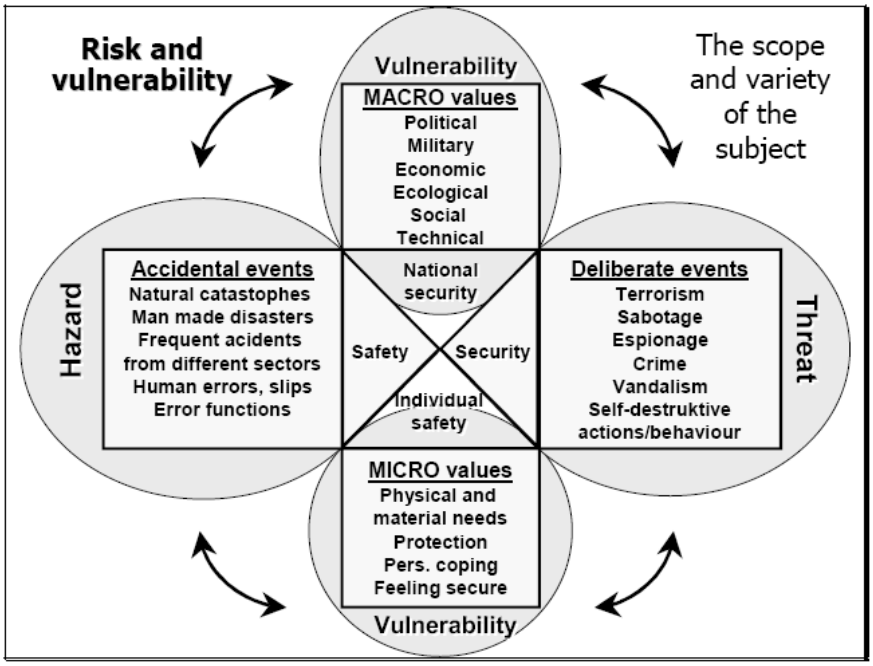

Figure 1: The vertical macro-micro perspective on risk management combined with types of hazards/threats and events (Hovden 2003)

The illustration in Figure 1 has also been used in an attempt to define and clarify the concept societal security. (Kruke, Olsen et al. 2005) proposed that societal security should cover the entire horizontal axis, while the lower part of the vertical axis, i.e. 'micro values' should be excluded from the concept.

1. Challenges associated with climate change

Two aspects of climate change will be crucial with regard to security: the *speed* and *magnitude* of changes in the climate system. These factors are partly interconnected; a rapid temperature rise would most likely cause extensive change, while a more tranquil and gradual course is expected to produce less comprehensive effects. Indeed, the duration of the transition period, until we manage to take control of the development or until the climate system is somehow stabilised, would also be of great importance. In general, it could be postulated that the faster and more extensive the changes, the greater challenges we will face in adapting. In the following, we will argue that both gradual and abrupt climate change has the potential to challenge security, but such problems are most likely to occur under the shifting and unpredictable circumstances of abrupt climate change.

The definition of *abrupt climate change* applied by the IPCC was given by the National Research Council (Alley, Marotzke et al. 2002):

> "(...) an abrupt climate change occurs when the climate system is forced to cross some threshold, triggering a transition to a new state at a rate determined by the climate system itself and faster than the cause. Chaotic processes in the climate system may allow the cause of such an abrupt climate change to be undetectably small."

To be denoted as *abrupt*, there is a prerequisite that climate change takes place so rapidly that human or natural systems have difficulties adapting (Ibid.).[3]

There is considerable palaeoclimatic evidence for abrupt climate change having taken place; most prominent is the example of warming in Northern Europe after the last ice age, with about half of the temperature rise taking place during a period of only ten years (Alley, Marotzke et al. 2002). In the following, we will discuss three examples of possible abrupt climate change, all with severe consequences for the Arctic and High North: A collapse of the Gulf Stream, accelerating sea level rise and a rapid meltdown of Arctic summer sea ice.

MOC collapse: A dramatic temperature drop in Northern Europe as a result of a rather unlikely, but still possible, collapse of the Atlantic Meridional Overturning Circulation (MOC)[4], of which the Gulf Stream is a part, is probably the most frequently discussed example of possible abrupt climate change (IPCC 2007a). In a study ordered by the Pentagon, Schwartz and Randall (2003) outlined a scenario based on an abrupt climate change event that took place some 8,200 years ago. A sudden cooling followed immediately after an extended period of warming, most likely triggered by a collapse of the MOC. Increased amounts of fresh water from precipitation and melting glaciers may have caused a decline in the sinking of cold, saline water in the ocean around Greenland, one of the 'motors' driving the North Atlantic arm of the global thermohaline conveyor. In the scenario, Europe experiences a drop in the annual average temperature of more than 3 °C in ten years, and the climate of Northwestern Europe turns colder, drier and windier, to a state more like today's Siberia. The scenario also includes 'megadroughts' in critical agricultural regions and lack of water in densely populated areas. According to Schwartz and Randall, possible outcomes of this situation may be food, water and energy resource constraints, leading to increasingly severe and violent conflicts between national states, as they become more and more desperate (Ibid.). Without considering the probability of this scenario, we would add that a dramatic climate change of this kind in the High North could lead to economic decline, disintegration of vital socioeconomic structures, followed by migration and political tension, or even open conflict. It can be argued that such a scenario contains speculative elements and do not deliver grounds for decision-making when it comes to adaptation strategies. Nevertheless, it illustrates how a thinkable future might appear, and highlights the fragility of society in the event of abrupt changes in the climate system.

Sea level rise: Changes in sea level as result of global warming is normally referred to in terms of gradual climate change. The reputable NASA physicist James Hansen claims that a mean global temperature increase of 2-3 °C (what he calls 'business as usual global warming') will inevitably lead to a sea level rise of several metres by the end of this century (Hansen 2007ba; 2007ab; Hansen, Sato et al. unpublished). A temperature change of this magnitude corresponds with the EU target of 2 °C maximum allowable temperature increase, which is the most ambitious climate policy ever adopted.[5] Hansen's assertion stands in contrast to the IPCC projections of global mean sea level rise, which vary between 19 and 58 cm during the 21st century – explicitly noting that the projections did not include calculations of possible dynamical responses of the ice sheets (IPCC 2007a). Hansen considers IPCC's use of these figures as misleading, and calls attention to evidence of dramatic sea level rise in the past (Hansen 2007a):

[3] This is a necessary but not sufficient prerequisite, which does not exclude the possibility of gradual climate change leading to adaptation difficulties.

[4] The Meridional Overturning Circulation (MOC) is restricted to the Atlantic sea, and is part of the Thermohaline Circulation (THC). While the first is a proved phenomenon, the latter is a theoretical concept describing a global ocean circulation or conveyor system.

[5] The 2°C target of the European Union has been translated into an upper limit for atmospheric greenhouse gas concentration of 450 ppm CO2-equivalents (contemporary level is 387 ppm, while pre-industrial level was 225 ppm).

> "[T]he palaeoclimate record contains numerous examples of ice sheets yielding sea level rises of several metres per century when forcings were smaller than that of the business-as-usual scenario."

Loss of sea ice: Arctic sea ice extent during the summer months has declined sharply in the last fifty years (Stroeve, Holland et al. 2007). In September 2007, the ice coverage reached a record minimum, declining by 42 per cent compared to the 1980s (Maslanik, Fowler et al. 2007). One important reason for the decrease in ice extent is a significant loss of the oldest and thickest parts of the remaining multiyear ice pack. The oldest ice types have more or less disappeared, and 58 per cent of the multiyear ice now consists of relatively young 2-and 3-year-old ice compared to 35 per cent in the mid-1980s (Ibid.). This process has been faster than projected by nearly any of the climate models used by the IPCC, indicating that these models may have underestimated the greenhouse gas response (Stroeve, Holland et al. 2007). According to the fourth assessment report from IPCC, published in 2007, late summer ice in the Arctic Sea is projected to disappear almost completely towards the end of the 21st century (IPCC 2007a). The dramatic summer meltdown recent years has raised concern among several scientists that we may experience an ice free North Pole in much shorter time: both 2013 and 2030 were expert estimates presented by the autumn of 2007.[6] The ice melting during the summer of 2008 has not been as dramatic, but an accelerating break-up of ice during the last few weeks has resulted in an opening of the Northwest Passage for the second year in a row. The ice minimum, which occurs within a couple of weeks from now, in mid-September, appears to be approaching the sensational level of 2007. This deepens the concern - at least among some scientists - that 2007 may represent a tipping point, the passing of a threshold indicating abrupt climate change in the Arctic. This is, however, a theory which may not be verified until the development has been studied in retrospect in about a decade.

An abrupt loss of summer sea ice in the Arctic would have a number of serious consequences for the climate system itself and for ecosystems, which may in turn influence the security situation in the High North. Once the multiyear ice is gone, it is not likely to be replaced. This is due to positive feedback mechanisms involving additional warming of the Arctic Ocean due to energy absorption in the dark sea surface (as opposed to ice with high albedo). Another possible effect is that warming of land in the Arctic and subsequent permafrost thawing and methane emissions might accelerate (Lawrence, Slater et al. 2008). Finally, there is great uncertainty regarding the impact sea ice decline may have on the distribution of fishery resources, as fish stocks are likely to move in response to changed access to nutrition and altered conditions for breeding. Possible direct security implications are numerous: The Arctic Sea, without multi-year ice, will lie open to a new scramble for resources, both minerals and hydrocarbons, under the sea floor. In an assessment of undiscovered conventional oil and gas resources in all areas north of the Arctic Circle, U.S. Geological Survey has estimated that this area, constituing 6 per cent of the Earth's surface, contains about 22 percent of the undiscovered, technically recoverable resources in the world. 84 per cent of these resources occurs offshore (USGS 2008). The planting of the Russian flag on the North Pole seabed last summer might be seen as a preparation for this new reality. New sea transport corridors will also be of strategic interest. A prolonged ice-free season north of Russia will probably pave the way for a renaissance for the Northeast Passage. If the Arctic sea ice extent continues to decrease with the speed currently witnessed, it will – in not too many years – be possible to sail between the North Atlantic and North Pacific Ocean via the North Pole during some parts of the year. International competition regarding resource

[6] See the lecture "Arctic Climate Change: Where Reality Exceeds Expectations" which *Mark Serreze* held at AGU Fall Meeting, San Fransisco 10-14 December 2007, at http://www.agu.org/webcast/fm07/.

exploitation, shipping and military strategic interests may challenge Norwegian interests in the region. A study by Norwegian Institute of International Affairs judges the increased availability to resources (i.e. hydrocarbons and fish) to be of greater political significance than the prospects of new sailing routes (Blakkisrud (Ed.), Bang et al. 2008). There are important, unsolved questions regarding the boundary on the continental shelf between Russia and Norway, and the status of the continental shelf around Svalbard (Orheim 2001). These are issues that may have to find their solutions under a quite different political climate than the one we experience today. If tension should occur due to resource exploitation on the Svalbard continental shelf, we cannot exclude the possibility that Norway's position according to the Svalbard Treaty might be challenged.[7]

Gradual climate change does not necessarily exclude the possibility of strain and peril to local communities or entire regions, despite the fact that society can more easily adapt to gradual than to abrupt climate change. It is widely recognised that gradual climate change might lead to an increase in – and new patterns of – natural disasters. This is due to extreme weather events, changed precipitation levels etc. (van Aalst 2006; IPCC 2007b). In the Northern Norwegian context, attention has been paid to climate-related natural hazards such as landslides, snow avalanches and flooding (Groven, Sataøen et al. 2006; Førland, Amundsen et al. 2007). Prevailing climate change scenarios for the region indicate a *gradual* change in temperature, precipitation and sea level rise during the 21st century (RegClim 2005; Vasskog 2007). However, no other region on Earth is expected to experience a more rapid increase in temperature than the Arctic. Based on the B2 emission scenario, which is a 'mid range' scenario, the temperature increase (average over the year) in the Arctic this century is projected to be 3-5 °C over land and up to 7 °C over sea. Temperature increase in winter is expected to be even higher (ACIA 2004). Such a strong temperature increase may lead to comprehensive changes in both abiotic and biotic systems. Thus, it is reasonable to assume that adaptation difficulties might occur due to the pace of change, even under conditions that are defined as gradual change.

The fact that vulnerability to climate change differs widely between local societies and between sectors, is one reason why vulnerability assessment and development of adaptation strategies should have a local society focus. A gradual change that hardly affects one community, may represent a severe threat to a neighbouring community. Examples of gradual changes with disastrous potential for local societies are sea level rise, shifting precipitation patterns leading to landslides in new locations or in unexpected forms. Even a relatively slow increase in sea level will eventually bring vulnerable coastal societies to a point where settlements and economic activity must be abandoned (but with a slow pace this situation will occur in a more distant future).

A region like the High North may also be exposed to impacts of climate change in other parts of the world. Destabilization due to a decrease in global grain production might come as a result of gradual changes in precipitation patterns (but can also be accelerated by abrupt climatic change).

As we have seen, national and international security may be affected by abrupt climate change. Even sea ice melting, the most likely and probably least dramatic of the three cases we have touched on, has the potential to trigger tension between national states. But it is when we go from the regional to the local level that the most obvious impact of possible abrupt

[7] The 'Treaty concerning Spitsbergen' of February 9, 1920 declared the arcipelago of Spitsbergen (now called Svalbard) a part of Norwegian territory. Despite Norwegian sovereignty, not all Norwegian law applies. All signatories (today, this includes 40 states) were given equal rights to engage in commercial activities on the islands, a right currently exercised by Russia and Norway.

climate change appears. It is in the individual local societies people will have to cope with increasing sea level, heavy rain or may be drought, landslides, snow avalanches, flooding etc.

When focus is shifted from abrupt to gradual climate change, the local level emerges as even more important. As gradual, less dramatic climate change within a conceivable time span, say fifty years, will hardly pose a threat to national or international security in the High North, it can pose significant threats to safety at the local level. A case in point, the city of Hammerfest (in the County of Finnmark) is currently highly exposed to dry snow avalanches, to which the population and local authorities have adapted through advanced monitoring and warning mechanisms. Climate scenarios indicating a temperature rise and more frequent rainfall during the winter season have given rise to concern that the city will experience new forms of avalanches, namely water-saturated slush avalanches, which occur on very gentle slopes. This is considered to be a safety problem by municipal representatives (Groven, Leivestad et al. 2008).

We are aware that *political security* mainly refers to the security of national states and the relationship between them, and that an authoritative interpretation of *societal security* limits the concept to "relations that affect national institutions, norms that regulate interaction in the society, and critical infrastructure" (Kruke, Olsen et al. 2005). Hence, local societies struggling to adapt to climate change will, in many cases, not be covered by these concepts. However, although the impact of climate change in local societies will, to a great extent, fall outside the standard definition of security, and maybe also societal security, these impacts may in sum constitute such a considerable strain on society that they are raised to a level of national significance.

2. The system of civil protection

The public system of civil protection spans three levels of government – the national (the Directorate of Civil Protection and Emergency Planning), regional (the County Governors), and local levels (municipalities), although the latter are not formally part of the system. In the following, we will give a brief presentation of the national and regional level.

The Directorate for Civil Protection and Emergency Planning (DCPEP) is placed under the jurisdiction of the Ministry of Justice and the Police (MoJP), and boasts an employment figure of approximately 700. In addition to the staff at the Tønsberg-based headquarters, the organisation includes a total of 20 civil protection districts, five Civil Protection camps, five schools, and five regional inspectorates for electrical safety. With respect to civil protection, the DCPEP's main overarching function is to maintain a complete overview of the risks and unwanted events which pose a potential threat to society. Aside from the Director General and his staff, the DCPEP's head office comprises four departments: Research and National Preparedness; Fire, Rescue and Civil Defence; Prevention and Electrical Safety; as well as Industry, Products and Hazardous Substances. The Department of Research and National Preparedness deals most directly with adaptation to climate change.

Norway's 18 *County Governors* supervise civil protection work in the country's 431 municipalities on behalf of the Norwegian Government. All of the 18 County Governors have staff whose work is mainly within this field, though the internal organisation is subject to some variation. As the formal representative of the Norwegian Central Government in each county, the County Governor holds a pivotal role of coordination and supervision of civil protection work in the municipalities, and in other bodies of government in each county. The work of the County Governors in the realm of civil protection could be described in terms of three pillars: maintaining an *overview* of risks and vulnerability across the county (e.g. developing a County Risk and Vulnerability Assessment), *crisis prevention* (e.g. supervision

of municipal land-use planning), and *crisis management* (e.g. reactive tasks in the event of wide-ranging accidents, crises, or natural disasters) (Husabø 2008).

In the 1990s, the Norwegian system of civil protection experienced a shift which partly stemmed from the geopolitical relaxation following the end of the Cold War. As the emphasis on military risks declined, and as Norway experienced serious natural disasters (in particular, the New Year's Hurricane in 1992 and the flood in Eastern Norway in 1995), non-military risks were gradually pushed to the foreground (MoJP 2001:67; Serigstad 2003; Husabø 2008). A Norwegian Official Report describes the shift of the 1990s in retrospect:

> 'Until the 1990s, planning was more or less singularly geared towards war, but in later years, more emphasis is put on emergency planning and preparations for handling peacetime catastrophes and disasters' (MoJP 2001:67)

The gradual de-prioritization of the traditional military focus was not an explicit strategy embraced by the Norwegian Government at any given point in time. Rather, the change occurred over time, as a slow transition consisting of several small steps, with a culmination around 1998 (Serigstad 2003:59). Manifestations of this shift can be found in a number of governmental documents and decisions. Two Government-assembled committees played important roles in this respect: *the Buvik Committee* in the early 1990s and *the Committee on the Vulnerability of Society* (Sårbarhetsutvalget) in 1999-2000, chaired by former Prime Minister Kåre Willoch (Husabø 2008). It would be wrong to conclude that the focus shift of the 1990s has demilitarised the system of civil protection. Rather, it seems that peacetime crises of a non-military character have become subject to greater acknowledgement over the last two decades.

The DCPEP approached the issue of adaptation to climate change publically for the first time in 2003. At that time the climate adaptation issue was not defined or perceived as overlapping with the Directorate's fields of competence, and few in the organisation or the Ministry felt that climate adaptation should come to constitute a separate field of focus. This approach has been kept, and thus 'climate awareness' is being integrated in the Directorate's different departments rather than being handled by a new or separate unit (Husabø 2008). By 2004, a Governmental report to the Storting (MoJP 2004) devoted an entire chapter to the consequences of climate change for societal security and safety, with one of the DCPEP staff members contributing significantly as an author and advisor. This report signified a political acknowledgment of anthropogenic climate change (and adaptation) as a national challenge. The report also constituted a turning point in the sense that adaptation became an issue alongside mitigation. By 2007, climate adaptation had become an integral part of the concept of *societal security and safety*, demonstrated by several public statements by the DCPEP's Director Jon A. Lea. In May 2006, the DCPEP's effort to address the issue of climate adaptation manifested itself in an inter-ministerial 'coordinating group' headed by the Ministry of the Environment. The Norwegian Climate Adaptation Programme came into existence, and the DCPEP was assigned with the task of operating a secretariat for the programme on behalf of the coordinating group. This work has so far resulted in a document outlining an adaptation strategy, publicised in May this year (NCAP 2008).

The DCPEP deems the realm of crisis prevention to hold the greatest potential for improvement of all the realms represented in the County Governor's civil protection work (DCPEP 2006), and climate change contributes to the relevance of the field. Implementation of risk and vulnerability assessments (RAV) on municipal level is considered the most important tool in this crisis prevention work. RAV is a long-term risk mapping method focusing on catastrophes and crises. Two types of RAVs are particularly relevant here: general municipal RAVs pertaining to the entire municipality, and specific RAVs pertaining

to individual construction plans. The use of RAVs as part of both crisis planning and land-use planning at the local and regional levels has been strongly encouraged by the DCPEP for more than a decade, and in 2006 the Directorate has expressed great concern over the fact that three quarters of Norway's municipalities still lacked RAVs related to land-use planning, especially 'in times when extreme weather produces a heightened risk of slides and flooding'. A legal requirement for the use of RAVs is underway, but will not be implemented until 1 July 2009 (Husabø 2008).

Given a dramatic climate change challenging Norwegian security interests in the ways outlined above, what would the institutional consequences be for the Norwegian civil protection system? Let us indicate some possible outcomes:

1. The system of civil protection will give additional emphasis to climate adaptation measures, within the frame of today's organizational structure.
2. Adaptation to the new conditions will be organised under a separate ministry, in line with the proposal of the Committee on the Vulnerability of Society from 2000, to establish a ministry dedicated exclusively to societal security and civil protection.
3. The civil protection system may, of military and strategic reasons, take a step back to the predominantly military focus known from pre-1990s.

The *first* outcome outlined above is associated with the least degree of institutional change. The notion that organisational changes are not needed in the institution of civil protection is, however, somewhat dubious. The current Norwegian system of civil protection is guided by three basic principles: the principles of decentralisation[8], liability and conformity. These principles state that the distribution of tasks during crises should differ as little as possible from task distribution under normal circumstances, that matters should be dealt with at the lowest possible level of government, and as close to the crisis as possible (MoJP, NOU 2006:6, 1.4.2). Mainly, these principles are applied to crises, but interestingly, are being echoed in key documents on climate adaptation:

> 'Each individual sector is responsible for carrying out required risk and vulnerability assessments, and for establishing sufficient preparedness measures for natural hazards and disasters, the breakdown of critical functions, and other events related to climate change'.[9]

The notion that institutional rearrangements are not planned for (i.e. that there will be no establishment new bodies with an explicit responsibility for climate adaptation tasks), has also been put forward, quite explicitly, by DCPEP staff in the NCAP secretariat on several occasions. This raises the question of where the impetus for climate adaptation might stem from, if not from a body dedicated to climate adaptation, as voluntary climate adaptation has proved slow e.g. in Norwegian municipalities, despite long-standing encouragement from some of the County Governors' Offices and the DCPEP (the slow rate of adoption of RAV assessments provides one indication of this). Climate adaptation is, in part, the implementation of physical measures to counteract a changing climate, but it is also a method which starts off with mapping vulnerability and end up with identifying a set of practical measures, which are then implemented. The introduction of this mindset is not in itself costly or difficult, but getting municipalities across Norway to act requires a unified, national effort. Judging from today's situation, where little is happening outside a few, resourceful municipalities, the first outcome outlined above may well result in a national standstill in the

[8] Also known as the principle of subsidiarity.
[9] 'Klimatilpasning i Norge. Regjeringens arbeid med tilpasning til klimaendringene' (DCPEP 2008:9)

realm of climate adaptation - unless information, advice, incentives, or earmarked funding are introduced by the Norwegian Government or the DCPEP (either through the County Governors or directly). And yet, in areas where the effects of climate change prove extremely acute, or where other factors conducive to climate adaptation are present, the larger picture should be expected to coexist with other, local outcomes. Even today, there is considerable variation between Norwegian municipalities with regard to climate awareness and adaptation, with some pioneers and many 'laggards'. It has been suggested by the DCPEP that municipalities with a high number of inhabitants and large municipalities with a tertiary sector dominance are generally at the forefront with regard to climate adaptation. Municipalities with few inhabitants and primary sector dominance are, as a general rule, placed at the other end of the spectrum.

As for the *second* outcome outlined above, it seems quite obvious that climate adaptation will be more effective on a national scale if a Ministry of Societal Safety and Security is established and assigned with responsibility for these tasks. As previously touched on, the top-down pressure to introduce adaptive measures is currently almost absent, and many of the stakeholders which might consider embarking on a course of climate adaptation at the local level are still starved for clear information, instructions, advice and earmarked funding – all of which could potentially be provided by the Norwegian Government though a ministry. It is possible that a dramatic turn in the speed of climate change and the nature of local effects, coupled with a heightening of the security threat, could potentially elicit stepped-up action on the part of the current system of civil protection. Alternatively, it is plausible that suggestion of establishing of a separate ministry of societal safety and security, put forward by of the Committee on the Vulnerability of Society (chaired by former Prime Minister, as well as former County Governor of Oslo and Akershus, Kåre Willoch), shall see a renaissance. As part of their results and conclusions in 2000, the Committee suggested establishing a ministry dedicated to societal security and civil protection. Instead, a Directorate - the Directorate of Civil Protection and Emergency Planning - was eventually established on the basis of a merger between three former Directorates, under the auspices of the Ministry of Justice and the Police. Without doubt, the advantages of establishing a separate ministry would be numerous, the chief gain being that a minister may be held responsible for the performance of her or his ministerial staff, potentially strengthening the effort to ensure implementation of climate adaptation measures.

The *third* outcome outlined pertains to the geopolitical climate, which may change as a result of scarcity-driven conflicts or territorial conflicts related to climate change (e.g. over marine traffic in the High North), or any 'unrelated' political developments such as the territorial controversy between Russia and Georgia over South Ossetia and Abkhazia in August 2008. Should, for example, Russia fail to live up to its budding reputation as a quasi-Western democracy and push for a return to Cold War conditions, a plausible consequence might be a US-Russia freeze with wide ramifications, e.g. for Norwegian military and strategic policy, and indirectly also for the system of civil protection. If worse came to worse, one might fear that the transformation of the system of civil protection witnessed since the 1990s (partly as a result of learning experiences with natural disasters and a steadily decreasing level of military tension climaxing in the fall of the Soviet Union), could be reversed. This would be negative in the sense that much-needed attention and resources in the realm of climate adaptation could be channelled to the military realm as a consequence of a geopolitical chill.

Finally, we will discuss institutional aspects of the challenges posed by climate change for the system of civil protection in light of the analysis and theories of Perrow. In his book *The Next*

Catastrophe (Perrow 2007) he points at the inevitable failures of organisations, private and public, to protect the citizens of USA from natural, industrial and terrorist disasters. Based on a study of the government response to Hurricane Katrina and the 9/11 terrorist attacks (as well as other cases), Perrow concludes that adequate protection of society cannot be provided, as a result of organizational failure. Furthermore, he holds that the consequences of disasters are getting worse due to the increasing size of catastrophe targets. Perrow identifies three main sources of vulnerability: concentrations of *energy* (such as industrial storage of explosive and toxic substances, vegetation exposed to fire, and dams), concentration of *populations* (especially in risky areas), and concentrations of *economic and political power* (such as in the electrical power industry). The conventional approach to disaster management is to prevent disasters and coping with their aftermath (responding and damage limiting). In addition to this, Perrow says, we should reduce the size of vulnerable targets.[10] In practice, downsizing the targets means to decentralize vulnerable structures (e.g chemical industry, power grids), but also when it comes to the governmental bodies responsible for preparedness and crisis management, Perrow is sceptical of centralized and oversized organizations. This conclusion is partly based on the experience drawn from the Department of Homeland Security (DHS) and Federal Emergency Management Agency (FEMA) after 9/11.

If we apply Perrow's theory to a Norwegian context, we might claim that concentration of energy, populations and economic or political power is taking place here as well. Urbanization and population growth in floodplains and locations close to the sea, are challenging future resilience to climate-related natural hazards in Norwegian municipalities (Groven, Leivestad et al. 2008), and governmental assessments have identified deregulation of the power supply as a source of increased vulnerability of vital infrastructure (Husabø 2008). As for the Norwegian system of civil protection as a whole, it seems to meet the requirements for a decentralized structure. As a whole, the preparedness network spans public and private organisations, from the County Governors to the municipalities, the Police, municipal fire brigades, local divisions of the Norwegian Civil Defence, the National Home Guard, and land-based and marine rescue corps organised by the various voluntary rescue organisations. Recent natural disasters in Norway, such as the forest fires in Southern and Easetern Norway in the summer of 2008, have proven invaluable for realising of the value of access to local crews with in-depth knowledge in crisis situations. Proposed mergers of sheriffs' districts in Norway and a trend towards larger municipalities are examples of policies that might heighten the vulnerability of local communities. However, as long as the principles of decentralisation, liability and conformity are employed, and there is a clear emphasis on local participation under governmental guidance and supervision in the proactive and reactive parts of civil protection work alike, the current decentralized structure would seem to be an advantage for adaptation to climate change.

Conclusion

Can climate change threaten security and safety in Northern Norway and its surroundings? The answer to this question depends on several factors. It should be emphasised that future vulnerability to climate change depends not only on the climatic development. Vulnerability can be separated in three variants: natural, socioeconomic and institutional vulnerability[11] (Aall and Groven 2003). Institutional aspects have been discussed in the case of civil protection. Socio-economic vulnerability is subject to demographic and economic parameters

[10] Not all dangers can be reduced by downsizing of the targets: Some natural disasters, as earthquake, tsunamis or tornadoes can not be avoided that way, as opposed to devastation from more common sources such as high winds, water and fire damage (Perrow 2007:2-3).

[11] When it comes to security implications of climate change, one should perhaps add a fourth dimension to this scheme: international relationships.

and the way we plan and construct our society – in terms of physical infrastructure, housing, industry, etc. Our point is that, regardless of climatic development, the socioeconomic and institutional circumstances to a great extent determine what adaptation challenges we and our descendants will meet in the future.

Furthermore, the question of security and safety threats depends on the degree of natural vulnerability, i.e. the impact of natural forces on human society. In that respect, we may distinguish between *abrupt* and *gradual* climate change, where the latter gives more room for adaptation and avoiding grave consequences than the first. It seems likely that abrupt climate change may challenge security in the high north, whereas gradual climate change within a conceivable time frame of fifty years have less potential to destabilise the region. A possible exception from this assumption might be the indirect effects of gradual climate change in other regions on Earth, for instance drought affecting food prices. Gradual climate change may pose safety threats to numerous local communities in the High North, and the sum effect of strain at the local level may have implications for Norway as a nation.

What potential implications in terms of institutional change may climate change have for the Norwegian system of civil protection? Decentralization, which is a current feature of the system of civil protection in Norway, has so far proven successful with regard to maintaining a high preparedness level vis-à-vis natural disasters. A higher rate of progress within the field of climate adaptation should be expected in Norway within few years, in order to reduce the vulnerability level of local communities. Soft approaches, such as the County Governors' current mild encouragement of risk and vulnerability assessments in municipal land-use planning, have yielded limited results in terms of learning and awareness-raising in municipalities. There are, however, two prerequisites for achieving a development towards widespread climate adaptation. Firstly, a certain degree of top-down steering must be in place in order to ensure that the climate adaptation measures deemed necessary are implemented by municipalities and other stakeholders. Secondly, funding and other types of resources (e.g. for competence-building) should be allocated in the form of incentives or earmarking. The national policy on climate adaptation is still in the making, but it seems clear that the effort will somehow be stepped up within a few years. If the above-mentioned prerequisites of steering and access to resources are in place, a continued decentralised approach will clearly constitute an advantage for progress in the effort of adapting to climate change.

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