



VULNERABILITY AND ADAPTATION TO
CLIMATE CHANGE IN THE ARCTIC (VACCA):
IMPLEMENTING RECOMMENDATIONS

Julia S. P. Loe – Econ Pöyry (Pöyry Management
Consulting AS, Norway)

Ilan Kelman – CICERO (Center for International Climate
and Environmental Research - Oslo)



Document details

Econ Report no.	R-2011-059
Project no.	5Z110044.10
ISBN	978-82-8232-181-5
ISSN	0803-5113
Internal codes	JPL/MAN/ahe, HBR
Report finish date	9. December 2011
Accessibility	Public

Contact details

Oslo

Econ Pöyry

Pöyry Management Consulting (Norway) AS
Post Box 9086 Grønland,
N-0133 Oslo
Norway

Visiting address:
Schweigaards gate 15B,
N-0191 Oslo

Telephone: +47 45 40 50 00
Telefax: +47 22 42 00 40
e-mail: oslo.econ@poyry.com

Stavanger

Econ Pöyry

Pöyry Management Consulting (Norway) AS
Kirkegaten 3
N-4006 Stavanger
Norway

Telephone: +47 45 40 50 00
Telefax: +47 51 89 09 55
e-mail: stavanger.econ@poyry.com

<http://www.econ.no>

Enterprise No: NO-960 416 090

Copyright © 2011 Pöyry Management Consulting (Norway) AS

DISCLAIMER AND RIGHTS

This report has been prepared by Pöyry Management Consulting (Norway) AS and CICERO (Center for International Climate and Environmental Research - Oslo) for the Norwegian Ministry of Environment, in accordance with the Agreement between Pöyry and the Norwegian Ministry of Environment.

Pöyry accepts no responsibility, financially, legally or otherwise, for decisions made or actions taken based on the contents of this report.

Pöyry bases its analyses on publicly available data and information, its own data and data or information provided to us in connection with specific assignments. We always assess whether the quality of these data is sufficient for use in our analyses. We can, however, not guarantee for the quality and accuracy of data that we do not own the rights to. Uncertainty is an element of any analysis. As part of the documentation of the methodical approach used in our individual analyses, we always endeavour to point out and discuss factors of uncertainty.

All rights to this report are reserved and exclusively defined in the Agreement between Pöyry and the Recipient.

TABLE OF CONTENTS

ABSTRACT	1
EXECUTIVE SUMMARY.....	2
1 THIS PROJECT BUILDS ON THE EARLIER VACCA (VULNERABILITY AND ADAPTATION TO CLIMATE CHANGE IN THE ARCTIC) PROJECT	3
1.1 Climate change in the Arctic	3
1.2 The first VACCA (Vulnerability and adaptation in the Arctic) project provided a broad overview	5
1.3 This project provides specific recommendations for climate change adaptation in the Arctic	5
1.4 The need for analyses to promote and facilitate Arctic climate change related action is particularly addressed.....	6
1.4.1 Improvements have been made on explaining the project purpose and in expanding the Russian context and content	7
2 METHOD	8
2.1 Written material was used as background and support for recommendations	8
2.2 Semi-structured interviews were used to get the opinions of arctic peoples ..	8
3 CONCRETE ADVICE FROM ARCTIC PEOPLES	10
3.1 Four Arctic contexts have been identified.....	10
3.2 Coastal / non-urban recommendations	12
3.3 Coastal / urban recommendations	13
3.4 Non-coastal / non-urban recommendations	14
3.5 Non-coastal / urban recommendations	15
3.6 Cross-contextual recommendations.....	16
4 CROSS-CUTTING THEMES UNDERLINED BY INTERVIEWEES	18
4.1.1 The Arctic has specific adaptation challenges	18
4.1.2 Conflicting interests between traditional industries and development of new business areas in the Arctic	18
4.1.3 Municipalities depend on enthusiastic individuals for adaptation measures	19
4.1.4 Russian stakeholders seek increased cooperation.....	20
4.1.5 Short-term actions within long term-perspectives are needed	20
5 FURTHER RESEARCH PRIORITIES	21
6 CONCLUSIONS.....	23

7	APPENDICES.....	24
7.1	Exact deliverable indicators	24
7.2	Core survey questions	24
7.3	Table of interviewees	26
7.4	Principal policy and academic sources consulted	27

ABSTRACT

This report provides recommendations for how Norway's government could move forward with the results from the Arctic Council supported VACCA project, suggesting how concrete activities may be implemented and applied to policy and practice. Based on the results of interviews with Arctic peoples and people involved in Arctic work, combined with desk studies of relevant literature, four Arctic contexts are defined within the dividing lines coastal/non-coastal and urban/non-urban. This report provides up to five concrete recommendations within each context, recommendations for cross-contextual action, and specific projects for further research and action.

EXECUTIVE SUMMARY

This report provides recommendations aimed towards Norway's government¹, suggesting how concrete climate change adaptation activities may be implemented and applied to policy and practice. Further research priorities have also been identified.

Reducing vulnerability and implementing adaptation to climate change represents a significant challenge for the Arctic region. The Arctic Council supported VACCA (Vulnerability and Adaptation to Climate Change in the Arctic) project, approved in 2007, was designed to provide practical, useful knowledge and information sharing at different governance levels and for different sectors, so that these lessons learned could be incorporated into policies and decision making. This report follows up recommendations from the first VACCA project, in particular the third recommendation: "Produce a series of analyses and assessments to promote and facilitate Arctic climate change related action".

The suggestions presented in this report are based on in-depth interviews with Arctic peoples and people involved in the Arctic, combined with desk-top studies of relevant literature. Interviewees from all Arctic countries except from Greenland have been consulted, resulting in a total of 27 interviews, conducted face-to-face, via telephone/Skype or in the form of email consultations.

Based on the consultations, four Arctic contexts have been defined within the dividing lines coastal/non-coastal and urban/non-urban. This report provides up to five concrete recommendations within each context, as well as a list of recommendations for cross-contextual action.

The recommendations include involving Arctic peoples in decision-making processes; using traditional, local, and indigenous knowledge; improving conflict resolution mechanisms; supporting research on climate change adaptation in the region; increasing climate change adaptation awareness among Arctic peoples; increasing the opportunities to gain from the Arctic region becoming a more important resource base, combined with increased shipping activities; and implementing measures to increase understanding and cooperation between Russia and the other Arctic states.

The main goal of the project is to inform Norway's authorities on a national level about what people in the Arctic are experiencing, what they recommend and prioritise regarding climate change. The advice in this report is thus based on responses from interviewees who may have differing interests and different levels of knowledge. As such, the recommendations provided cannot be taken to represent the views of the report authors or funders, and some inconsistencies within the recommendations might be evident.

Further research priorities have been identified as mapping out the needs and actions for local climate change adaptation in Norwegian communities, including risk and vulnerability analysis in already developed areas; assessing how to support local Russian climate change adaptation projects; coordinating and linking observational networks; engagement of youth; and evaluating measures for conflict resolution in the Arctic.

¹ Mainly the Ministry of the Environment

1 THIS PROJECT BUILDS ON THE EARLIER VACCA (VULNERABILITY AND ADAPTATION TO CLIMATE CHANGE IN THE ARCTIC) PROJECT

1.1 CLIMATE CHANGE IN THE ARCTIC

Reducing vulnerability and implementing adaptation to climate change in the Arctic represents a significant challenge for the region. Some of the key findings regarding climate change impacts in the Arctic are summarised below.²

Figure 1 Key findings regarding climate change impacts on the Arctic

Climate change impacts on the Arctic
The past six years (2005–2010) have been the warmest period ever recorded in the Arctic. Higher surface air temperatures are driving changes in the cryosphere³
There is evidence that two components of the Arctic cryosphere – snow and sea ice – are interacting with the climate system to accelerate warming
The extent and duration of snow cover and sea ice have decreased across the Arctic. Temperatures in the permafrost have risen by up to 2°C. The southern limit of permafrost has moved northward in Russia and Canada
The largest and most permanent bodies of ice in the Arctic – multiyear sea ice, mountain glaciers, ice caps and the Greenland Ice Sheet – have all been declining faster since 2000 than they did in the previous decade
Model projections reported by the Intergovernmental Panel on Climate Change (IPCC) in 2007 underestimated the rates of change now observed in sea ice
Maximum snow depth is expected to increase over many areas by 2050, with greatest increases over Siberia. Despite this, average snow cover duration is projected to decline by up to 20% by 2050
The Arctic Ocean is projected to become nearly ice-free in summer within this century, likely within the next thirty to forty years
Changes in the cryosphere cause fundamental changes to the characteristics of Arctic ecosystems and in some cases loss of entire habitats. This has consequences for people who receive benefits from Arctic ecosystems
The observed and expected future changes to the Arctic cryosphere impact Arctic society on many levels. There are challenges, particularly for local communities

² AMAP (2011) *Snow, water, ice and permafrost in the Arctic*. AMAP (Arctic Monitoring and Assessment Programme) Secretariat, Oslo.

³ The cryosphere refers to frozen water on or near the Earth's surface, including for example, sea ice, glaciers, snow cover, permafrost, and ice sheets.

and traditional ways of life. There are also new opportunities

Transport options and access to resources are radically changed by differences in the distribution and seasonal occurrence of snow, water, ice and permafrost in the Arctic. This affects both daily living and commercial activities

Arctic infrastructure faces increased risks of damage due to changes in the cryosphere, particularly the loss of permafrost and land-fast sea ice

Loss of ice and snow in the Arctic enhances climate warming by increasing absorption of the sun's energy at the surface of the planet. It could also dramatically increase emissions of carbon dioxide and methane and change large-scale ocean currents. The combined outcome of these effects is not yet known

Arctic glaciers, ice caps and the Greenland Ice Sheet contributed over 40% of the global sea level rise of around 3 mm per year observed between 2003 and 2008. In the future, global sea level is projected to rise by 0.9–1.6m by 2100 and Arctic ice loss will make a substantial contribution to this

Everyone who live, works or does business in the Arctic will need to adapt to changes in the cryosphere. Adaptation also requires leadership from governments and international bodies, and increased investment in infrastructure

There remains a great deal of uncertainty about how fast the Arctic cryosphere will change in the future and what the ultimate impacts of the changes will be. Interactions ('feedbacks') between elements of the cryosphere and climate system are particularly uncertain. Concerted monitoring and research is needed to reduce this uncertainty

From such findings, people from many locations around the Arctic highlight that these changes will lead to more dangerous travel and hunting conditions along with more isolation of communities due to difficult travel. Particularly in North America, there is significant concern that climate change will exacerbate already existing and severe marginalisation, underdevelopment, and livelihood difficulties in Arctic communities. In some locations, existing social challenges are the key concern making the communities vulnerable to climate change, rather than climate change itself being the root cause of problems witnessed. There is hope that if the social problems could be tackled, then the communities themselves would be able to deal with many of the challenges brought by climate change. The social dynamic can be quite different in Scandinavia, so the recommendations in this report need to be considered in light of differences around the Arctic.

1.2 THE FIRST VACCA (VULNERABILITY AND ADAPTATION IN THE ARCTIC) PROJECT PROVIDED A BROAD OVERVIEW

The Arctic Council project, VACCA (Vulnerability and Adaptation to Climate Change in the Arctic), approved by the Arctic Council in 2007, was designed to provide practical, useful knowledge and information sharing at different governance levels and for different sectors, so that this learning could be incorporated into policies and decision making.⁴

Since the end of VACCA in 2008, the project has until now not been followed up formally, and the recommendations described in the final report have not been pursued as a full program. The material from the VACCA project provides valuable information in order to meet Arctic challenges related to vulnerability and adaptation to climate change. Consequently, Econ Pöyry (Pöyry Management Consulting AS, Norway) and CICERO (Center for International Climate and Environmental Research - Oslo) have taken the initiative to move forward with the VACCA results, justifying this project because it will build on the earlier VACCA work to aim for specific actions from the knowledge baseline. Combining academic input and in-depth knowledge from the earlier VACCA project, especially the survey, with external expertise on strategy and policy analysis will ensure a practical and applicable set of advice that can be used by the Norwegian government to follow up on its Arctic policy related to vulnerability and adaptation to climate change.

Within the Norwegian context, the NOU 2010:10 report, "*Tilpasning til eit klima i endring*"⁵, based on the work of the Climate Adaptation Committee, presents the committee's assessments and conclusions, providing an initial platform for climate change adaptation, which should be scoped out more. This is a national initiative, seeking to guide cross-sectoral tools and methods for climate change adaptation at all levels. This report is not in any way affiliated with the NOU report, but draws on the published material for context and connections.

While local action often seeks national support and advice, the development of national approaches also often seeks to be informed by local experiences and needs. A need is frequently articulated regarding hearing the voices of those being affected by climate change and needing to adapt.⁶ Arctic peoples, in being some of those most affected by climate change and not always heard in international venues, need the opportunity to describe their interests and recommendations regarding vulnerability and adaptation to climate change in the Arctic. Their recommendations should be included in the decision-making process for action.

1.3 THIS PROJECT PROVIDES SPECIFIC RECOMMENDATIONS FOR CLIMATE CHANGE ADAPTATION IN THE ARCTIC

This project builds on the earlier VACCA project to suggest specific recommendations for dealing with climate change in the Arctic primarily based on consultations with local peoples. The main target group is the Norwegian government, mainly the Ministry of the Environment. The key is to inform Norway's national level about what *people in the Arctic* are experiencing, what they recommend, and prioritise. It is important to note that the

⁴ Njåstad, B., I. Kelman, and S. Rosenberg (eds.). 2009. *Vulnerability and Adaptation to Climate Change in the Arctic*. For the Sustainable Development Working Group of the Arctic Council. Kortrapport/Brief Report Series no 12, Norwegian Polar Institute, Tromsø, Norway, <http://www.sdwg.org/content.php?doc=85>

⁵ NOU 2010: 10, *Tilpasning til eit klima i endring: Samfunnet si sårbarheit og behov for tilpasning til konsekvensar av klimaendringane*, Miljøverndepartementet, 15. november 2010

⁶ For an academic perspective, see Kelman, I., 2010, "Hearing local voices from Small Island Developing States for climate change", *Local Environment*, vol. 15, no. 7, pp. 605-619.

advice in this report is primarily based on responses from interviewees who may have differing interests and different levels of knowledge.

As such, a potential concern is that some recommendations might be perceived as being contradictory or unfocused. Rather than giving a final or fully consistent answer on what should be done regarding vulnerability reduction and adaptation, this report seeks to shed light on the *opinions and perceptions* “on the ground”. As such, the recommendations provided cannot be taken to represent the views of the report authors or funders and a possibility exists that factual inaccuracies occur in places. Nonetheless, insight is given into the opinions and perceptions of those living and working in the Arctic.

The consultations and recommendations focus on practical measures and steps that could and should be taken regarding climate change, according to the interviewees. The ultimate aim is to integrate vulnerability reduction and adaptation into governance and policy frameworks for Norway at all levels – international, Arctic regional, national, and local – but especially to better connect those governance and policy scales.

Specifically, answers to the following questions have been of interest:

- Based on the first VACCA project and the NOU 2010:10 on climate adaptation in Norway, a need for information and ideas exists on implementing local adaptation: how can international-regional-national-local interaction be supported?
- When seeking local, enabling frameworks for dealing with adaptation, who has which responsibilities? How can adaptation be integrated into already existing international-regional-national-local frameworks in, and otherwise relevant to, Norway?
- Within existing international-regional-national-local level connections and processes, how should adaptation be included? How should approaches by location, by sector, and by law/policy be balanced?

To address such questions, the focus of this work is on consultations with Norwegians from the Arctic as well as recommendations that could be implemented in Norway. Nonetheless, material and people from around the entire Arctic were consulted, because Norway and Norway’s Arctic do not operate in isolation. Instead, other contexts and perspectives can and should inform Norway to ensure that Norway’s VACCA-related actions are as comprehensive and integrated as feasible, geared towards Norway’s interests and needs, without neglecting those of other Arctic locations and peoples.

It is worth noting that climate change is not necessarily only negative – it may also provide opportunities for and optimism in the Arctic for certain sectors and interests. That does not justify climate change nor does it take away from the suffering that will occur due to climate change.

1.4 THE NEED FOR ANALYSES TO PROMOTE AND FACILITATE ARCTIC CLIMATE CHANGE RELATED ACTION IS PARTICULARLY ADDRESSED

Four principal recommendations emerged from the first VACCA project, which are updated here:

1. A better understanding of climate change related work that is ongoing around the Arctic, through an improved survey approach, as well as through considering mitigation and resilience in addition to vulnerability and adaptation.
2. Establish a (community-led) expert group, team, or network on climate change (impacts, vulnerability, adaptation, mitigation, and resilience) in the Arctic.

3. Produce a series of analyses and assessments to promote and facilitate Arctic climate change related action (covering impacts, vulnerability, adaptation, mitigation, and resilience).
4. Encourage and foster Arctic and climate change related collaborations, meetings, and projects (covering impacts, vulnerability, adaptation, mitigation, and resilience).

Recommendation 3 is the main one related to specific, concrete action for supporting Arctic peoples and communities in addressing climate change. Thus, it represents the main recommendation followed up in this report.

1.4.1 *Improvements have been made on explaining the project purpose and in expanding the Russian context and content*

The Norwegian government has been keen to seek specific actions on climate change in the Arctic based on the original VACCA work, but to improve that work as well. In this report, two particular aspects of the first VACCA project have been expanded and improved:

1. One concern expressed in connection with the first VACCA project was that it was unclear exactly who would use the material, how, or why. That was improved in this project by explaining explicitly these aspects so that (i) people were more comfortable responding to the request for information and (ii) responders would target their answers appropriately. The focus of this project on advice to the Norwegian government, rather than the Arctic Council more generally, assisted. Consequently, this project achieved specific, targeted recommendations for action, but geared towards the Norwegian context.
2. The first VACCA project confirmed that Russia's situation and perspectives are quite different from the other seven Arctic countries, especially in terms of governance and understanding of the vocabulary and topics. As well, Russian input was somewhat limited in the first VACCA project. For this project, a Russian research assistant was brought in as part of the project team and she used her own networks to contact people in Russian and to hold interviews and email exchanges in Russian. Consequently, this project achieved significant Russian input.

2 METHOD

The method comprised primarily consulting written material for background and context followed by in-person and email consultations with people living and working in the Arctic.

2.1 WRITTEN MATERIAL WAS USED AS BACKGROUND AND SUPPORT FOR RECOMMENDATIONS

Written material was consulted for background and context for the project, as well as to assist with formulating the recommendations⁷.

The material consulted initially was selected on the basis of prominent publications, authors, policy processes, or scientific processes regarding the Arctic and climate change. It comprised academic and non-academic publications. The former involved peer-reviewed papers in scientific journals, scientific books, peer-reviewed book chapters in scientific books, and scientific conference material. The latter involved policy reports, governmental and intergovernmental documents, popular science publications, and project/programme material.

Most material reviewed is in English with a few of the documents in Norwegian, although the Russian research assistant drew on her own background with Russian material to provide guidance regarding Russian perspectives. In particular, the Russian material in both Russian and English demonstrated that many approaches and priorities articulated in material on Arctic climate change are geared towards perspectives from the other seven Arctic countries without fully accounting for Russian viewpoints.

The main limitation encountered regarding this material was that not all gave solid or specific recommendations. Many provided general policy approaches or generic actions, without indicating the specific contexts of application, the specific mechanisms for implementation, or the responsibilities and resources required. The scientific material, in particular, was often information only, providing and analysing data, without always interpreting that for action, meaning that this project's staff completed such interpretation.

2.2 SEMI-STRUCTURED INTERVIEWS WERE USED TO GET THE OPINIONS OF ARCTIC PEOPLES

The consultations used a semi-structured interview guide⁸. Questions were deliberately left open-ended so that the interviewees could take the conversation in the direction that they wished, rather than adhering to a rigid structure. The guide was drafted by the project team and then presented to the target group for feedback, resulting in modifications to the questions as well as to the manner of presenting the material.

Then, the guide was piloted with individuals from the Arctic whom the project team knows, resulting in further modifications. In particular, the interview guide was modified to yield different versions for phone or face-to-face interviews, email lists, and social media. Some interviewees preferred phone/Skype discussions while others preferred to reply by email and to engage in email conversations. That was left entirely up to the interviewee.

Although most interviewees were happy to be identified, the reporting here is provided in a manner that retains the anonymity and confidentiality of the interviewees. Interviews were not recorded and transcripts were not produced.

⁷ The list of principal written material consulted is provided as an Appendix in Section 8.

⁸ The interview guide is provided in the Appendix in Section 8.

The interviewees were chosen among people with a special interest for or relation to the Arctic region, and the majority were academics, representatives of NGOs, or members of indigenous organizations. There was less representation from the government and private sectors, but those viewpoints were not entirely absent. Members of indigenous organizations primarily represented their own groups and expressed their personal opinions, while recommendations given by academics were to a large degree based on research on climate change. Most NGOs consulted had a special focus on reducing the negative effects of climate change.

Using personal networks, the networks of colleagues and the “snowball-method” (asking interviewees to recommend other relevant persons to consult), potential interviewees were identified and an extensive contact list for telephone interviews was created. In addition, the interview guide was publicised in seven email lists and three Facebook groups. The consultations generated 27 completed interviews including representation from each Arctic country, apart from Greenland (Denmark). Of particular note was the high participation from Russia – five Russian interviews plus one Russian expert outside of Russia – which was a specific goal of this project. The Russian participation was achieved by using a Russian research assistant to translate the interview guide and publicity email into Russian, conducting interviews in Russian, and then translating the key points into English and embedding those key points in wider Russian perspectives and contexts.



Murmansk, Russia (photo: Julia S. P. Loe)

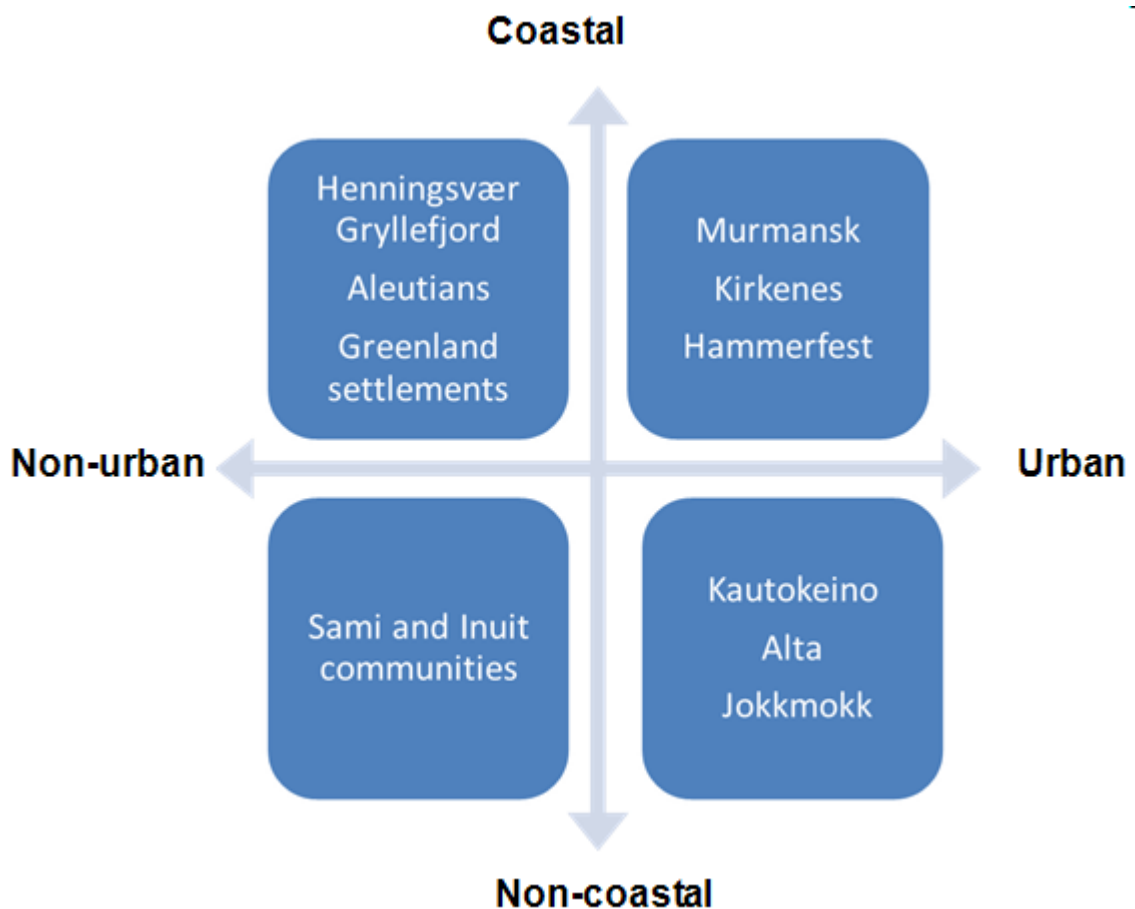
3 CONCRETE ADVICE FROM ARCTIC PEOPLES

3.1 FOUR ARCTIC CONTEXTS HAVE BEEN IDENTIFIED

This chapter contains the results from the interviews, formulated as concrete advice to the Norwegian government. Four Arctic contexts were identified, and up to five recommendations are given for each context, in addition to five cross-contextual recommendations. The latter is included because, while some recommendations were easy to place within one Arctic context, the consultations revealed that much advice from the interviewees was based on overarching perspectives covering many or most Arctic contexts. In order to reflect the breadth of the recommendations, we have thus included cross-contextual recommendations as a fifth category.

In consultation with the written sources, the target group, and the pilot interviewees, the four contexts were developed, and are provided with examples in Figure 2. Each axis should be seen as a gradation between the two endpoints, rather than any location being one or the other endpoint, despite the recommendations being presented in this fashion. Overall, this project did not set out to resolve these challenges nor to provide rigid, fixed, unchallengeable definitions. Instead, Figure 2 represents a guide for understanding vulnerability and adaptation to climate change in the Arctic.

Figure 2 The four Arctic contexts used for recommendations



Primarily, these contexts are appropriate due to the clear physical differences, which imply livelihood differences that exist across all Arctic countries. That is, urban and rural contexts are well-documented as being different in terms of the services available, the population to draw upon for work, and the livelihood and livelihood training opportunities. Similarly, the presence of the ocean is a significant factor in determining possible livelihoods and in access to certain resources, such as transportation routes and food types. An additional advantage of these contexts is that they are comparatively non-contentious, unambiguous, and mutually exclusive.

We also considered indigenous/non-indigenous as a dividing line, but decided not to use it due to potential controversies. Many Norwegian Arctic communities are mixed regarding indigenous and non-indigenous populations, so, for some locations, it might be unfair, or controversial to label them as one or the other.

Yet urban/rural and coastal/non-coastal divisions are not entirely free from ambiguity. Defining an “urban” situation in Northern Norway is not always straightforward, given the various sizes of the settlements. We have not made an absolute limit for what is defined as “urban”, but considering that communities in Northern Norway with only a couple of thousand inhabitants are defined as “towns”, we have focused on whether the activities discussed are relevant for an urban setting – or performed mainly in rural areas.

When it comes to the coastal/non-coastal division, many towns sit at the end of fjords or behind islands, connected directly to the sea through salt water, yet sheltered and quite far inland from the open sea. Many coastal communities also have substantial livelihoods based on their inland side while inland communities, especially in Norway, are not always that distant from the sea or a port. Furthermore, some industries, like reindeer herding, are based on seasonal movement between different grazing lands, so that they cannot be categorized uniquely as coastal or non-coastal. The recommendations appear under the non-urban, non-coastal context, but may apply equally to the non-urban, coastal context.

Nonetheless, these four contexts display a certain degree of difference regarding expected climate change impacts. For instance, coastal contexts need to contend with sea-level rise and sea storms while non-coastal contexts are projected to experience higher temperature gradients and higher average temperature changes. Additionally, rural locations tend to have longer travel times and more difficult access routes to services than urban locations. Consequently, if climate change increases severe weather, then blocked roads and damaged transport infrastructure could suggest a need for increased self-sufficiency in rural areas compared to urban sites—withstanding the possibilities for larger towns to have their supply routes cut off due to extreme weather.

In the following four sub-sections of this chapter, some characteristics specific to each context are described along with recommendations for each context that relate to some of the characteristics. In conducting the consultations, many recommendations turned out to be non-contextual or they were raised for several contexts. Some interviewees did not identify any specific contexts, instead providing specific approaches that they felt were relevant to all locations, as frequently corroborated by those providing advice for their specific community. Therefore, a fifth set of recommendations was needed, for those which are cross-contextual. Those are given in the final sub-section.

3.2 COASTAL / NON-URBAN RECOMMENDATIONS

Examples of characteristics of the “Coastal/Non-urban” context

Illustrative examples of environmental characteristics to consider for climate change’s impacts:

- Sea ice thinning and retreating, along with later formation and earlier break-up.
- Changes to the wave regime, as that influences renewable energy potential and infrastructure damage.
- Storm surges and polar lows.
- Illustrative examples of livelihoods and social characteristics to consider for climate change’s impacts:
 - Marine living resources for livelihoods, e.g. fish farms, fisheries, and whaling.
 - Reindeer herding.
 - Increased likelihood of fossil fuel exploration and production near the shore.
 - Traditional knowledge, especially regarding natural resource based livelihoods and especially extreme weather.
 - Farming.
 - Tourism tending to be more accessible and desirable in the future.

- **Reorganize fishery quotas.** Climate change may yield new movement patterns for fish, including new species arriving. The Norwegian government should revisit fisheries quotas and regulations so that neither livelihoods nor ecosystems will collapse as a result of the changes. Additionally, local fishers could be allowed to fish for new species and thus benefit from potentially positive effects of climate change.
- **Finance readjustment projects.** In Northern Norway, although harsh weather conditions have always been a part of everyday life, climate change may lead to change in the extreme weather regime. That could pose a challenge to traditional crop rotation between farming and fishing livelihoods. The Norwegian government could provide livelihood-specific financing for livelihood readjustment and investment programs, both supporting adjustments in existing livelihoods and supporting alternative job opportunities, especially based on locally run, small-scale industries.
- **Provide conflict resolution regarding fish farming.** Sea surface temperature warming will likely lead to opportunities to expand fish farming further north. Given past and ongoing conflicts with fish farms in Norway and elsewhere, Norway needs to be pro-active in conflict resolution, especially in terms of balancing fish farming with wild salmon interests. Norway’s government could sponsor a action-orientated stakeholder workshop regarding fish farming in northern Norway under climate change, specifically aiming for working together to reconcile different interests for moving forward.
- **Manage marine living resources in the face of climate change.** Despite climate change, traditions regarding marine living resources, are still of high importance regarding identity and livelihoods for many Arctic populations. When formulating responses to climate change in the Arctic, Norway’s government should consult with

all stakeholders regarding the need for and impacts of different forms of managing marine living resources.

- **Consider marine, coastal, and terrestrial protected areas.** Ecosystems will experience significant stress under climate change, threatening species. Different forms of protected areas can ease pressures on ecosystems or can exacerbate problems. Norway's government should build on existing regimes to investigate the implementation of different forms of protected areas (e.g. sea parks, heritage areas, managed forests) for Norway with the full and fair participation of local people to determine which areas of the Arctic might require formal protection and which manner of protection is recommended within the context of local livelihoods.

3.3 COASTAL / URBAN RECOMMENDATIONS

Examples of characteristics of the "Coastal/Urban" context

Illustrative examples of environmental characteristics to consider for climate change's impacts:

- Sea ice thinning and retreating, along with later formation and earlier break-up.
- Changes to the wave regime, as that influences renewable energy potential and infrastructure damage.
- Storm surges and polar lows.
- Illustrative examples of livelihoods and social characteristics to consider for climate change's impacts:
 - Marine living resources for livelihoods, e.g. fish farms, fisheries, and whaling.
 - Industrial and commercial shipping using ports more frequently.
 - Increased likelihood of fossil fuel exploration and production close to communities.
 - Collective infrastructure can be present, such as schools, hospitals, ports, airports, large sewage systems, and water and wastewater treatment plants.
 - Collective institutions can be present, such as universities, colleges, government offices, policy centres, and advice centres.

- **Regulate the shipping and mineral industries.** Reduced Arctic sea ice could increase access to mineral sources, principally hydrocarbons, and seems likely to lead to increased shipping traffic, such as through the Northern Sea Route. This increases the chances for shipwrecks, contamination, and spills. Norway's government needs to take a leading role in regulating these industries along Arctic coasts, especially with regards to emergency management. Norway's government could continue using the Arctic Council to promote strict regulation of the shipping and fossil fuel industries in the Arctic, through both national and regional legislation amongst all Arctic countries.
- **Develop central harbours.** As Arctic sea ice diminishes, it might lead to significant interest in Arctic resources. For Northern Norwegians to take part in related industrial opportunities, Norway's government should investigate the need for and consequences of new infrastructure, e.g. central harbours. This may give Northern Norway the opportunity to be more self-sufficient and contribute to a positive drive for the region.

- **Assess industrial facilities and municipal services.** Industrial facilities and municipal services such as water and wastewater treatment must be assessed for climate change impacts on their emissions/effluents so that pollution prevention can be enacted before climate change fully manifests. This may particularly apply to Russia with Norway as a potential partner assisting with expected emissions/effluents under climate change.
- **Use principles of low-carbon urban development.** If fossil fuel resource extraction expands, then coastal communities are likely to develop. This should be done using the best available principles of low-carbon urban development and being proactive regarding addressing the challenges brought by population expansion in Arctic communities. Norway's government should examine the current laws, regulations, and guidance currently available to encourage low-carbon urban development and suggest changes to laws, regulations, and guidance to deal with expected population expansion.

3.4 NON-COASTAL / NON-URBAN RECOMMENDATIONS

Examples of characteristics of the "Non-coastal/Non-urban" contexts

Illustrative examples of environmental characteristics to consider for climate change's impacts:

- Freshwater patterns changing, such as precipitation, storm, and run-off regimes.
- Strong possibilities for wildlife and vegetation species that have not been seen before establishing themselves.
- Illustrative examples of livelihoods and social characteristics to consider for climate change's impacts:
 - Reindeer herding.
 - Traditional knowledge, especially regarding natural resource based livelihoods and especially extreme weather.
 - Farming.
 - Tourism tending to be more accessible and desirable in the future.

- **Facilitate dialogue between reindeer herders and other industries.** Norway's government should facilitate dialogue between reindeer herders and other industries across Scandinavia and Russia to ensure that reindeer herding remains a viable livelihood in the face of climate change. In particular, the existing rights of the reindeer herders should be monitored and followed up on, so that the reindeer herders are not always on the defensive regarding their rights and livelihoods. This may improve the opportunity for compromise and cooperation between stakeholders with conflicting interests.
- **Increase flexibility in reindeer administration.** Climate change makes it harder to follow established grazing land regulations. Norway's government should continue to support increased flexibility in the reindeer administration so that the reindeer owners, to a larger degree, can choose which grazing land they access when. With flexible herding approaches, for example, reindeer herders could use existing knowledge about adaptation for sustaining their traditional industry.

- **Increase the price of reindeer meat.** The number of reindeer is, according to some interviewees, too high to achieve an ecological balance in Northern Norway. The Norwegian government could assess existing policy mechanisms to make the market more favourable to reindeer meat producers, such as considering if similar income could be obtained with fewer reindeer.
- **Use traditional, local, and indigenous knowledge.** Indigenous and non-indigenous peoples from the Arctic have long experience with changing environments, which may be valuable for dealing with climate change in the Arctic region as well as elsewhere. Norway’s government should continue to use and value this resource. By using existing knowledge, it will become clearer where knowledge gaps exist, and new research can be more precisely targeted, while excessive resources are not used to find out something that is already known, especially by people from the region.
- **Support the tourism industry.** Increased tourism may create job opportunities that can compensate for other ways of living being constrained by climate change, but locals need to know the advantages and disadvantages of tourism. The tourism industry needs to diversify their services in order to reach a broader market. Norway’s government should support the tourism industry in Arctic areas considering diversity and flexibility under climate change, such as through training, courses, and information through national, regional, and local tourism and business organisations.

3.5 NON-COASTAL / URBAN RECOMMENDATIONS

Examples of characteristics of the “Non-coastal/Urban” context

Illustrative examples of environmental characteristics to consider for climate change’s impacts:

- Freshwater patterns changing, such as precipitation, storm, and run-off regimes.
- Strong possibilities for wildlife and vegetation species that have not been seen before establishing themselves.
- Illustrative examples of livelihoods and social characteristics to consider for climate change’s impacts:
- Collective infrastructure can be present, such as schools, hospitals, ports, airports, large sewage systems, and water and wastewater treatment plants.
- Collective institutions can be present, such as universities, colleges, government offices, policy centres, and advice centres.

- **Provide education for people relying on snow/ice transport.** People relying on snow and ice transportation routes need education and training, which Norway’s government could provide, to understand the dangers that climate change will bring to these traditional transport methods. In particular, the changes in snow and ice conditions could mean that people need to entirely change their logistics for winter transport (this suggestion is from Russia and applies to North America as well. The interviewees did not mention it for Norway). This recommendation is clearly important for coastal areas too, and should not be neglected there, but it is placed in the non-coastal context to highlight that changes in snow/ice inland could be as lethal as for coastal locations.
- **Support research on consequences of mineral extraction:** Climate change opening up inland mineral extraction needs to be managed so that community

character is preserved and so that the temporary immigration does not bring more problems. Norway's government needs to support community workshops for exploring how inland mineral extraction under climate change would affect the nearby communities and to develop guiding principles.

- **Proactively monitor and manage forests.** The few studies that have examined climate change impacts in northern forests highlight that, for Scandinavia, the climate is projected to be wetter with one consequence projected to be even fewer forest fires than currently occur. The consequences, if any, of the increased rainfall and diminished fire ecology for forests has not been fully articulated, keeping in mind comparatively limited forest expanses in Northern Norway. Norway's government should consolidate the information available and institute a proactive forestry management regime under climate change. That will help to support forestry-related livelihoods while recognising and countering any potential threats that arise to forests or nearby communities from climate change.
- **Monitor insect-borne diseases.** Climate change affecting insect-borne diseases is frequently raised as a significant health concern in the Arctic and elsewhere, but empirical evidence for the Arctic is scarce. Inland areas can have particular concentrations of mosquitoes and ticks, so it is not known whether a real concern exists that non-coastal, urban areas will find themselves susceptible to increased rates of insect-borne diseases. Norway's government could implement a monitoring program, based in the communities, to be able to recognise quickly whether or not insect-borne diseases become an increasing concern.

3.6 CROSS-CONTEXTUAL RECOMMENDATIONS

- **Raise awareness and knowledge among Arctic peoples.** Some sectors have strong awareness of climate change's challenges and are actively seeking to learn more and to respond to that knowledge. Not everyone is at that level, with further awareness and knowledge potentially being important. Norway's government should identify the sectors and groups with different knowledge levels and seek to improve awareness amongst those with lower levels. Examples are tutorials, meetings, seminars, and online material that are proactively targeted at groups who might feel that they have little interest in the topic. That highlights a need to research mechanisms for bringing advice, training, and tutorials to Arctic peoples, especially those living in non-urban locations rather than forcing them to come to urban areas. Online, mobile phone, and self-guided courses targeted at non-urban people, on their own terms and in their own languages are highlighted⁹, especially for engaging youth, but also recognising that not everyone uses technology for education. Alternatively, courses could be given in people's homes or in community centres, religious centres, corner shops, and other community gathering places. The material and courses need to be presented in the local language and culture, especially building on traditional and local knowledge and connecting knowledge to culture and action. As part of engaging youth, they can be especially harnessed for such work, such as through offering financing, cooperation, and education credits to youth who get involved. That also has the advantage of the material and courses being supplied locally rather than everything seeming to be externally pushed. This approach also applies beyond Norway, in that the Russian interviewees emphasised that they seek wider European support for informing themselves about climate change and adaptation, such as developing step-by-step user guides with recommendations along with showing best practice examples.

⁹ Spare Time University <http://www.sparetimeuniversity.com> concepts and material might be particularly applicable.

- **Ensure participation of people affected:** Policies, laws, and regulations are needed for dealing with vulnerability and adaptation in the Arctic. Those should be developed, implemented, monitoring, and enforced with full and fair participation of the Arctic peoples affected, including minority groups within a community. Norway’s government should continue its facilitation and consultation processes on such matters to ensure that actions reflect the interests of Arctic peoples.
- **Develop Arctic infrastructure for climate change.** Harsh climate conditions have been a part of Arctic throughout human history and infrastructure has been developed for that. Climate change will likely entail alterations, such as due to increased coastal erosion due to less sea ice and unstable permafrost as it melts. The design regimes for Arctic infrastructure need to be changed and Norway’s government should be proactive in recognising the environmental changes that are expected and the consequences for infrastructure design and maintenance.
- **Maintain incentives to live in the Arctic:** Decreasing population in the Arctic can limit the opportunities (and incentives) to create viable adaptation solutions. Norway’s government should aim to keep current tax regimes and to support other incentives to attract people who will stay in and contribute to Northern Norway. Examples are writing off student loans for Arctic residents, encouraging recruitment of a high-competence work-force for sustainable rather than temporary industries in the north, and stimulating youth to pursue higher education or vocational training and then to settle in the north.
- **Support local climate observations.** People from Arctic communities are an important source of local observations to indicate how climate change and other factors are changing the micro-climate and environment. As observation networks for the Arctic and climate change are set up and expanded, Norway’s government should ensure that local observations are factored in and that the networks cover both environmental and social data.



Tourist mushing in Svalbard (photo: Ilan Kelman)

4 CROSS-CUTTING THEMES UNDERLINED BY INTERVIEWEES

In addition to the concrete recommendations, some cross-cutting themes and challenges were underlined by interviewees. In order to gain fully from the consultations, this chapter provides an overview and briefly discusses some of the commonly highlighted cross-cutting issues related to adaptation in the Arctic.

4.1.1 *The Arctic has specific adaptation challenges*

While some of the recommendations apply not only to Arctic communities, but to similar contexts within all of Norway and beyond, the Arctic region is in a special position regarding climate change and has specific adaptation challenges.

Firstly, climate change is happening faster in the Arctic than in many other regions, and the consequences are already being noticed. Secondly, the consequences of climate change, e.g. reduced sea ice levels, are expected to ease the access to hydrocarbon and mineral resources, and potentially increase shipping traffic. The Arctic has been highlighted as the next global “hot spot” for oil and gas developments while the Northern Sea Route has been described as a future rival of the Suez and Panama Canals – whether or not Arctic peoples want these developments. Thirdly, melting permafrost is another major, physical change relatively unique to the Arctic and that Arctic peoples and communities will need to deal with regarding housing, transportation, and other infrastructure. A final example is winter travel, for which traditional ice roads and ice routes over water, along with snow-based transportation, might no longer be reliable in many locations.

Furthermore, traditional industries already frequently differ with other industries. Reindeer herding as a traditional and still important Arctic livelihood, in particular, will be affected by climate change and specific adaptation challenges face reindeer herders. Increased industrial development around the Arctic may accelerate conflicts and endanger traditional industries and livelihoods of Arctic peoples and communities.

Nonetheless, cultural, social, and political differences between and within the eight Arctic countries exist. There are thus specific challenges in the Arctic that require special awareness among the Norwegian authorities, while recognising diversity within the Arctic region.

4.1.2 *Conflicting interests between traditional industries and development of new business areas in the Arctic*

Securing the Sami population’s opportunity to carry out their traditional culture and business activities is a Norwegian obligation¹⁰ and must thus be particularly considered when developing climate change adaptation policies in Northern Norway. As such, it is important to be aware of existing and potential conflicts amongst indigenous and non-indigenous Arctic stakeholders. Many laws and regulations protecting indigenous peoples’ rights already exist, yet, according to interviewees, these rights are often challenged, and it is not given that a right existing on paper is fully respected. Sami representatives ask for increased monitoring and enforcement of existing laws and regulations, so that they are not always on the defensive, fighting for rights that are clearly established. Some non-indigenous interviewees expressed concerns that some controversial issues might not be

¹⁰ NOU 2010: 10, *Tilpasning til eit klima i endring: Samfunnet si sårbarheit og behov for tilpasning til konsekvensar av klimaendringane*, Miljøverndepartementet, 15. november 2010, page 162

fully addressed due to political correctness. Awareness of these conflicts, potential conflicts, and especially the different perceptions are all important for working constructively in the Arctic under climate change. Where laws and rights exist, they must be applied and enforced. Otherwise, the key is facilitating a process involving all stakeholders.

4.1.3 *Municipalities depend on enthusiastic individuals for adaptation measures*

Some interviewees suggest that, due to lack of national strategies and guidelines, municipalities are left on their own to figure out how to deal with climate change vulnerability and adaptation in the Arctic. It is not required by law to have someone working on climate change in Norwegian municipalities or counties. In small municipalities, resources are scarce and prioritising is tough. Questions regarding adaptation are usually not prioritized because other challenges are perceived to be more pressing. If the municipality does not have someone who acts as a champion for climate change (“ildsjel”), then it is likely that the subject will not be addressed.

National guidelines and strategies are under development and are likely to be of help in tackling this problem. Norway’s government is also continually asked to provide direct support to municipalities for adhering to the national guidelines and strategies and for integrating climate change into already existing activities. That also overcomes municipalities’ concerns related to the need for national strategies or guidelines available now. In particular, if the municipality is proactive in dealing with climate change, then they might have to undo some of their efforts if a national strategy suddenly appears, differing from their actions undertaken. From that perspective, it is advantageous for municipalities to wait – until national initiatives (and possibly incentives) are available.



Henningsvær, Northern Norway (photo: Ilan Kelman)

4.1.4 Russian stakeholders seek increased cooperation

There is reportedly an information vacuum related to climate change and adaptation in Russia, with less focus on climate change and adaptation than in the other Arctic countries. Other and more acute problems are considered more important and scepticism towards Western-centric climate change approaches and perspectives is common. Nevertheless, several Russian interviewees dealing with environmental issues have asked for wider European support to deal with climate change, especially people working for local authorities, academia, and NGOs as well as indigenous people, as central authorities in Russia tend to be more focused on possible resource exploitation in the Arctic under climate change.

Cultural and language barriers represent a challenge for increased Norwegian cooperation with Russia. There is also a lack of knowledge about Russian conditions, limiting opportunities for interaction. By increasing the competence on and understanding of Russia within Norway, a potential exists for developing and leading a broader platform for pan-Arctic dialogue and experience sharing. One mechanism might be to emulate already existing, successful networks, with one example being the EALAT network¹¹. Baltadapt¹² for the Baltic Sea Region, UNEP's Barents Sea regional seas programme¹³, and NORRUSS¹⁴ are other models to consider.

4.1.5 Short-term actions within long term-perspectives are needed

Climate change is happening faster in the Arctic than in other regions. The interviews repeatedly revealed that Arctic peoples see a need for action being implemented as soon as possible, recognising climate change as a highly urgent topic. Simultaneously, they stressed the need for a long-term perspective when planning for climate change. Although some adaptation actions could require substantial investments, they can also be seen as an opportunity such as for upgrading current infrastructure, for generating self-sustaining livelihoods, and for implementing actions that should be executed anyway. Thus, adaptation could be used for improving living conditions for Arctic peoples and for sustaining Arctic communities despite climate change.

¹¹ http://icr.arcticportal.org/index.php?option=com_content&view=frontpage&Itemid=78&lang=en

¹² <http://baltadapt.eu>

¹³ <http://www.unep.org/regionalseas/programmes/independent/baltic/default.asp>

¹⁴ Russia and international relations in the northern Areas
<http://www.forskingsradet.no/servlet/Satellite?c=Page&cid=1226994122311&pagename=geopolitikk-nord%2FHovedsidemal>

5 FURTHER RESEARCH PRIORITIES

This project has highlighted opinions and suggestions from Arctic peoples and others with specific interests in and for the region. The results take the work from the earlier VACCA project one step further. The results also led to gaps identified and questions remaining to be answered. This chapter contains suggestions for further research priorities that have been identified by the authors during the project period. These are:

Further research priorities

- **Mapping out the needs and actions for local climate change adaptation in Norwegian communities.** To what degree is climate change adaptation seen as a challenge in Norwegian communities, what should be done, and who should do it? A key method would be working with counties and municipalities in conducting a risk and vulnerability analysis¹⁵ involving the local population specifically for climate change, but without neglecting the wider context of other hazards. Risk and vulnerability analysis has mainly been done for new projects, but the method could be applied to already developed areas experiencing challenges from climate change. That would assist in shaping development and adaptation decisions to be appropriate for Arctic peoples and communities under climate change. Sector-specific as well as place-specific analyses could be conducted; for example, to determine the risks/benefits and vulnerabilities of the health of people, livestock, and ecosystems under climate change.
- **Support for local Russian climate change adaptation.** This field of research would assess how Norway can support Russian environmental organizations with creating education and training materials and courses related to climate change adaptation. To compile, develop, pilot, and refine such material, an understanding of the Russian context would need to be developed through consultations with Russian partners, followed by developing and experimenting with material to test what works best.
- **Coordination and linking of observational networks.** Many observational networks exist in the Arctic, but they are not always connected or coordinated, especially in terms of seeking consistent baselines; linking environmental and social data; and combining external and local observations. Such techniques have been implemented in some ways in Norway and elsewhere, so they could be further adapted for and tested in Norway as part of recording and responding to climate change's impacts. That includes learning how to incorporate traditional, local, and indigenous knowledge into responses to climate change, especially at the national and regional levels.
- **Engagement of youth in the Arctic.** Arctic youth are a key element in adapting to climate change, particularly since they are the ones who will have to deal with climate change the most and who will be sustaining Arctic communities in the future under climate change. With the advent of new technologies and social media, engaging youth without losing traditional knowledge or their elders' experience becomes challenging. Techniques for engaging Arctic youth in dealing with climate

¹⁵ Risiko- og sårbarhetsanalyse (ROS)

change so that the youth stay in their own community and draw on their own culture and heritage are needed. Research would set up pilot projects led by youth to see how youth communicate, learn, teach, and act within the context of information on climate change. Areas such as sense of community, identity, health, food, water, and livelihoods are particularly important.

- Evaluate mechanisms for conflict resolution.** Many conflicts and competing priorities already exist in the Arctic and were identified as likely to be exacerbated under climate change. Examples are fish farms, protected areas, shipping, fossil fuel extraction, mineral extraction, reindeer herding, and wolves. National mechanisms in Norway for local conflict resolution exist already, but their effectiveness is not always evaluated. By analysing past Arctic conflict resolution processes and results, and by seeking transferability of conflict resolution lessons from non-Arctic contexts, as well as by following ongoing approaches, suggestions could be made for improvements. That would especially incorporate flexibility in adaptation responses that will be needed as climate change manifests in different ways.

Several interviewees contributed to the discussions surrounding research needs. One point made by some interviewees, which applies to all research work on the Arctic and climate change, is that research regarding the Arctic should always include involvement with institutions in the region. There should not be a situation where external institutions formulate, lead, and conduct the work without involving Arctic peoples at all. No claim was made that Arctic institutions should have a monopoly on Arctic work nor that Arctic institutions should have full control and leadership of all Arctic work. Instead, it is about ensuring the involvement and engagement with those being directly affected by climate change, while recognising that limited capacity in the Arctic means that non-Arctic institutions and personnel should have the opportunity to formulate, lead, and contribute to Arctic research activities in collaboration with Arctic peoples.

Another overarching research theme highlighted was indicating the transferability and non-transferability of adaptation measures from and to non-Arctic locations. As mentioned in Chapter 4, the Arctic has many unique climate change challenges as well as some which are not exclusive to the Arctic. When advice for Norway¹⁶ (or other locations) is provided regarding climate change, what applies and does not apply to the Arctic and exclusively to the Arctic?

Within that context, the goal of climate change related research for the Arctic should not be only research-based publications, despite the importance of those. An equally important goal is retaining the knowledge for action within the region, especially to transmit the knowledge to future generations. Open access approaches to knowledge generated can be valuable in this regard. Research endeavours should explicitly include such components, even if the project is not based in the Arctic. As part of such work, research activities can be used to educate and build capacity in the Arctic regarding climate change impacts and how to respond to those impacts.

As pointed out by one of the interviewees, research-based education is particularly useful and academic research should thus be linked to the Arctic academic institutions. In these contexts, Masters Degrees and PhDs are important, especially when training people from the Arctic so that they can (i) research their own communities regarding climate change and (ii) return to their communities afterwards to apply the knowledge that they have gained.

¹⁶ See <http://www.klimatilpasning.no> and <http://www.klimakommune.no> as well as *Tilpasning til ekstremvær under klimaendringer i norske kommune*. CIENS-rapport 4-2011, <http://www.ciens.no/5461>

6 CONCLUSIONS

Based on the consultations and consolidating the specific recommendations, overarching perspectives and themes emerge, framing the topic of vulnerability and adaptation to climate change. These seem to apply to both Norwegian and pan-Arctic contexts.

Of particular importance is involving local populations in vulnerability reduction and adaptation processes, through full and fair participation, as much as possible on their own terms. Competing interests exist regarding the Arctic and within the Arctic. Too often, those competing interests lead to conflict because local interests are not fully considered in decision-making. With the immense transformations occurring in the Arctic due to climate change and other factors, responses should be happening with the support of and inputs from the people living in the region.

Within that context, Arctic peoples highlighted their interests in livelihoods that would be viable despite climate change and that were embedded in their traditional knowledge and practices. There was strong recognition that the changes in the Arctic are happening and many dimensions are unavoidable. As such, not all traditional knowledge can be relevant for or can be maintained in the future. Aspects of livelihoods and culture will inevitably change—as they have changed for millennia under degrees of social and environmental change.

Yet the inevitable changes should not be compounded by further impositions of unnecessary changes. Elements within many external industries—such as shipping, mineral extraction, and even tourism to some extent—view the Arctic as a resource which will create wealth externally, even if that wealth is temporary. Instead, Arctic peoples have given strong advice that they would prefer limitations and controls on industries that endanger renewable resources and traditional Arctic livelihoods. That does not necessarily mean eliminating such industries, but ensuring that a balance acceptable to Arctic peoples is reached.

That entails a strong component of Arctic research on Arctic communities and peoples by the communities and peoples themselves. That does not exclude others, but collaborates with them—even with those outside the Arctic sometimes leading the work—so that research processes and outcomes support Arctic peoples in the face of climate change. Examples are conflict resolution processes, community-based adaptation, ecosystem-based adaptation, and flexible and diverse Arctic livelihoods; for instance, so that traditions can be balanced with the new environment and industries in the Arctic under climate change.

Throughout these processes of change, the key is to be listening to Arctic voices, even when those voices give disparate messages. Particularly in the Norwegian context, the role of central government is to facilitate local decisions, balancing the needs of different voices and interests, while ensuring that existing laws and rights are upheld. Successfully achieving such a balance could inspire similar processes in other locations around the Arctic. Consequently, Arctic peoples and others with interests in the Arctic can continue to exchange stories and to learn from each other to make the best of the difficult climate change situation.

7 APPENDICES

7.1 EXACT DELIVERABLE INDICATORS

Table 1 Indicators agreed and achieved

Indicator Name	Agreed Indicator	Result
Reports, documents, and publications consulted and used for establishing a baseline of material and contacts.	At least 30	47
Semi-structured interviews via phone, Skype, and email.	15-20	27
Arranging and facilitating meetings in Oslo with the main target group.	At least 2	4
One 20-30 page report.	20-30 pages.	30 pages plus front matter and back cover.
PowerPoint presentation summarising the results.	1	1
Definition Arctic contexts to develop specific needs for each of the contexts.	A minimum of 4	4, as well as recognising the importance of a cross-contextual category.
A list of prioritized actions to address climate change for each of the defined Arctic contexts.	Up to 5 for each context.	Each context has either 4 or 5 recommendations. Additionally, 5 separate recommendations are given that are cross-contextual.
An overview of topics requiring further research.	A minimum of 5	5

7.2 CORE SURVEY QUESTIONS

Depending on the media used (oral interview, email discussions, or social media); different versions of the interview guide were produced. Different versions were also produced in English, Norwegian, and Russian. In addition, given the open-ended nature of the survey, the interviewees were permitted to take the interview in the directions that they wished. Given these variations, only the core, summarised questions are provided here, which served as the generic guide for all forms of interviews and consultations.

Key questions

1. What would you suggest about specific policies and actions for vulnerability and adaptation to climate change in the Arctic?

(a) What is the policy or action?

(b) Who will implement the policy or action? Who is affected by it? Are local, national, and regional levels covered?

(c) On what timeframe should the policy or action be implemented? To what timeframe does it apply?

(d) What resources (time, money) are needed for those involved?

(e) Is your advice based on your own opinion (which is most welcome) or would you wish to provide supporting documentation?

2. Out of the policies and actions that you mentioned, which are really needed, being essential to survival of Arctic communities and peoples under climate change? Which are hoped for?

Demographic data

3. Do you wish to remain anonymous?

4. If not, then what data could you provide:

(a) Name

(b) Nationality/cultural background

(c) Contact information for follow ups (e-mail and telephone number)

(d) Place where living

(e) Place where working/position

(f) Interest in the Arctic (research? livelihood? personal experience?)

If you wish to provide more information (optional)

5. What is your interest in and knowledge about Norway's Arctic policies and actions focused on vulnerability and adaptation to climate change?

6. Do you have any specific geographic interests in the Arctic (examples could be regions, countries, islands, towns, districts, counties, or however else you wish to describe your place-based interests).

7. Do you have any specific sectoral interests in the Arctic?

8. Within the specific geographic and sectoral interests you have mentioned, what are, the greatest climate change challenges and opportunities

7.3 TABLE OF INTERVIEWEES

Table 2 Interviews, retaining anonymity

	Location	Urban Rural	Coastal Non-Coastal	Indigenous Non-indigenous
1	All (based in Alaska)	both	both	both
2	All (based in Iceland)	both	both	both
3	Canada, Labrador	Rural	coastal	indigenous
4	Canada, Labrador	Rural	Coastal	indigenous
5	Canada, Nunavut and Labrador	Rural	Coastal	indigenous
6	Finland, Lapland and Barents	Rural	both	both
7	Finland, Lapland and Barents	both	both	both
8	Norway	Rural	coastal	non-indigenous
9	Norway	both	both	non-indigenous
10	Norway	Urban	coastal	non-indigenous
11	Norway	Rural	Coastal	both
12	Norway	both	both	both
13	Norway	both	both	both
14	Norway	rural	non-coastal	indigenous
15	Norway	rural	coastal	indigenous
16	Norway	rural	coastal	indigenous
17	Norway	rural	coastal	both
18	Norway	rural	coastal	both
19	Norway	rural	non-coastal	indigenous
20	Russia	both	both	both
21	Russia	both	both	both
22	Russia	both	both	both
23	Russia	both	both	both
24	Russia	both	both	both
25	Russia	both	both	both
26	Sweden	Rural	Non-coastal	both
27	USA, Alaska	both	both	both

7.4 PRINCIPAL POLICY AND ACADEMIC SOURCES CONSULTED

- ACIA (2005) Arctic Climate Impacts Assessment. Cambridge University Press, Cambridge.
- AHDR (2004) Arctic Human Development Report. Stefansson Arctic Institute, Akureyri.
- Alsos, I.G., P.B. Eidesen, D. Ehrich, I. Skrede, K. Westergaard, G.H. Jacobsen, J.Y. Landvik, P. Taberlet, and C. Brochmann (2007) "Frequent Long-Distance Plant Colonization in the Changing Arctic". *Science*, 316: 1606-1609.
- AMAP (2011) Snow, water, ice and permafrost in the Arctic. AMAP (Arctic Monitoring and Assessment Programme) Secretariat, Oslo.
- Anderson, A. (2009) *After the Ice: Life, Death and Politics in the New Arctic*. Virgin Books, London.
- Arctic Frontiers conferences, held in Tromsø each January, <http://arctic-frontiers.com>
- Bravo, M.T. (2009) "Voices from the sea ice: the reception of climate impact narratives". *Journal of Historical Geography*, 35, 256-278.
- Climate Change and Water Management – Meeting the Challenges in the Barents Region*. 5-16 June 2011, Arkhangelsk, Russia <http://www.waterclimate2011.com>
- Corell, R.W. (2006) "Challenges of Climate Change: An Arctic Perspective". *Ambio*, 35(4): 148-152.
- Dana, L.P. (2009) "Community-based entrepreneurship in Norway". *Entrepreneurship and Innovation*, 9(2): 77-92.
- Drivenes, E.A. and H.D. Jølle (eds) (2004) *Norsk polarhistorie. Bd. 1-3*. Gyldendal, Oslo.
- Emmerson, C. (2010) *The Future History of the Arctic*. Public Affairs, New York.
- Forbes, B.C. and F. Stammer. (2009) "Arctic climate change discourse: the contrasting politics of research agendas in the West and Russia". *Polar Research*, 28, 28-42.
- Ford, J.D. (2009) "Dangerous climate change and the importance of adaptation for the Arctic's Inuit population". *Environmental Research Letters*, 4, paper 024006.
- Gearheard, S. and J. Shirley (2007) "Challenges in Community-Research Relationships: Learning from Natural Science in Nunavut". *Arctic*, 60(1): 62-74.
- Gearheard, S., W. Matumeak, I. Angutikjuaq, J. Maslanik, H.P. Huntington, J. Leavitt, D.M. Kagak, G. Tigullaraq, and R.G. Barry (2006) "'It's Not that Simple': A Collaborative Comparison of Sea Ice Environments, Their Uses, Observed Changes, and Adaptations in Barrow, Alaska, USA, and Clyde River, Nunavut, Canada". *Ambio*, 35(4): 203-211.
- Goldhar, C. and J.D. Ford (2010) "Climate Change Vulnerability and Food Security in Qeqertarsuaq, Greenland". Chapter 11 in G.K. Hovelsrud and B. Smit (eds.), *Community Adaptation and Vulnerability in Arctic Regions*, Springer, New York.
- Hall, C.M. and J. Saarinen (2010) "Polar Tourism: Definitions and Dimensions". *Scandinavian Journal of Hospitality and Tourism*, 10(4): 448-467.
- Hovelsrud, G.K, H. Dannevig, J. West, and H. Amundsen (2010) "Adaptation in Fisheries and Municipalities: Three Communities in Northern Norway". Chapter 2 in G.K. Hovelsrud and B. Smit (eds.), *Community Adaptation and Vulnerability in Arctic Regions*, Springer, New York.
- Hovelsrud, G.K., J. White, M. Andrachuk, and B. Smit (2010) "Community Adaptation and Vulnerability Integrated (CAVIAR)". Chapter 14 in G.K. Hovelsrud and B. Smit

- (eds.), *Community Adaptation and Vulnerability in Arctic Regions*, Springer, New York.
- Huntington, H., T. Callaghan, S. Fox, and I. Krupnik (2004) "Matching Traditional and Scientific Observations to Detect Environmental Change: A Discussion on Arctic Terrestrial Ecosystems". *Ambio*, Special Report Number 13, The Royal Colloquium: Mountain Areas: A Global Resource, pp. 18-23.
- IPCC (2007) *IPCC Fourth Assessment Report: Chapter 15 Polar regions (Arctic and Antarctic)*. IPCC (Intergovernmental Panel on Climate Change), Geneva.
- Laidler, G.J. (2006) "Inuit and Scientific Perspectives on the Relationship Between Sea Ice and Climate Change: The Ideal Complement?" *Climatic Change*, 78: 407-444.
- Laidler, G.J., J.D. Ford, W.A. Gough, T. Ikummaq, A.S. Gagnon, S. Kowal, K. Qrunnut, and C. Irgaut. (2009) "Travelling and hunting in a changing Arctic: assessing Inuit vulnerability to sea ice change in Igloodik, Nunavut". *Climatic Change*, 94: 363-397.
- Larsen, J.N., P. Schweitzer, and G. Fondahl (2010) *Arctic Social Indicators*. Nordic Council of Ministers, Copenhagen, <http://www.svs.is/asi/asi.htm>
- Macdonald R.W., T. Harner, and J. Fyfe (2005) Recent climate change in the Arctic and its impact on contaminant pathways and interpretation of temporal trend data. *Science of the Total Environment*, 342: 5-86.
- Many Strong Voices programme <http://www.manystrongvoices.org>
- Nelson, F.E., O.A. Anisimov, and N.I. Shiklomanov (2009) "Climate Change and Hazard Zonation in the Circum-Arctic Permafrost Region". *Natural Hazards*, 26: 203-225.
- Njåstad, B., I. Kelman, and S. Rosenberg (eds.) (2009) *Vulnerability and Adaptation to Climate Change in the Arctic*. For the Sustainable Development Working Group of the Arctic Council. Kortrapport/Brief Report Series no 12, Norwegian Polar Institute, Tromsø, Norway.
- NorACIAs klimascenarier for norsk Arktis
http://met.no/admin/filestore/Manus_NorACIA.pdf
- Nordic Council of Ministers (2010) *Arctic – Changing Realities, Conference Report 2010*. Nordic Council of Ministers, Copenhagen.
- Nordic Council of Ministers (2011) *Megatrends in the Arctic*. Nordic Council of Ministers, Copenhagen.
- Nuttall, M., P.-A. Forest, and S.D. Mathiesen (2008) *Adaptation to Climate Change in the Arctic*. A background paper prepared for the joint seminar of UArctic Rectors' Forum and the Standing Committee of Parliamentarians of the Arctic Region on February 28, 2008, at the Arctic Centre in Rovaniemi, Finland. University of the Arctic Rectors' Forum, Standing Committee of Parliamentarians of the Arctic Region (SCPAR), Rovaniemi, University of Lapland, Finland.
- Parkinson, A. and J.C Butler (2005) "Potential Impacts of Climate Change on Infectious Diseases in the Arctic". *International Journal of Circumpolar Health*, 64(5): 478-486.
- Rauken, T., I. Kelman, J.K.S. Jacobsen, and G.K. Hovelsrud (2010) "Who can stop the Rain? Perceptions of Summer Weather Effects Among Small tourism Businesses". *Anatolia*, 21(2): 289-304.
- Regjeringen Stoltenberg, 2009, Nye byggesteiner i Nord: Neste trinn i Regjeringens nord-områdestrategi, available from:
http://www.regjeringen.no/upload/UD/Vedlegg/Nordomr%C3%A5dene/byggesteiner_nord.pdf

- Rowe, E.W. (ed). (2009) *Russia and the North*. University of Ottawa Press, Ottawa.
- Russian Regional Environmental Centre and UNDP Russia. (2009) *Integrated Climate Change Strategies for Sustainable Development of Russia's Arctic Regions (Case Study for Murmansk oblast)*. Russian Regional Environmental Centre and UNDP Russia, Moscow.
- Rybråten, S. (2006) "Naturen kan ikke styres' Natursyn, identitet og holdninger til statlig forvaltning av levende ressurser i Qeqertarsuaq, Vest-Grønland". Masteroppgave i sosialantropologi, Sosialantropologisk institutt, Universitetet i Oslo, Våren 2006.
- Shearer, C. (2011) *Kivalina: A Climate Change Story*. Haymarket Books, Chicago.
- Smit, B., G.K. Hovelsrud, J. Wandel, and M. Andrachuk (2010) "Introduction to the CAVIAR Project and Framework". Chapter 1 in G.K. Hovelsrud and B. Smit (eds.), *Community Adaptation and Vulnerability in Arctic Regions*, Springer, New York.
- Sustainable Development Working Group 2009-11 Report to Arctic Council Senior Arctic Officials*, March 2011, Sustainable Development Working Group, Arctic Council.
- Tervo, K. (2008) "The Operational and Regional Vulnerability of Winter Tourism to Climate Variability and Change: The Case of the Finnish Nature-Based Tourism". *Scandinavian Journal of Hospitality and Tourism*, 8(4): 317-332.
- UNEP/Risø's *Cool 100 Energy Project*, <http://nordsesil.wikispaces.com/The+Cool+100+book+project>
- UNESCO (ed.) (2010) *Climate Change and Arctic Sustainable Development*, UNESCO, Paris, France as well as the conference material (Monaco, 2009) on which this book was based.



Sunset over Northern Norway (photo: Ilan Kelman)

Pöyry is a global consulting and engineering firm

Pöyry is a global consulting and engineering company dedicated to balanced sustainability. We offer our clients integrated management consulting, total solutions for complex projects and efficient, best-in-class design and supervision. Our in-depth expertise extends to the fields of industry, energy, urban & mobility and water & environment. Pöyry has 7000 experts operating in about 50 countries.

Pöyry's management consultants guide our clients and help them find solutions to complex business challenges. Over the years we have accumulated a vast source of industry-specific knowledge, thought leadership and expertise. We put that knowledge to work for our clients – adding insight and new ways to solve business-specific problems. Pöyry Management Consulting has about 500 consultants in Europe, North-America and Asia Pacific.

Econ Pöyry is the Norwegian part of Pöyry Management Consulting, with offices in Oslo and Stavanger. We offer insight and understanding into the complex interaction between markets, technology and policy. For more than 20 years we have guided informed decision making across business, organizations and the public sector. We offer three integrated types of services and ways of working: Market analysis, Market design, and Strategy and business consulting. Our three core competence areas are Energy, Economics, and Environment and climate.

Econ Pöyry

Pöyry Management Consulting (Norway) AS

Schweigaards gate 15B
0191 Oslo
Norway

Tel: +47 45 40 50 00
Fax: +47 22 42 00 40
E-mail: oslo.econ@poyry.com

