

CliCNord

Climate
Change
Resilience in
Small
Communities in the
Nordic Countries



NordForsk

Climate Change Resilience in Small Communities

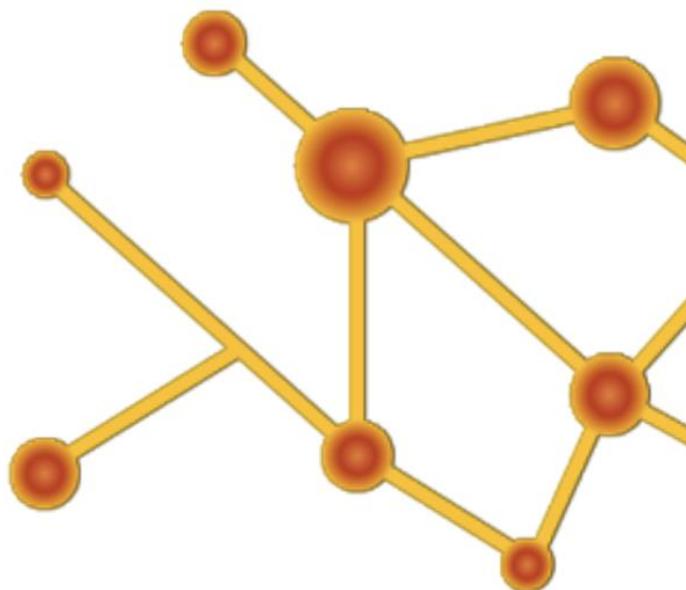
Policy recommendation from Nordic research project

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The project

The project

Climate change is affecting the Nordic countries. Many small communities will be affected by an increasing number of devastating natural events.

The Climate Change Resilience in Small Communities in the Nordic Countries project (CliCNord) has focused on how to increase capacity building in small communities to meet the effects of climate change.

The project has investigated:

- How small communities understand their situation in relation to climate change?
- How they handle climate-related challenges?
- How competencies and resources among the local citizens can help build capacity?
- The circumstances regarding the citizen's need for help from the established system and civil society organizations?

This report

This report is relevant for practitioners and students working with emergency management and climate change adaptation in remote areas across the Nordic countries.

The report presents the main recommendations from the project in the form of ten policy briefs that have been published during the project.

The project aims at reaching conclusions that can be relevant both across different countries and climate challenges, as well as more context specific findings. Therefore, the first two policy briefs in this report will present recommendations drawn across all the project's eight cases, while the following eight policy briefs give context specific advice and insights building on the results from the individual cases.

Overarching Research Question

How can capacity building in small rural communities be increased to meet the effects of climate change, involving the competencies and resources among the citizens and using new ways of organizing support and assistance from authorities, civil society organizations, politicians, and the public?

Cases and methodology

Cases

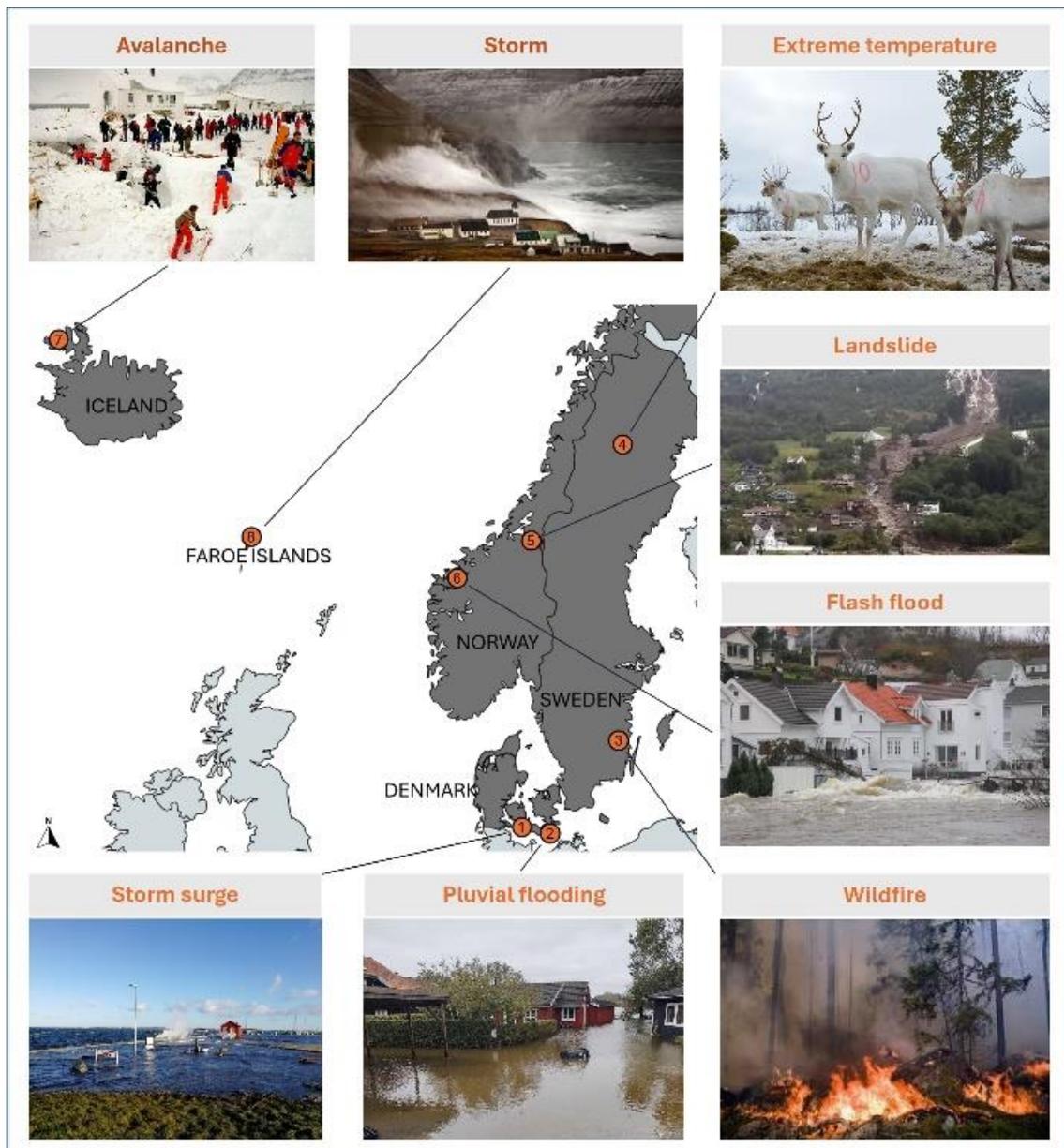
The project included eight different hazards affecting local communities across the Nordic countries. All the hazards, that are regarded as a direct consequence of climate change, are coastal flooding due to storm surges, cloudbursts, wildfires, temperature extremes, landslides, slush avalanches, flash floods, and storms. The eight cases were placed across the five Nordic countries Denmark, Sweden, Norway, Iceland, and the Faroe Islands.

Methodology

CLiCNord builds on the assumption that research can be designed to provide concrete support to small remote communities on how they can prevent, prepare, respond to, and recover from climate-related events.

The project has taken place from 2020 to 2024. During this time, data was collected by visits to case areas, interviews with both community members and local authorities, and workshops with all relevant stakeholders.

All Policy briefs in this report have been sent directly to all participants in the project, as well as to relevant decision- and policy makers in the five countries.



The research partners

The project brought together the expertise of six Nordic research institutions. The interdisciplinary research group contributed with perspectives from anthropology, communication, crisis management, natural and human geography, physics, political science, risk management, security science, sociology, and sustainability science.

The partners were:

- University College Copenhagen (UCC) - Emergency and Risk Management Programme
- RISE Research Institutes of Sweden (RISE) - Department of the Fire Research Dynamics
- Lund University (LU) - Centre for Sustainability Studies
- Norwegian University of Science and Technology (NTNU) - Centre for Energy, Climate and the Environment
- Arctic University of Norway (UiT) - Department of Technology and Safety
- University Centre of the Westfjords (UW) - Coastal Communities and Regional Development Program



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Policy Brief 1

How to improve climate change adaptation in rural areas of the Nordic Region

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Key recommendations

- Climate change adaptation should be addressed in a similar manner as mitigation, as a cross-sectoral societal challenge across all levels of governance. This requires involvement of all societal actors from both public and private sectors, civil society organisations and citizens, and improved collaboration between local, regional, and national governance levels.
- Solutions for climate adaptation need to be adapted to the local context and integrate local knowledge and practices. This requires that local authorities improve their communication with citizens and engage citizens in decision making. For this to be possible more dialogue about the connection between climate change and the increase of local risks is needed.
- Climate adaptation strategies need to consider societal groups that are particularly vulnerable to the effects of climate change, such as indigenous and rural communities and socio-economically disadvantaged groups. This requires increased efforts to identify not only physical climate vulnerabilities, but also social and economic vulnerabilities.
- Laws and regulations must be developed further in order to enable collective adaptation action in local communities.

Introduction

At the time of writing, global warming already amounts to 1.1 degrees Celsius, displaying tangible effects around the world, of which the scenarios indicate that this will get much worse [1]. The Nordic Region is also affected by climate change with the Arctic being one of the fastest warming regions globally [2]. Climate change-related hazards – such as floods, droughts, wildfires, landslides and avalanches – have become more common in recent years and the risk of such hazards will significantly increase in the future. In addition to these more

acute events, there are also gradual changes, such as the disappearance of permafrost and a changing flora and fauna, that need to be managed. However, the current speed of climate adaptation in the Nordic Region is too slow. There is therefore a great need for the Nordic countries to intensify their efforts to adapt to a changing climate [3, 4].

To achieve the vision that the Nordic Region will be the most sustainable and integrated region in the world by 2030, climate change adaptation should be at

the centre of attention. While the main focus of current adaptation efforts is on urban areas, we argue that rural areas deserve more attention in the context of climate change adaptation. How successful rural areas manage to adapt will have large consequences for rural livelihood and economies. Central parts of rural economies, such as agriculture, forestry and tourism, rely on the weather and biodiversity and must improve their resilience to climate change-induced hazards.

Important infrastructure, such as roads, railways, and electricity lines pass through rural areas and should be adapted to withstand extreme weather events. Furthermore, rural areas are home to some of the most vulnerable groups to climate change, such as Sami reindeer herding communities and rural communities with nature-dependent livelihoods. Lastly, all citizens in the Nordic Region, including those living in rural areas, should be able to live with a minimum of risk from climate change-induced hazards. Increased climate adaptation efforts will thus reduce inequality between rural and urban areas and contribute to environmental, economic, and social sustainability of rural areas across the Nordic Region.

This policy brief is a result of a collaboration through the NordForsk-funded project CliCNord (Climate Change Resilience in Small Communities in the Nordic Countries). The recommendations presented here build on CliCNord project results and more generally on the state of research on climate adaptation in rural areas.

Climate change adaptation efforts are limited to specific societal sectors

While climate change mitigation and the reduction of greenhouse gas emissions is increasingly understood and dealt with as a cross-sectoral challenge, of which all societal actors (including citizens) engage with, climate adaptation is still a topic only dealt with by the few – mostly in the technical department of municipalities and in the scientific community. However, independent of our global success of reducing CO₂ emissions, climate change is already happening, and the Nordic countries must adapt. The climate adaptation challenges that the Nordic countries face demand the involvement of all sectors, in the same manner as our societies today engage with climate mitigation and the reduction of emissions.

Municipalities in the Nordic countries experience an increase of tasks related to the preparing for and handling of extreme weather events [5, 6]. For most climate change-related hazards, local governments have the responsibility for both assessing the risk and managing climate adaptation projects. The process of applying for planning and construction permission in rural municipalities in Norway, for example, has become more complex due to the increased focus on risks related to climate-induced hazards. The officials in charge who were previously able to process these applications alone, now often have to involve additional expertise to implement the risk assessments. These additional tasks stretch the human and economical resources, especially those of smaller municipalities in rural areas, which have fewer people to take care of the broad variation of tasks and who often lack the specialised competences needed to deal with climate change adaptation. Thus, climate adaptation needs more attention from regional and especially national authorities to support the adaptation efforts of municipalities. There is then also potential for increased learning and collaboration across municipalities, for example through sharing resources in intermunicipal cooperation. Additionally, there is a need for more actors to be involved on the local level too – such as citizens, businesses, and civil society organisations – as they have specialised knowledge that can support the management and decision making of the municipalities.

Policy recommendation 1:

Address climate change adaptation as a cross-sectoral societal challenge on all levels of governance

Climate change adaptation must be treated as an important issue across all public and private sectors, as well as in civil society. Actors on both local, regional, and national levels must take responsibility for local climate change adaptation. For this to happen, climate adaptation must be treated with the same political attention as climate change mitigation.

Rural communities hold important knowledge about adapting to extreme weather

Adaptation to a changing climate occurs at the local level. Given that risks, needs, capacities, and possibilities vary between different physical places and different social communities, local knowledge about hazards and the specific places should form the basis for developing suitable adaptation strategies. Many rural communities have experienced events like storms and floods for generations and have thus developed strategies for handling them. These adaptation strategies are based on local knowledge and local practices which have often developed over generations and which enable said communities to deal independently with climate change related hazards. For example, it is common that people in such communities are more aware of observing signs in the environment that indicate that a landslide or avalanche is about to happen, and will clean gullies or fill water streams with gravel in order to prevent an event such as a landslide [7, 8]. On top of this, the first response to such events in rural communities is often organised by citizens while they wait for professional emergency response to arrive from further afield. Without this local knowledge and such practices, many communities would experience more damage from extreme weather events. Thus, such knowledge and practices should be included in climate adaptation efforts in the future.

Policy recommendation 2:

Integrate local knowledge and practices into climate adaptation

Future climate adaptation efforts would benefit from taking their starting point in local knowledge and practices. There is therefore a need to find ways to include this knowledge in all phases of climate adaptation, planning, implementation, operation, and maintenance, and in disaster management on local, regional, national, and Nordic levels.

Rural areas are among the most vulnerable to climate change and extreme events

To increase the Nordic countries' ability to implement climate adaptation, the social, political and geographical contexts need to be taken into consideration. Climate adaptation is never neutral – there will always be different goals, values and ambitions. The distribution of

disadvantages and benefits may favour some groups and individuals more than others. Groups that are hardest hit by disasters are often synonymous with groups that are already economically, socially, and politically marginalised [9, 10].

People in rural areas are among the most vulnerable to climate change and extreme weather events. Rural areas are exposed to the changing climate in different ways than those in urban settlements due, for example, to nature-dependent livelihoods, large areas with small populations, high physical and social vulnerability, and lack of financial and human resources and expertise. Though rural communities are experienced in handling challenges locally, climate change also stretches their resources and consistently provides both greater and new challenges. Rural communities therefore need help from outside if they are going to be able to prepare for and respond to increased climate related risks on the same level as people in urban areas. Hence, rural areas are dependent on support from the wider society, both for the prevention of hazards and by way of support during acute events. This support could be in the form of training, funding for preventive measures or in some cases, help for relocation.

Policy recommendation 3:

Consider societal groups that are particularly vulnerable in climate change adaptation efforts

There is a need to increase our understanding of how marginalised and vulnerable groups are affected by a changing climate, as well as how a fair distribution of responsibility for climate adaptation can be developed. Climate adaptation needs to be just and inclusive.

Laws and regulations create barriers for collective climate adaptation action

Today the regulations in force across the different Nordic countries constrain the opportunities for local communities to adapt to a changing climate. Even if the responsibility for adaptation varies between countries and hazards, the CliCNord project shows that there are similar problems throughout the Nordic Region. Adaptation to several of the climate related hazards is today the responsibility of individual home or landowners.

For example, in Sweden, a large responsibility lies with the owner of the property or forest, and in Denmark protection against flooding from the sea is a private responsibility [11]. In recent years, research has argued that this division of responsibility, and especially the responsibility that lies with the property owners, is unreasonable given that individual property owners may be hit particularly hard and in most cases do not have the resources or ability to reduce the risk by themselves [3, 12, 13]. Furthermore, it might be difficult for property owners to act effectively, as measures often require coordination. Today, legislation is often designed to support individual actions and even creates barriers to more collective climate adaptation projects.

Policy recommendation 4: Enable collective adaptation action through the adjustment of existing laws and regulations

There is a need to update the laws and regulations to ensure they support collective action in the best way possible, and that they do not create unnecessary barriers for people in rural areas to take action themselves to reduce their risk from climate related hazards.

Research needs

As input for the abovementioned policy recommendations, more inter- and transdisciplinary research on climate change adaptation is needed. Based on the current state of knowledge, we suggest the following, though not exclusive, list of research priorities, of which point to specific, much needed contributions of the social sciences:

- **Citizen engagement in climate adaptation** has mainly been argued for and studied from a top-down perspective. How citizens themselves understand their responsibility for and how they engage with adaptation needs to be investigated further.
- **Identification of vulnerability:** Research is needed to investigate who is vulnerable to climate change and which sectors, communities, and individuals will suffer the most and should thus be the focus of policies and measures.
- **Just climate adaptation:** Justice is a fast-growing field of research in the context of sustainability transitions and climate change mitigation. However, it has not been addressed widely in relation to climate change adaptation. Studies of distributional, recognition and procedural justice especially

related to vulnerable groups in rural areas are needed.

- **Governance:** Small municipalities do not have enough resources for the climate adaptation tasks required. Research is needed to develop new governance models that focus on collaboration between local, regional, and national governance levels, but also on innovative ways of collaborating between local authorities, which can then aid in increasing capacity in rural areas.

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Policy Brief 2

Emergency management in small remote communities – an urgent issue in the Nordic countries

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Context

Nordic countries face increased risk as a result of climate change [1–3], and both sparsely and densely populated areas will be affected. Most climate change adaptation research focuses on densely populated areas [4,5], but globally and in the Nordic countries, a significant proportion of people still live far outside the bigger cities, and many of those small remote communities face climate-related hazards that cannot be solved with the same approaches as employed in the densely populated areas, which have robust infrastructure and ready access to emergency services [6-11].

Overall, there are two ways a risk can be reduced. One is to reduce the likelihood of a hazard occurring. Here, building structures is often the preferred solution, but this is costly. The second is to reduce the consequences if the hazard occurs [12], which, for instance, can be achieved by improving emergency management [13,14]. There is a large focus on how to adapt cities to climate change. Solutions frequently referred to are, for instance: the construction of infrastructure such as dykes or avalanche barriers to remove potential hazards, or the relocation of the most important infrastructure or buildings. In small remote communities, this will not be an option, or, if it is an option, this would only be possible in a scaled-down version because of the cost of those measures. Governmental

funds will be prioritised to more densely populated areas, and there are too few people in the small communities to fund these structures themselves. Thus, climate adaptation in small remote communities must be thought of differently.

Across the Nordic countries, climate change-related incidents will add further strain to the contemporary emergency management system. Climate-related hazards occur more frequently and on a large scale [15,16] and will thereby stretch existing resources [17-19]. Hence, it is not realistic that the formal emergency management system will be able to prioritise all operations in small remote communities. Instead, there is a need to rethink the present organisation of emergency management in the Nordic countries to support the inclusion of novel resources and the implement of new principles for organisation. In practice, this can be done by involving citizens living in small remote communities but also local civil society organisations and private entities not traditionally part of emergency management set-up. Most importantly, this is not to be organised in the midst of a disaster. There is an urgency for the integration of new actors and entities through planning and training before disasters occur. Consequently, in-depth explorations are needed to find solutions to this impending need.

Key findings in recent Nordic projects

- There is an inherent tradition of independence in relation to handling local emergencies and disasters in small remote Nordic communities, since they cannot expect emergency management assistance from external sources. However, they lack formal context-specific scenario training concerning climate change-related incidents, since these hazards pose new challenges that most communities have limited experience with. However, the frequency and scale of these disasters will increase.
- Exercises and training within established, traditional emergency management systems are designed to facilitate learning and secure preparedness among professionals, but when new actors such as citizens, civil society organisations, and private entities are included in those exercises, their learning is limited.
- There is a need then to develop new ways of organising emergency management systems in small remote communities and also to create new methods to train and learn within emergency management that has been designed for a situation where a diverse and heterogenous group of actors are involved.

Ways Forward

Novel ways of organising Nordic emergency management

Remoteness forces community members to deal with hazards themselves when they initially occur, since the isolation often complicates the presence of the rescue service. However, the remoteness not only creates challenges but can also create a strength concerning building adaptive capacity to climate change. Such communities often have a long tradition of responding independently to challenges and developing local solutions [9,14]. Many small remote communities already have their own first responders and fire brigades, and they have a well-established tradition that local services are operated based on voluntary work [10].

Contemporary emergency management in the Nordic countries identifies and addresses the need for including new actors in the existing system [20]. A growing attention towards new ways of including volunteers and other organisations can be identified [21]. The prognoses for more extreme weather events are to a large extent expected to overwhelm the capacity of the emergency management system. Larger events such as avalanches, landslides, flash floods, temperature extremes, wildfires, storms, and floods will most likely create a situation in the future where the civil society needs to be included in ways that there has not previously been a tradition for in the Nordic countries [21]. It will create situations where other actors, not only people and organisations in remote areas, need to play an active part in the relief work in case of an emergency or disaster.

An intensified focus on both the establishment and improvement of emergency management in small remote communities will not only strengthen the resilience of those communities but also provide an important testing ground for developing a Nordic emergency management system better prepared for a future affected by climate change.

Novel approaches to training and learning within emergency management

Despite the tradition in remote communities of independent problem-solving and the development of solutions tailored to local needs, most communities still lack the formal training and experience to do so [22]. Thus there is not only a need for new ways of organising emergency management in a Nordic context but also for developing new ways to train and develop the competencies among the new actors involved.

The use of emergency management exercises is a traditional and often applied format to practice skills and competencies within professional emergency management organisations. Exercises are used to train, for example, coordination, communication, and decision-making [23]. The aim is to enhance the organisations' and stakeholders' capacity to react, their ability to prioritise critical societal functions, and to respond in a sound way to rare incidents through simulation. The central aims of such exercises are to practice the organisations' plans for responding to a

certain scenario and to test weaknesses and address the need for improvements. Representatives meet across sectors, organisations, and spheres to train their capacity to cooperate and coordinate their response and need for resources [11].

Despite the fact that actors and entities outside the emergency management sector, such as citizens, private companies, and civil society organisations, are nowadays also included in emergency management plans, they are rarely included in the training and exercises of professional emergency management. The engagement of remote communities in training and exercising emergency management requires the development of new formats. Firstly, there is a need to include all the participants' know-how and insights, including those who are not professionally engaged in emergency management organisations but who have a knowledge of local conditions and routines [24]. Secondly, it is important to overcome the often-faced problem that initiatives are required to construct exercise formats which ensure that individuals, organisations, and communities actually become better prepared for a real incident through exercises [25]. Thirdly, the formats are often directed either towards decision makers on a strategic national level [26] or towards firefighting, healthcare and medical care, and law enforcement on an operational level. Finally, there is a need to include the context of climate change-caused extreme weather events in the formats [26].

Added value in a Nordic context

Research has shown that despite their differences, the challenges that small remote communities face across the Nordic countries are very similar [9,10,13,14]. In some communities, robust solutions have been developed, such as the development of local extreme weather emergency plans [9,10], but there is a lack of sharing such insights across communities facing similar situations.

Hence, there is a comprehensive potential for facilitating learning and developing solutions in cooperation across the Nordic countries. It is very plausible that good examples, experiences, or solutions to learn from can be found in the other Nordic countries. At the

same time, parallel welfare state systems, governance standards, and principles of emergency response provide transferability of solutions.

Policy recommendations

- Small remote communities have to adapt to climate change through other solutions and tools compared to cities and more densely populated areas. Consequently, it is paramount to include the communities when developing solutions and plans for how to face climate change in the Nordic countries.
- To respond to and manage the increasing number of climate-related hazards in the future, also in the smaller communities, emergency management organisations need to transform and reorganise resources. The inclusion of citizens, civil society organisations, and the private sector in the emergency management structure is imperative.
- Special attention is needed to develop new formats of training and learning for managing emergencies. New actors, such as local communities, need to strengthen their own capacity and to learn to cooperate with professional emergency management systems both locally and nationally, but also across the Nordic countries.

Recent research projects in a Nordic context

This paper builds on international, European, and Nordic research, and the latter includes results from two NordForsk-funded research projects:

“The Climate Change Resilience in Small Communities in the Nordic Countries project” (CliCNord, 2021–2023) focuses on how to increase capacity building in small communities to meet the effects of climate change. The project investigates how small communities understand their situation in relation to climate change, how they handle climate-related challenges, how competencies and resources among the local citizens can help build capacity, and the circumstances

regarding the citizens' need for help from the established system and civil society organisations. CliCNord has received funding from the NordForsk Nordic Societal Security Programme under Grant Agreement No. 97229.

“Building resilient communities in the High North” (2020–2022) aimed to map out an understanding of community resilience to catastrophic incidents in Greenland and the Faroe Islands through scenario exercises and workshops to enhance situational awareness. The project sought to improve the understanding of the currently available learning tools on organisational resilience when applied to a context that significantly differs from our knowledge of communities that are logistically well connected to national emergency response infrastructure. The project was financed through Nordplus under the Nordic Council.

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Policy Brief 3

Protecting the small Danish islands against future climate change



Key recommendations

The recommendations below are based on the findings from a three-year Nordic research project that examined how the small Danish islands currently deal with flooding, and how the islands can best prevent and withstand the future consequences of extreme weather.

- The islands need help and support to build stronger local preparedness. Most islands already have fire preparedness, and their responsibilities can be expanded to include prevention and response related to extreme weather. This can be done by giving local rescue services resources to help islands develop emergency plans and support the organization of such preparedness.
- There is a need to look at whether the legislation regarding the maintenance and construction of dikes on small islands can be simplified, so that it is easier to understand and follow. Alternatively, a scheme could be established to provide islanders with advice and practical help in preparing correct applications to send to the authorities.

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The valuable but threatened Danish islands

Today, Denmark's small islands face a double challenge when it comes to improving their preparedness for extreme weather. They are sparsely populated, and are therefore not always prioritized when authorities invest in flood protection and other types of climate adaptation measures. And during extreme weather, they are harder to reach for emergency services on the mainland, as one of the first things to be affected by storms and high tides is ferry traffic. This means that when it comes to both preventing floods and taking action when they happen, islanders are often more alone than people on the mainland.

The need to change these conditions is great, as many of Denmark's 400 islands will feel the effects of climate change in the future. In a future with higher sea levels and more storm surges, large parts of the islands will experience regular flooding. According to DMI forecasts, water levels around Denmark will rise by up to one meter within the next hundred years, and the number of storm surges will be up to seven times greater than today. Denmark has more than 8,000 km of coastline and will therefore need to prioritize which areas we can and will protect. In this race, the Danish small islands are at risk of losing out.

Denmark reaps many benefits from inhabited small islands. The people on the islands are very attached to where they live and cannot imagine living anywhere else. Right now, there is a lot of pressure on Denmark's major cities to make room for all the newcomers. Therefore, there is value in making it attractive to live outside of the larger cities, for example on the islands. In addition, the islands have great value as nature and vacation areas. All these are arguments for not overlooking the islands' challenges in relation to future flooding.

Key Findings

- Many small islands in Denmark are particularly vulnerable to flooding in the future.
- Small Danish islands are not prioritized when municipalities allocate funds for flood protection and climate change adaptation due to their small populations.
- When the water level is high, the small islands are often left to fend for themselves, as the emergency services prioritize helping elsewhere first, and often have trouble reaching the islands.
- There is a tradition on the islands to fend for themselves, but right now they find it difficult to do anything due to existing coastal protection legislation and rules related to being located in a Nature 2000 area.
- All islands have a fire emergency response team, but most of these emergency response teams only deal with fire, and there is no preparedness for extreme weather.

Possible Solutions

There are two ways that the risk of flooding and the damage it causes can be reduced on the Danish islands. Physical measures can be taken, such as building dikes, securing existing buildings and ensuring that no construction takes place in low-lying areas. Alternatively, emergency response teams can be reinforced, so that they can act to minimize damage when warnings of high water levels are issued.

Better opportunity to get permission for flood protection

Today, it is a private responsibility to protect your own land and property against flooding, and islanders are aware of this. However, many find it difficult to get permission to do something for themselves.

One of the reasons is that the shore protection line applies up to 300 m inland, and for many smaller islands, this means that virtually the entire island is covered.

At the same time, many of the smaller Danish islands are located in Nature 2000 areas, which have even stricter rules for what can be built and altered. The fact that Denmark has a very well-preserved coastal nature and free access to it in most places is due to ambitious nature conservation legislation.

In order to get permission to make changes to coastal areas, the consequences these changes will have on nature and people in the surrounding area must be thoroughly investigated and documented. This is regardless of whether there is talk of building a new dike or restoring an old one. This documentation is important, but can also be an insurmountable challenge for people on islands who may not have the time, skills or financial means to get the necessary research done, and the right documents filled out properly.

Today, this means that much of the maintenance of dikes and construction of new dikes on the islands is done with the hope of forgiveness instead of permission. When excavation for new buildings or construction waste is left over, it is common practice in many places to place it on the dikes. In practice, the current legislation means that on many small islands, dike construction and maintenance still takes place, but without being coordinated and thought out together. In cities, the need for climate adaptation is currently being used in many places as a lever for broader debates on local urban development. This potential is not being utilized on the islands, as the uncoordinated approach to flood protection today does not open up a larger conversation about the future of the islands.

There is therefore potential to explore whether current legislation could be simplified, or whether advice and help could be offered to islanders to apply for the right permits.

“ When it comes to both preventing floods and taking action when they happen, islanders are often more on their own than people on the mainland. ”

Better local flood preparedness

There is also potential to improve the islands' preparedness for extreme weather, and specifically for flooding. Today, flooding is not an official part of the role played by emergency services, and this is reflected in local island preparedness. All inhabited small islands have a voluntary fire brigade, but for most islands, this brigade is limited to focusing on fire only.

This responsibility could be expanded to include extreme weather. In collaboration with local professional emergency services, these island emergency services could be responsible for creating flood contingency plans, monitoring warnings, coordinating efforts such as sandbagging, securing buildings with shutters and plastic or, in more extreme cases, coordinating the evacuation of residents in low-lying houses.



The CliCNord Research Project

The Climate Change Resilience in Small Communities in the Nordic Countries project (CliCNord) focuses on how to increase the resilience of small communities so that they can better withstand the consequences of climate change. The project examines:

- How small communities understand their own situation in relation to climate change
- How they deal with climate-related challenges
- How the skills and resources of local residents can contribute to increased resilience
- When and how local residents need outside help from local authorities and organizations?

<https://www.clicnord.org>

Moving Forward

If you need help regarding how to move forward with this, please reach out to us. The CliCNord research project runs until the summer of 2024, and until then we are happy to provide further information, guidance and assistance.

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Thank you to The Association of Danish Small Islands for their cooperation throughout the project

Front page photo: Lise Thillemann Sørensen. Photo this page: Ole Odsgaard

Policy Brief 4

Collaboration on climate change adaptation on open land



Recommendation

It is commonly accepted that effective climate change adaptation in Danish summerhouse areas requires engagement and dialogue between local government administration, homeowners' associations, and summerhouse owners. Especially engagement of homeowners are crucial for achieving consensus and garnering support for adaptation and flood risk management efforts.

It is recommended that these engagement processes not only facilitate dialogue on the technical feasibility of flood prevention measures, but also explore what climate change might mean for the social and cultural values embedded in the local area. Such discussions could focus on homeowners' sense of place and what they value about their local area and what they deem important to preserve. This approach to citizen engagement might help to ensure, that adaptation strategies are not only technically sound but also culturally and socially acceptable.

Photo: Ingrid Riis

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Climate change adaptation planning often assumes that citizens can be motivated to participate in local mitigation measures.

However, in practice, engaging citizens often proves challenging. This is particularly evident when climate adaptation measures are perceived as disruptions to the idyllic character of specific locations, such as Danish summerhouse areas. It is beneficial to integrate these considerations during the planning stages of climate change adaptation projects.

For most municipalities in Denmark summerhouse areas hold both significant economic and cultural value. These areas are often situated in scenic coastal and rural landscapes. Historically, Danish summerhouse areas have been developed on low-lying and reclaimed lands that were not deemed suitable for agriculture. Due to their location, these areas are among the most vulnerable to flooding from prolonged rainfall and other climate related hazards. Approximately 20 percent of Danish summerhouses are expected to face at least one flood-related risk in the future due to climate change.

In Denmark, as in most European countries, local and national policies and planning for flood risk management and climate change adaptation are based on the premise that effective adaptation measures require citizen engagement. There are several reasons for this. One reason is that when it comes to pluvial flooding, citizens may not be able to address the issues solely on their own property—the solution often lies on 'someone else's property.' Therefore, local governments often take an initiating and facilitating role in finding collective solutions, despite property owners in Denmark being primarily responsible for securing their own homes against flooding and managing rainwater on their own property.

However, the efforts of local authorities to motivate landowners and homeowners to participate in voluntary collective adaptation

measures have yielded varying results. Positive experiences exist with stakeholder collaboration on climate change adaptation, but there remains a need for substantiated approaches to involve and engage summerhouse owners. When local governments choose to use citizen involvement in climate change adaptation initiatives, it is favorable to understand what motivates citizens to engage in collective efforts.

Dilemmas in Climate Change Adaptation on Open Land

- Handling rainwater and flood risks on their own property is the responsibility of landowners. However, many landowners perceive flood risk management as the responsibility of the local government.
- Authorities must therefore appeal to landowners to take responsibility for managing rainwater themselves. Yet very few of the issues related to flooding from prolonged rainfall can be effectively resolved by landowners on their own property.
- Homeowners' associations and local governments can thus attempt to facilitate collective solutions. However, landowners seldom agree on what is worth protecting and what interventions can be accepted. New summerhouse owners may not always have a strong awareness of the local area's vulnerability to flooding. Meanwhile, older summerhouse owners might be reluctant to accept changes that they do not control or see the value in.
- Dialogue and thorough engagement processes are therefore crucial for finding common solutions. Additionally, the opportunity to engage landowners and other stakeholders in collective solutions is greatest immediately after an event. However, engagement processes take time, and it can be challenging to maintain momentum.

Common Solutions and Different Values

The research project examined the attitudes of summerhouse owners towards engaging in climate change adaptation measures aimed at preventing flooding from prolonged rainfall. The research focused on a summerhouse area that had experienced a major flooding event due to a combination of prolonged rainfall and cloudbursts.

The results of the research project indicate that even within a very small summerhouse area, there can be significant differences in landowners' sense of place, what they value about their local area, and how they perceive its vulnerability to climate change. Therefore, there can be differences in which activities are perceived as relevant to engage in locally.

“ ... even within a very small summerhouse area, there can be significant differences in landowners' sense of place, what they value about their local area, and how they perceive its vulnerability to climate change. ”

A classic assumption regarding citizen involvement and flood prevention is that those most at risk are the most motivated to take action. This research project also found evidence supporting this assumption. The landowners who had experienced standing knee-deep in flood water responded very actively to limit damages and remove water not only from their own properties but also from common roads—both during and immediately after the event.

However, the motivation to engage in prevention, particularly in collective solutions, dwindles as time passes after an event. Few of the landowners interviewed ten years after the incident expressed a desire or saw a need for collective initiatives such as establishing

surface drains or maintaining drainage ditches, even though they perceived that their area could be at risk of flooding again.

When initiatives are taken well after major events, it is therefore worth reconsidering whether the most motivation and support for area-based solutions necessarily come from the landowners with the most vulnerable houses. There may be other motivations for choosing to engage—or not engage—in collective solutions beyond the assessment of flood risks on their own property.



This means that especially local government planners, process consultants, and also homeowners' associations should consider what informs the homeowners' sense of place when planning and executing climate change adaptation projects using citizen involvement and volunteerism.



The CliCNord Research Project

The research for this policy brief is part of the Nordic project Climate Change Resilience in Small Communities in the Nordic Countries (CliCNord). The project studies how places far from major urban areas in the Nordic countries can adapt to and withstand upcoming climate change challenges.

In this context, the study has examined how the sense of place of Danish summer house owners is shaped by and shapes their experience of a climate change related flooding event.

<https://www.clicnord.org>

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Authors: Mikkel Nedergaard and Amanda Bæksted Vestergaard.

Policy Brief 5

Climate change adaptation to wildfires in the Nordic countries



Key recommendations

The following recommendations are informed by a research project, which for the past three years has investigated the how a community in the southeast of Sweden cope with present wildfires, effectiveness of mitigating activities and capacity building as well as what triggers adaptive or preventive actions.

The recommendations are:

- That homeowners keep the area next to facades free from flammable fuel.
- That adequate suppression tools (in particular hoses) are readily available when burning in or around your garden.
- That forest managers reduces precommercial thinning of deciduous species to reach a ~10 % deciduous component in the mature coniferous stand.
- That rescue services continue to seriously regard every ignition as potentially hazardous and work to minimize detection and response times.

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Climate change and wildfires

The Nordic countries are often described as a region in which a whole new fire regime is expected due to climate change. However, the boreal parts of the region is well accustomed to wildfires and not all regions are expected to exhibit the same change in wildfire exposure. Projections vary spatially from no increase in parts of the north to increased occurrence of droughts and higher weather-driven fire danger in the already dry regions of the south-east.

While most wildfires in the Nordic region occur close to densely populated areas, the largest and most intense ones occur in rural areas. Municipalities with low population densities usually suffer from fiscal constraints for prevention and suppression, leading to resource scarcity and low preparedness levels. Remoteness is also associated to long detection- and response times, key factors for fires that grow large and intense.



and responding to wildfires is, according to the Swedish Civil Protection Act, distributed among the forest owner, the individual, the municipality and the state. A forest owner has primary responsibility for his or her forest. But if

an individual cannot prevent a wildfire, municipal fire and rescue services are obliged to respond to the immediate threat. Once the fire is controlled, the landowner is responsible for mop-up and surveillance, making sure that the fire does not reignite.

Municipalities also work to strengthen individuals to fulfill their obligations. This is primarily done through e.g. information, fire bans or use of equipment after incidents.

Key Findings

- Homeowners express low commitment in preventive or adaptive measures regarding their house and garden.
- Forest owners express low commitment in preventive or adaptive measures. However, those with previous wildfire experience are more inclined to take measures aiming to simplify rescue service suppression activities for future incidents.
- The fire and rescue service is considered responsible for both preventing and suppressing fire. They also regard themselves as responsible for managing wildfires and work actively to build the capacity of the fire and rescue service.
- Simple mitigating actions for both landowners and residents can significantly decrease the risks losses or injuries associated to wildfires

Homeowners' adaption to wildfires

Homeowners express low commitment in preventive or adaptive measures regarding their house and garden. Residents usually do not manage gardens for fire prevention.

In the studied area wildfires are not seen as a threat to the future well-being of the community. Other consequences of a drier climate such as irrigation bans are spoken of with more emphasis.

Forest owner's climate adaption

Despite their legal responsibility, forest owners express low commitment for preventive or adaptive actions for mitigating increasing wildfire risks in a changing climate.

Forest owners with previous experience of wildfires highlight a need for preventive measures. These measures aim to aid the rescue service in suppression, such as water accessibility and wayfinding.

The rescue service and future wildfires

All actors in the study consider the municipal rescue service to be responsible for both preventing and suppressing wildfire. This includes the rescue service themselves which actively work to build capacity. Capacity building stems from large incidents further north in 2014 and 2018 and effectively dictates a large organizations for central command and control.

Homeowner recommendations

We have shown that the most important actions for improving passive wildfire protection are related to the close proximity of buildings. These actions include the removal of flammable fuel loads growing or stored against the façade, to cut the lawn and to increase the broadleaf-conifer ratio at the garden perimeter. People most vulnerable to wildfire related property loss or fatalities are: elderly people, people who actively use fire for yard maintenance and people in remote or isolated areas. We therefore recommend homeowners to (1) remove debris, dead grass, wood piles and coniferous plants

adjacent to buildings, (2) ensure adequate suppression tools before burning, and (3) be more than one person on-site when burning.

Land management recommendations

Remote areas are particularly vulnerable to large forest fires as the likelihood of early intervention decreases with less population density. To reduce large fires in the predominantly coniferous forests in there are simple but effective management strategies that can be adopted by forest managers.

First, less aggressive precommercial thinning of broadleaves will increase the deciduous (mostly birch) component of the grown forest. Saving a small portion of the naturally pioneering broadleaves, such that every 10th in a coniferous forest is birch, will significantly reduce the forest fuel's ability for rapid flame spread and high intensity fires. Second, enabling access to water resources for the rescue service to use in their suppression work can save valuable time in the early and critical part of the initial attack.

Managers of landscapes around buildings or settlements should be aware that light spring fuel is the main conveyer of flames eventually igniting buildings in Sweden. Cutting standing grass next to buildings in the autumn to avoid large fuel accumulation after springtime snowmelt significantly reduces the risk of building ignition. This will not interfere with goals of flowering meadows during summers.





The CliCNord Research Project

The research, which has informed this brief, is part of the project Climate Change Resilience in Small Communities in the Nordic Countries (CliCNord). The project investigates how places far from the larger cities in the Nordic countries can adapt to and withstand future challenges related to climate change. In doing so, the project explores the following questions:

- How do small Nordic communities understand their own situation regarding climate change?
- How do they currently handle adverse events?
- How can they build resilience towards climate-related hazards?

Read more at: <https://www.clicnord.org>

Conclusion

The fire and rescue services are building capacity to face a possible increasing fire danger in a changing Nordic climate. However, Few preventive or adaptive measures are taken by homeowners or land managers, who instead rely on suppression by rescue services. This attitude is attributed to the lack of severe implications from the generally well-managed fires in the region.

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Photos: Helikopterbataljonen, Johan Sjöström, Johan Sjöström, Mikael Berglund

Policy Brief 6

Pastureland restoration is urgent for Sámi reindeer pastoralism to coexist with the forest industry and adapt to climate change in Northern Sweden



Key recommendations

- Pastureland restoration must be implemented to reduce dependency on coping mechanisms such as emergency feeding, mechanized transport and intense workloads. These coping mechanisms are increasingly used to deal with the cumulative effects of encroachments from competing land uses, predator pressure, and the impacts of climate change on snow conditions.
- Vigorous thinning of dense, managed forests is a critical pastureland restoration measures that can reverse the negative trend of loss, degradation and fragmentation of ground lichens, which are key forage resources for reindeer during snow periods. Other studies show that implementing such restoration measures can benefit both reindeer pastoralism and forestry.
- Conservation of old-growth and primary forests would further improve the conditions for Sámi reindeer pastoralism as such forests are habitats for pendulous lichens, another key forage resource, and are important for cultural heritage, biodiversity conservation, and carbon storage.
- Pastureland restoration measures that improve the ecological conditions for Sámi reindeer pastoralism must be adapted to local and landscape scale conditions, and Indigenous and local knowledge can help in that process.

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Sápmi and reindeer pastoralism

Sápmi, the lands of the Indigenous Sámi people, spans across Northern Fennoscandia, and includes Northern Sweden. Reindeer pastoralism is an important livelihood and cultural practice among the Sámi. It is based on free-ranging semi-domesticated reindeer that use natural pastures within highly variable, multi-purpose pastoral landscapes. It also delivers multiple ecosystem services such as food production and climate warming mitigation as grazing suppresses the greening of mountain ecosystems, counteracting albedo feedbacks. The land on which reindeer pastoralism is practiced also represents cultural landscapes in which the Sámi people hold customary and Indigenous rights to land, water, and natural resources and carry the collective experience of a colonial history.

The pasture availability problem

The pastoral winter season is a critical time in the annual herding cycle, wherein the accessibility of ground - and pendulous lichens as forage is vital to the survival of the herd. Since the 1950s there has been a massive reduction of such key forage resources in Northern Sweden. The main culprit is intensive forestry which has resulted in denser and younger forests, leading to the loss, degradation, and fragmentation of lichen habitats [1-3]. It is the cumulative effects of encroachments, climate change impacts on snow conditions, and predator pressure, that has worsened the availability of reindeer forage during snow periods (the “pasture availability problem”, for short).

We conducted a study together with members of the Maskaure forest reindeer herding community. The study examined how community members cope with and experience basal ice formation within their landscape under the influence of climatic and environmental change. Our goal was to better understand what constitutes ecological conditions in line with members’ desired experiences of their landscapes to improve on policy recommendations. The study combined a literature review, workshops, semi-structured interviews, and quantitative analysis of climate - and forest data.

Basal ice formation

Our study focused on impacts and causal relations around basal ice formation, under snow, that is thick enough to coat key forage resources at the ground vegetation layer with ice, making them inaccessible. Two types of weather events can create conditions for this to occur, rain-on-snow events and thaw-and-freeze events, both of which mostly occur between October and December [2].

Our findings show that the impact of basal ice formation on the availability of winter forage for reindeer is amplified by the directional effects of climate change and encroachments, especially particular forestry practices and their surrounding infrastructure [2]. We found that ongoing and planned land uses will exacerbate the pasture availability problem, which in turn will be exacerbated by climate change impacts on snow conditions and lichen habitats. Members of the Maskaure forest reindeer herding community clarified how some coping mechanisms threaten natural pasture-based reindeer pastoralism, and that the pasture availability problem therefore represented a threat to Sámi identity, culture, and livelihoods more broadly. Below we present three policy recommendations.

Vigorous thinning as pastureland restoration

Ground lichens gain biomass slowly as they require light, a suitable combination of water and temperature and a balance of nutrients to grow effectively. Forest densification thus helps other plants outcompete ground lichens at the ground vegetation layer [1].

Our policy recommendation is to implement regulation that pushes forestry companies to “open up” dense, managed forests. Timely and vigorous thinning of forests to 800 – 1200 stems per hectare can increase light availability and improve the conditions for ground lichen growth and sustenance [3-4]. Harvest residues must be piled up and removed to not negate potential gains and small machinery is preferred [4]. Studies show that forestry remain profitable even if it implements such adapted forest management practices, adapted to local conditions [4-5].

Old-growth and primary forest conservation

Pendulous lichens have similar growth requirements and poor dispersal abilities, but also depend on specific substrates to survive. Community formation depends on forest age and possibly even forest volume. These conditions are found in forests older than 100 years [1].

Our recommendation is to increase the amount of protected old-growth and primary forests in Northern Sweden, and to let more managed forests age to old-growth status. Members of the Maskaure forest reindeer herding community underlined that foraging on pendulous lichens is the preferred adaptation measure during severe basal ice formation events. Other societally recognized values of such forests include cultural heritage, biodiversity conservation and carbon storage [6-8]. Protection schemes must also allow for continued use of that land by Sámi reindeer pastoralists. There are several examples of such protection schemes to draw on when implementing our policy recommendation.

Integrating Indigenous and local knowledge

Forest management and planning adapted to reindeer pastoralism requires a Sámi pastoral landscape perspective to be incorporated into decision-making [1-2].

Our recommendation is to strengthen the decision-making power of reindeer herding communities in their negotiations with other land users, such as large forest owners and forestry operators. Other studies show that all implemented institutional arrangements have failed at providing reindeer pastoralists with meaningful influence over forest management and planning practices [9]. Given that on-the-ground forest management practices must incorporate factors beyond those we suggest above, such as variation at the stand scale, we believe that a stronger position of those with Indigenous and local knowledge could provide an improved base for decision-making.

New research project takes the next step

The Swedish Research Council FORMAS recently funded the project “*Embracing extreme weather and compound events in landscape planning: the case of reindeer husbandry in Northern Sweden*”. The project will develop storyline-based alternatives for planning at the landscape scale to better navigate the expected increase of impactful extreme weather and compound events. The project can be considered a continuation of the research of the Lund University division of CliCNord and will put more emphasis on articulating different decision-making strategies in landscape planning that could address trade-offs in sustainable development as societies are increasingly confronted with compounding extreme weather due to climate change.

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Photo: Anna-Maria Fjellström

The CliCNord Research Project

The research, which has informed this brief, is part of the project Climate Change Resilience in Small Communities in the Nordic Countries (CliCNord). The project investigates how places far from the larger cities in the Nordic countries can adapt to and withstand future challenges related to climate change. In doing so, the project explores the following questions:

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Read more at: <https://www.clicnord.org>

We would like to express our gratitude to all of the members of the Maskaure reindeer herding community and to staff at Silvermuseet / the Institute for Arctic Landscape Research in Arjeplog for the support and hospitality that you provided throughout the research.

Policy Brief 7

Wilder and wetter climate will challenge small municipalities: Managing landslide risk



Recommendations

The recommendations are based on findings from the CliCNord research project. The project has studied from social science perspectives how small Norwegian municipalities in Trøndelag in Mid-Norway manage climate adaptation and landslide risk.

- All societal actors, from both public and private sectors, as well as citizens, should actively participate and be involved in climate adaptation related to landslide issues. Collaboration between local, regional, and national levels of governance should be strengthened.
- Landslide prevention measures should consider the unique local context. Municipalities should recognize the value of local knowledge and citizens' adaptation practices and initiate effective dialogue with citizens on local climate adaptation measures and their role in landslide prevention and preparedness.
- Municipalities should develop strategies to preserve, enhance, and communicate local knowledge and local climate adaptation practices to new generations, newcomers, and tourists, in collaboration with citizens.

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Climate change leads to increased landslide risk

In the coming years, we can expect a wilder and wetter climate with increased precipitation and extreme weather events in Norway. We are already witnessing the consequences of climate change, manifesting as an increased risk of hazards such as floods, storms, wildfires, and various types of landslides. The risk of such events will escalate in the future.

According to the [climate profiles](#) for Trøndelag, which are based on the high emissions scenario from the IPCC (RCP 8.5), the average temperature is expected to rise by approximately 4.0°C in Southern Trøndelag and 4.5°C in Northern Trøndelag by the year 2100. Annual precipitation is expected to increase by 20%, resulting in more frequent and intense precipitation events. Furthermore, the amount of snow will decrease, the snow season will be shorter, and there will be more periods of snowmelt during the winter.

These expected climate changes will affect landslide risk in Trøndelag. As landslides are often triggered by weather-related factors, it is expected that landslide events caused by rain, floods, snow, and snowmelt will increase. Particularly, the risk of soil slides, floodslides, and slush slides will rise. Also, the frequency of rockfalls and rockslides may increase during heavy rainfall events. Additionally, increased precipitation may lead to river and stream flooding and erosion, potentially triggering quick clay slides.

Challenges for small municipalities

Municipalities are responsible for assessing risks and managing climate adaptation projects locally, including landslide prevention and preparedness. Many municipalities face increased tasks related to landslide prevention and the management of climate-related events. This is due, in part, to additional mandated responsibilities and more detailed governance over how municipalities handle these tasks.

For example, the process of applying for

planning and building permits has become more complex due to increased focus on climate-related risk. This requires additional expertise to conduct risk assessments. Another challenge is the mapping of landslide risk. Although many areas have already been mapped, a comprehensive mapping of all relevant areas requires significant human and financial resources. All of this adds extra pressure on already burdened administrative units, especially in small municipalities. The lack of resources makes it difficult to handle the increased responsibility. In addition to having limited resources for climate adaptation and landslide management, small municipalities face challenges in attracting qualified workforce.

The challenges that small municipalities must address are numerous in the years to come, and climate adaptation is just one of many issues. How does one argue for increased funding for landslide prevention when competing with areas such as health and education, which are also critically important to society? These are complex questions of allocation and prioritization that small municipalities with limited resources must navigate in the years ahead.

Climate adaptation as a shared responsibility

Unlike climate change mitigation, which is generally considered a collective challenge where all societal actors and citizens should contribute, climate adaptation is often perceived as a task for a limited number of actors, such as technical departments in municipalities. Considering the expected climate changes in Trøndelag and the significant challenges associated with adaptation, it is essential for all societal actors, both public and private, as well as citizens, to actively engage in local climate adaptation efforts.

It is evident that municipalities often feel alone in their responsibility for climate adaptation. Therefore, climate adaptation needs increased attention from regional and national authorities to support municipal adaptation efforts. Collaboration across administrative levels should be strengthened.

Furthermore, there is potential for improved learning and collaboration between municipalities, for example, through resource sharing in inter-municipal and host municipality collaboration ([vertskommunesamarbeid](#)).

Inter-municipal collaboration

Especially for small municipalities with limited resources and large land areas, entering into inter-municipal collaboration around climate adaptation and preparedness can be beneficial. It can help these municipalities gain access to crucial expertise, resources, and networks.

Such forms of collaboration can ensure sustainable services, better resource utilization, and a strengthened position in an increasingly complex societal context. This enables a quicker response to new requirements and needs, such as technological development, climate adaptation, or changes in legislation. It can provide benefits such as:

- Networking and opportunities for exchange of experiences, joint projects, and general support that strengthen cohesion in the region.
- Cost savings through joint procurement, sharing of infrastructure and services, as well as more efficient use of available funds.
- Enhanced influence and more weight in regional and national forums, as well as in political decisions.
- Capacity building and access to broader expertise, knowledge, and experienced professionals.

The value of local knowledge and citizens' climate adaptation practices

Climate adaptation takes place at the local level. Because risks, needs, capacities, and opportunities vary between different places and communities, it is crucial to build on the knowledge available locally. Many small communities have experienced landslide events over time and have developed strategies to deal with them. These strategies

are based on local knowledge and practices that have often been developed through generations, enabling communities to effectively handle climate-related events and risks.

Citizens of small municipalities possess valuable local knowledge. They carefully observe nature and are attentive to changes in the terrain, rivers, tree inclinations, vegetation, and the water levels in streams, which can serve as warning signs for increased landslide risk. Many citizens also take measures to prevent landslides. This may involve simple but crucial measures such as inspecting drains and culverts during walks, removing twigs blocking water tunnels, or placing gravel and stones in streams. All these measures contribute to controlling the flow of water and ensuring that extreme weather, floods, or snowmelt do not result in landslides

To succeed in adapting to future climate changes, it is important to use this local knowledge and integrate it into all phases of climate adaptation: planning, implementation, operation and maintenance, as well as emergency preparedness. Municipalities should engage in an open dialogue with citizens about local consequences of climate change, local measures, and how citizens can contribute to climate adaptation and preparedness. It is essential for municipalities to acknowledge local knowledge and citizens' adaptation practices and collaborate with them to ensure effective prevention and response.

Citizens can be involved in climate adaptation and emergency management in the following ways:

- Open communication channel for observations: Establish a communication channel where citizens can report observations. People often know their local areas well and can detect changes that may indicate landslide risk. Encouraging reporting and taking citizens' input and suggestions seriously can build trust and ensure effective collaboration between the community and municipal authorities.

- Awareness and training: Municipalities should conduct information campaigns through meetings, school projects, brochures, and digital resources to raise awareness about landslide risk. Training should focus on how to recognize warning signs, report risk areas, and contribute to prevention.
- Collaboration with local groups and neighborhoods: Encourage collaboration among neighbors through local emergency groups or networks so they can share information, practical measures, and coordinate actions.
- Clear communication and warning procedures: Develop clear warning procedures that inform citizens about landslide risk and what actions to take. Citizens should be aware of evacuation procedures, escape routes, and safe zones in case of landslides.
- Road closures and infrastructure measures: Citizens can play a crucial role through reporting potentially hazardous road sections or infrastructure suspected of landslide risk. The municipality must respond quickly by implementing road closures, closing dangerous areas, and implementing necessary measures to protect its citizens.

Strategies for maintaining, developing, and disseminating local knowledge and practices

With increasing landslide risk in the future, it is crucial to maintain, further develop, and adapt local knowledge and practices. This is especially important as citizens in small municipalities are concerned that vital local knowledge for climate adaptation may be lost. Young people, newcomers, cabin owners, and non-locals are considered a concern because they lack knowledge about the areas. At the same time, adaptation practices, such as observing warning signs or inspecting drainage, are not integrated into everyday life in the same way as for citizens with long-term connections to the areas.

Local knowledge and practices are often 'tacit' and experience-based.

To meet the need to maintain, develop, and disseminate local knowledge and practices, the following recommendations may be relevant for small municipalities:

- Establish an open platform that serves as a resource base for local knowledge about landslide risk and climate adaptation. This can include historical events, local observations, and best practices for managing landslide risk.
- Organize regular community meetings to discuss and document local knowledge and experiences. This can make tacit knowledge more explicit and accessible.
- Provide support for local initiatives aiming to preserve and transmit local knowledge, including cultural and history projects and voluntary organizations.
- Develop informational material targeting cabin owners, newcomers, and others without a long-standing connection to the area. This should include guidelines for landslide prevention, information about risk areas, and how people can contribute to climate adaptation and preparedness.
- Initiate campaigns to raise awareness about the importance of maintaining and disseminating local knowledge about landslide prevention to future generations. This can include school projects aimed at children or events and information targeting parents.
- Collaborate with local contractors and craftsmen to integrate knowledge about landslide prevention into their practices. This can include training programs, guidelines for construction in vulnerable areas, and encouragement to use local experts.

Through collective efforts, valuable experience and adaptation expertise can become a resource that remains vibrant and relevant for the community over time, strengthening the community's ability to cope with climate change and landslide risk.



The research project CliCNord

The project *Climate Change Resilience in Small Communities in the Nordic countries* (CliCNord) focuses on how to increase resilience and build capacity in small communities so that they can better cope with the challenges of climate change.

The project studies:

- How small communities understand their own situation related to climate change
- How they handle climate-related challenges
- How citizens' competencies and resources can contribute to increased resilience
- When and how citizens need support from local authorities and civil society organisations.

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Policy Brief 8

Adapting to heavy rainfall and flood risk, lessons learned from Møre and Romsdal



PHOTO: CHRISTA EDER

Key recommendations

- Local communities' knowledge and capacities are crucial inputs for municipalities and county governors in risk- and vulnerability analysis (RVA), emergency preparedness planning, and response. Facilitating knowledge exchange between citizens and municipalities is vital for effective local hazard management. Municipalities should systematically integrate local knowledge and capacities.
- When developing regional RVA, the County Governor should actively include municipalities and integrate their knowledge. In return, municipalities should utilize the regional county ROS as valuable input to their municipal RVA and subsequent municipal emergency preparedness plans.
- Due to an expected increase in frequency and intensity of extreme rainfall, communities are increasingly more vulnerable to flooding. Flooding risk spans across municipal borders therefore cooperation between neighbouring municipality should be facilitated by including them in the regional RVA.

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The recently published White paper Meld. St. 26 (2022-2023) emphasize that “Climate change is happening faster, and the consequences are more extensive and dramatic than previously believed.” [1].

The distinctive landscape of western Norway, marked by steep mountains, long coastline, and diverse geography, exposes the region to a variety of natural hazards. The region is particularly exposed to the risk of flood events and various types of slides. With the impacts of climate change, we can expect more frequent occurrences and increased intensity of these events [2]. According to the regional climate profile of Møre og Romsdal, there is an expected annual precipitation increase of 15%, with autumn and summer receiving the most significant amounts. This increase is expected to be experienced as more short-term intense rainfall events. Such events of intense precipitation can in turn result in flash flooding— a type of flood event that typically occur rapidly, often within a timeframe of 6 hours or less. Because of the quick onset of the flood, it can be challenging to issue early warnings and take necessary precautions in a timely manner, which in turn can result in more devastating consequences. A recent study show that municipalities located along the west coast of Norway are more exposed to climate hazard and their impacts. At the same time, these municipalities are, on average, adapting less to these challenges [3]. As such there is a need for significant efforts to enhance municipal resilience in the face of these hazards.

Local communities possess invaluable knowledge of local flood risk

Climate change is often said to be a global challenge with local impacts. Especially small and remote communities are more vulnerable to current and future changes. Owing to their remoteness these communities often possess capacities for handling hazard impacts themselves. This has grown out of necessity as professional emergency responders will not be able to immediately arrive at the

impacted area.

Norwegian municipalities hold a key role in ensuring peoples safety through a statutory responsibility for managing risk and mitigating the impact of climate-induced natural hazards. Utilizing local knowledge and capacities within exposed communities can provide valuable input to local climate change adaptation strategies and emergency preparedness plans, strengthening the municipal capacity for handling unwanted events. We encourage the municipalities to engage in discussions with local communities to address the risk and prepare for impacts in a proactive manner.

“

When you have lived here your whole life – you pay attention to the wind directions – so you have in mind what your next move will be.

“

Significance of integrating local knowledge in local risk assessments.

Local communities exposed to flooding often have years of experience living with this risk. Experience and daily observations made by “the locals” are not fully utilized in practices. For instance, routines for receiving and following up on reports of concerns from resident related to flood risk are often lacking.

Moreover, emergency preparedness plans rarely include an overview of relevant local capacities that can be utilized during a crisis. Examples of this could be an inventory of relevant equipment and skills found in the exposed communities. Incorporating the valuable informal knowledge from local communities into municipal planning can be challenging. Formalized methods are needed to enhance community resilience, such as collaborative workshops between municipal representatives and selected locals to discuss specific risks and concerns. These workshops offer direct input to emergency planning and foster mutual understanding of roles before, during, and after events. Other approaches include developing joint local emergency plans tailored to local risks and conducting joint preparedness exercises. These initiatives ensure local involvement and cooperation between at-risk communities and authorities.

Policy recommendation 1: Systematic integration of local knowledge about flood risk in municipal climate change adaptation and emergency preparedness processes

Inclusion of the inhabitants' risk perceptions and knowledge enriches municipal risk assessment and plans, giving local actors and municipalities a better understanding of acceptable risk and measures needed to reduce the risk, such as cleaning the river upstream from debris. Ways of integrating this knowledge can be through;

- workshops
- joint local emergency plans and preparedness exercises
- inventory of relevant equipment in communities
- integration and follow up of weather warnings from local community members

Municipal input to regional risk- and vulnerability assessments.

Part of the County Governor responsibilities is to maintain an overview of the region's risks- and vulnerabilities and periodically conducting risk- and vulnerability assessments (regional RVA). To integrate municipal perspectives into this process the County Governor of Møre og Romsdal invited selected municipalities, infrastructure operators, emergency preparedness responders and researcher to be a part of this process. These stakeholders provided input to the development of a relevant flash flood scenario and the subsequent risk- and vulnerability assessment. Such actors have extensive knowledge from a practical viewpoint on vulnerabilities and hazards in their area. Merging this knowledge with input from the research community add scientific weight to the RVA-analysis and can provide a more holistic view on risks and their management.

As flooding occurrence and impacts are not confined within municipal borders, we advise the county to include neighbouring municipalities in the regional RVA process, promoting cross-border cooperation. This is needed as flooding can occur or create cross - border impact, thus requiring a broader response. Cooperation between municipalities can also streamline resources used during emergency response.

Bringing together different actors for input on the regional RVA can be done through digital or physical platforms. Both ways have pros and cons. Using digital platforms often increases number of participants, as it is easier to attend. On the other hand, a high number of participants might decrease the involvement, where high-ranking persons with strong personality tend to dominate the discussions.



PHOTO: LILLIAN IVEIT

Physical meeting platforms allows for better learning environment with more active discussions in smaller groups. Involvement of different actors can also be done through questionnaires and in written feedback/review-processes of analysis.

Policy recommendation 2: Include more diverse and relevant stakeholders in regional ROS analysis process.

Local and regional stakeholders have extensive knowledge on hazards and vulnerabilities that can provide valuable input to the regional RVA analysis. Workshops (digital and/or physical), questionnaires, written reviews-processes, has proven to be useful method to integrate municipalities and other actors in the regional analysis. Furthermore, including neighboring municipalities in the regional RVA process promotes cross-border collaboration.

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Policy Brief 9

How to improve climate change adaptation in small and remote communities in Iceland



Key recommendations

- Review of the volunteering system regarding preparedness, response, and recovery.
- Encourage regular desk exercises in the Civil Protection and Emergency Management Committees at municipal level.
- Raise local awareness of climate related hazards and the implications within remote communities.
- Increase coordination amongst first responders through regular training exercises aimed at natural hazards.
- Improve the early warning system.
- Based on risk assessments, decisions on avalanche barriers should be taken at governmental level and be fully funded.

Climate change adaptation in Iceland

The fourth assessment report from the Scientific Committee on Climate Change in Iceland found that climate change has already had significant impact on nature and environment, such as receding of glaciers, hydrology, land-, and marine ecosystems. The report highlights that increased risk of natural hazards should be considered to a greater extent in planning. Adaptation and response to climate change will be challenging as it will impact both social and built infrastructure as well as culture [1]. A white paper on climate change adaptation [2] and an action plan [3] was published by the government in 2021, and a report published in 2023 by the Ministry of Environment, Energy and Climate focused on suggestions for a national plan on climate change adaptation [4]. It's therefore clear that policy making surrounding climate change adaptation is ongoing.

Small and remote communities

Iceland has only two government levels, state and municipal. The municipalities are tasked with ensuring the safety of the inhabitants. The only municipality we found to have published a report on climate change adaptation in their community was Reykjavik [5]. The reality is that most municipalities in Iceland are both small in terms of population numbers and categorized as remote. Municipalities are most often coastal communities with a resource dependent economy. These factors make it especially relevant to take into consideration the context surrounding small and remote communities in Iceland when policy on climate change adaptation is being considered under increasing risk of natural related hazards.

Policy recommendation 1: Review of the volunteering system

As Iceland does not have an army, the country relies on so-called search and rescue squads (ICE-SAR) for preparedness, response, and recovery, as well as the Red Cross, which are mostly based on voluntary participation.

An over-dependence on volunteers for preparedness, response, and recovery in Iceland in terms of crisis management, can have implications for security in the long run. Following back-to-back events in the country since 2019 with extreme weather events, landslides, avalanches, wildfires and volcanic eruptions on top of the covid-19 pandemic, the ICE-SAR is already publicly sounding alarms that the volunteering system is at its limits. The capacity of the current response system in Iceland could potentially be threatened if two simultaneous events occurred.

Policy recommendation 2: Encourage regular desk exercises in Civil Protection and Emergency Management Committees

The Department of Civil Protection and Emergency Management should provide all relevant municipal committee members training upon appointment, in addition to a protocol for holding 'desk exercises' to increase preparedness against natural hazards.

According to law on Civil Protection and Emergency Management in Iceland, municipalities should form and appoint members to a Civil Protection and Emergency Management Committee following municipal elections. It is up to each municipality to choose the size of the committee, and many of them choose to collaborate with neighboring municipalities to form them.

Therefore, even though there are 72 municipalities in Iceland, there are 21 such committees spanning over 9 police districts [6]. The committees should hold a meeting at least twice per year, but that is not always the case. To increase support for the committees to carry out their legal duties, further training by The Department of Civil Protection and Emergency Management should be provided to appointed members, as well as a protocol for 'desk exercises'. Those exercises should be designed to allow committee members to go through the response protocols in case of a natural hazard related event, go through the list of contacts involved, and update contact information if needed. Doing so would increase coordination amongst committee members and therefore enhance preparedness.

Policy recommendation 3: Raise local awareness of climate change related hazards and their implications

To raise awareness amongst inhabitants, with emphasis on newcomers and foreigners in the community, emergency plans and risk assessments need to be accessible and communicated effectively by authorities.

Civil Protection and Emergency Management Committees at the municipal level are responsible for carrying out risk assessments as well as emergency plans in cooperation with the Department of Civil Protection and Emergency Management, which provides guidelines [7,8]. Those risk assessments and emergency plans need to be regularly communicated in an efficient and structured manner to all inhabitants, with emphasis on newcomers and those of foreign origin. This needs to be done in a

thoughtful manner to avoid scaring people, but still provide inhabitants with the relevant information to raise awareness to enhance community preparedness.

Policy recommendation 4: Increase coordination amongst first responders through regular training exercises aimed at natural hazards

No mandatory and large-scale training exercises aimed at response to natural hazards take place in Iceland.

Icelanders often refer to their systems being reactive rather than proactive. The same applies to the emergency management system. The only regular and large-scale training exercises for first responders are held every four years and are related to airplane crashes, which are a mandatory requirement for maintaining operating licences for all airports in the country. Considering the increased risk of natural hazards, regular training exercises aimed at such risks need to be held with local and regional first response teams, with support from the Department of Civil Protection and Emergency Management. That would enhance community preparedness, as it provides a platform for first responders to meet in person, train response efforts and coordination.



Policy recommendation 6: Improve the early warning system

With increased infrastructure for cell phone service and 5G in Iceland, an early warning system for natural hazards should be developed and made a standard for preparedness.

With increased coverage of cell phone reception and 5G access point in Iceland, the country should be making better use of text messaging to alert those nearby a location with a raised hazard level. This has been done to a certain extent, for example to alert about increased likelihood of a volcanic eruption in the Reykjanes peninsula, as text messages are sent to all cell phones in the area. Making this part a standardized part of preparedness against increased risk of a natural hazard would raise awareness of the risk, not only among the inhabitants in the area in discussion, but also towards other groups in the area, such as tourists. In addition, it might be advisable to consider the use of artificial intelligence for early warning systems, modelling, and the identification of risk areas. International examples for such applications exist in flood forecasting.

Policy recommendation 6: Based on risk assessments, decisions on avalanche barriers should be taken at governmental level and be fully funded.

Today municipalities can request avalanche barriers followed a risk assessment carried out by the MET office and funding is mostly covered by government funds.

As the MET office carries out avalanche risk assessments in municipalities, the need for avalanche barriers to protect residential housing might be identified.

Following that, the municipality in question must then send an official request for avalanche barriers to the government, that has a special fund for such projects. However, the government funds do not cover the full costs of the construction and the fund is limited. Therefore, considering the growing financial difficulties experienced by municipalities in Iceland, there is a chance that they will refrain from requesting the construction if they deem that they do not have financial capacity to take it on. Therefore, it is advisable that both the decision and funds for building avalanche barriers come from the government.

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Policy Brief 10

Faroe Islands and climate change adaptation - securing remote communities against future storms



Key recommendations

The following recommendations are informed by a long-term research project, which for the past three years has investigated the relationship between people, places, and storms on the Faroe Islands. We see the results as highly relevant to regional and national efforts to build resilience towards future climatic changes amongst remote Faroese communities.

The recommendations are:

- Increased collaboration across administrative levels and sectors is essential in order to ensure support for small remote communities exposed to increasingly frequent and intense storms
- Greater preventative action must be taken holistically and sustainably, so that local efforts to adapt can keep up with the increasing risks posed by climate change
- Local preparedness plans must be enhanced so that the impact of climate change on future storm frequency and intensity is accounted for

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For those inhabiting the Faroe Islands, storms are not an uncommon occurrence. Here, tales of stormy weather date back centuries. However, as future climatic changes threaten to increase both the intensity and frequency of storms in this region, a storm is no longer just a storm.

Over the past six decades, there has been a notable shift of Atlantic cyclone activity towards the north-east Atlantic region. On the Faroe Islands, this means that especially wintertime storms are expected to occur more often and with greater strength, than ever before. Already now, those involved in emergency response operations report that they are called upon more frequently to assist with storm-related incidents.

In the remote regions of the Faroe Islands, small communities surrounded by rough terrain often have to rely on their own knowledge and resources to navigate and recover from the impacts of severe weather events. While there is a lot of focus on how larger cities are preparing for a future with climate change, these remote communities tend to be forgotten in larger regional and national efforts to secure people and places against threats related to climate change.

Due to a general lack of resources, these communities face more challenges when it comes to implementing robust adaptation strategies, and tend to implement highly individualized adaptive measures. In the face of escalating climate change impacts, such small-scale measures will no longer be sufficient to confront the anticipated intensity of future storms.

This underscores the need for targeted support and tailored solutions to ensure the resilience of smaller, more isolated communities in the face of climate change on the Faroe Islands. To achieve this, it is crucial for authorities, and community stakeholders to collaborate in addressing the multifaceted challenges posed by the increasing occurrence of adverse weather events.

Key Findings

- People living in remote communities on the Faroe Islands know how to deal with storms, and tend to have a high level of self-sufficiency
- Predictions indicating an increase in storm frequency and intensity mean that smaller, individualized measures to cope with storms are highly likely no longer sufficient
- Because of strong connections to place, people living in remote locations will stay, even if they are increasingly threatened by severe storms
- Smaller communities often lack the resources to implement larger and more robust adaptation measures
- Collaboration between local and regional actors has the potential to spur more widespread, yet locally informed, adaptation efforts



Moving Forward

It is crucial to include and support small remote communities in wider climate change adaptation strategies to ensure a more equitable and sustainable transition to a future shaped by climate change. While it can be difficult for emergency services to reach these communities during extreme weather events, there are a number of measures that should be taken to build resilience towards the increasingly pressing effects of climate change within these communities.

Increased regional and sectoral collaboration

To properly integrate remote communities into regional and national climate change adaptation efforts, stronger networks and communication channels between different stakeholders, such as local communities, authorities, and civil society organizations, are required.

Due to high levels of social cohesion, collaboration between people within small remote communities already helps the community cope during extreme events. However, local administrations cannot handle the increasing pressure of storms alone.

Collaboration across sectors and levels, including involvement from regional and national authorities, as well as expertise from various outside fields, is required.



It is crucial to include and support small remote communities in wider climate change adaptation strategies to ensure a more equitable and sustainable transition to a future shaped by climate change.



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Greater preventive action

As storms become more frequent and intense due to the changing climate, the preventive measures in place to cope with them must be adapted and upscaled in order to keep up with increasing pressures. When it comes to whether or not these measures are implemented, societal preferences and economic feasibility are key factors that need to be considered.

Deliberative methods like citizen assemblies can help rally support for necessary adaptation measures on-site. Meanwhile, resources must be directed at more comprehensive adaptation efforts that are effective and sustainable in the long run.



Crisis management exercise lead by CliCNord with community members and emergency services in Klaksvik, March 2022

Enhanced preparedness plans

It is important to have well-functioning preparedness plans in place to respond effectively to new challenges and threats, including those related to climate change. Therefore, the resources, plans, and systems in place to respond to storms must be updated to ensure that they can cope with the increasing frequency and intensity of extreme weather events.

This can include training and educating personnel, acquiring extra equipment and resources, establishing regional communication channels, and conducting exercises to ensure that preparedness plans function optimally in the event of an emergency.



The CliCNord Research Project

The research, which has informed this brief, is part of the project Climate Change Resilience in Small Communities in the Nordic Countries (CliCNord). The project investigates how places far from the larger cities in the Nordic countries can adapt to and withstand future challenges related to climate change. In doing so, the project explores the following questions:

- How do small Nordic communities understand their own situation regarding climate change?
- How do they currently handle adverse events?
- How can they build resilience towards climate-related hazards?

Read more at: <https://www.clicnord.org>

Conclusion

Overall, the impact of climate change on the Faroe Islands, primarily regarding the increased frequency and intensity of storms, necessitates a concerted effort to increase resilience amongst small remote communities. This is an issue that requires greater collaboration between small communities and surrounding social systems at the regional and national levels.

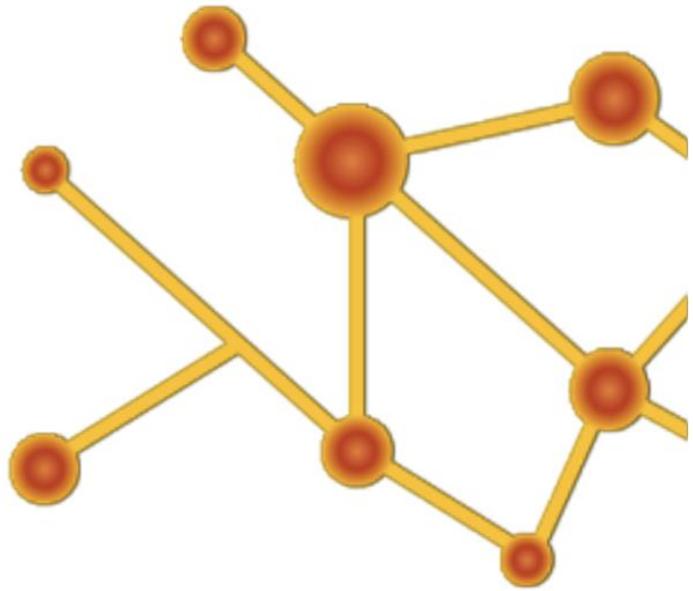
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