Increased need for Nordic co-operation in civil preparedness and resilience in the Arctic

Arne Flåøyen

22.10.2025

NordForsk

Civil preparedness

Civil preparedness refers to the capacity of civilian institutions and populations to maintain essential governmental functions and services during emergencies or crises (natural disaster, man-made disaster, or in times of war), and to support civil–military co-operation when needed.

Definition from ChatGPT

Resilience

Resilience is the capability of a system (society, infrastructure, government, etc.) to withstand, absorb or resist shocks and disruptions, maintain essential functions during them, and recover quickly afterwards; often also to adapt so as to better deal with future shocks.

Definition from ChatGPT

The Nordic region

What characterises the Arctic region?

- Large land and sea areas
- Harsh climate
- Low population density
- The population is aging
- Long distances between communities
- Home of many Indigenous people

What characterises the Arctic region?

- The demand for minerals and green energy is increasing leading to increased industrialization in the Arctic
- More tourists are visiting the Arctic
- Few professional health workers, police, firefighters and rescue workers etc.
- Local people must be largely self-sufficient

Type of threats

- Climate change
- Hybrid threats
- Health and pandemics

Climate Change in the Arctic

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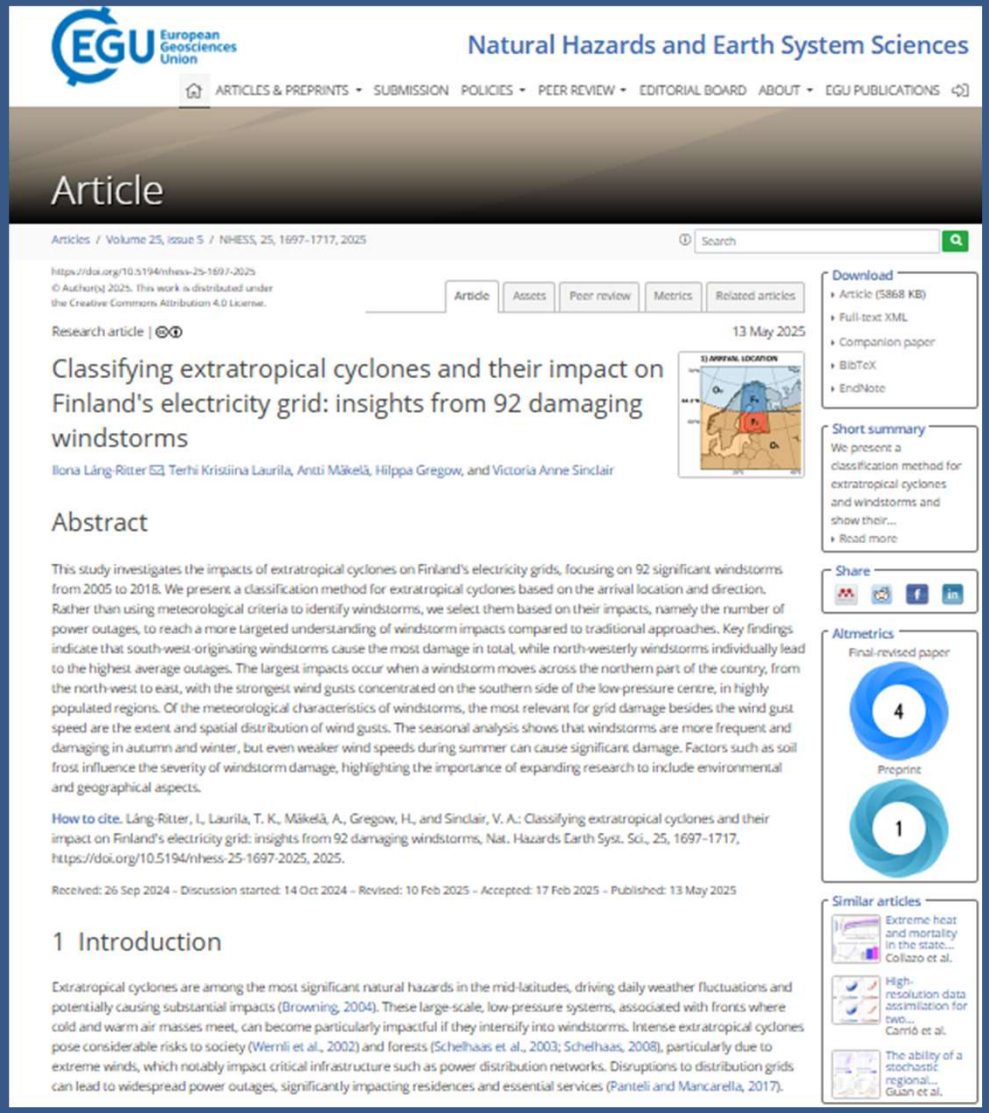
Storms

- Finland:
  - More rain-on-snow and mixed precipitation storms
  - Heavier rainfall is projected, especially summer cloudbursts
  - Example: Heavy rain after snowmelt saturates soils, then a windstorm uproots trees and destabilizes slopes



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Research article | 13 May 2025

Classifying extratropical cyclones and their impact on Finland's electricity grid: insights from 92 damaging windstorms

Ilona Láng-Ritter, Terhi Kristiina Laurila, Antti Mäkelä, Hilppa Gregow, and Victoria Anne Sinclair

Abstract

This study investigates the impacts of extratropical cyclones on Finland's electricity grids, focusing on 92 significant windstorms from 2005 to 2018. We present a classification method for extratropical cyclones based on the arrival location and direction. Rather than using meteorological criteria to identify windstorms, we select them based on their impacts, namely the number of power outages, to reach a more targeted understanding of windstorm impacts compared to traditional approaches. Key findings indicate that south-west-originating windstorms cause the most damage in total, while north-westerly windstorms individually lead to the highest average outages. The largest impacts occur when a windstorm moves across the northern part of the country, from the north-west to east, with the strongest wind gusts concentrated on the southern side of the low-pressure centre, in highly populated regions. Of the meteorological characteristics of windstorms, the most relevant for grid damage besides the wind gust speed are the extent and spatial distribution of wind gusts. The seasonal analysis shows that windstorms are more frequent and damaging in autumn and winter, but even weaker wind speeds during summer can cause significant damage. Factors such as soil frost influence the severity of windstorm damage, highlighting the importance of expanding research to include environmental and geographical aspects.

How to cite. Láng-Ritter, I., Laurila, T. K., Mäkelä, A., Gregow, H., and Sinclair, V. A.: Classifying extratropical cyclones and their impact on Finland's electricity grid: insights from 92 damaging windstorms, Nat. Hazards Earth Syst. Sci., 25, 1697–1717, https://doi.org/10.5194/nhess-25-1697-2025, 2025.

Received: 26 Sep 2024 – Discussion started: 14 Oct 2024 – Revised: 10 Feb 2025 – Accepted: 17 Feb 2025 – Published: 13 May 2025

1 Introduction

Extratropical cyclones are among the most significant natural hazards in the mid-latitudes, driving daily weather fluctuations and potentially causing substantial impacts (Browning, 2004). These large-scale, low-pressure systems, associated with fronts where cold and warm air masses meet, can become particularly impactful if they intensify into windstorms. Intense extratropical cyclones pose considerable risks to society (Wernli et al., 2002) and forests (Schelhaas et al., 2003; Schelhaas, 2008), particularly due to extreme winds, which notably impact critical infrastructure such as power distribution networks. Disruptions to distribution grids can lead to widespread power outages, significantly impacting residences and essential services (Panteli and Mancarella, 2017).

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Short summary
We present a classification method for extratropical cyclones and windstorms and show their…
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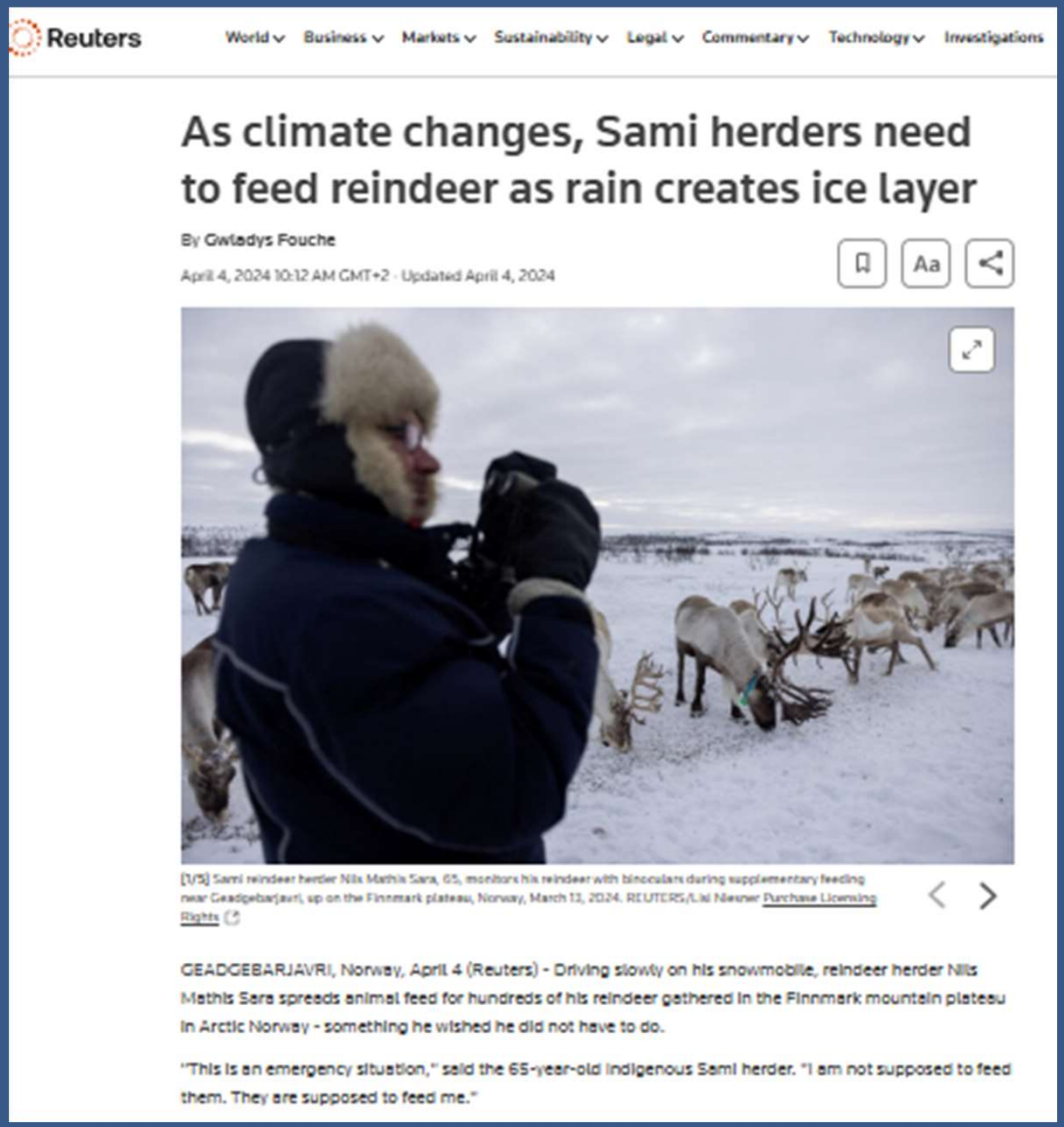
"Rain-on-snow" - events

- Ice layers make it difficult for reindeer to get access to feed
- Happens more frequently than before
- Threat to reindeer herding



Reuters

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As climate changes, Sami herders need to feed reindeer as rain creates ice layer

By Gwladys Fouche

April 4, 2024 10:12 AM GMT+2 · Updated April 4, 2024

Aa

[1/5] Sami reindeer herder Nils Mathis Sara, 65, monitors his reindeer with binoculars during supplementary feeding near Geadgebarjavri, up on the Finnmark plateau, Norway, March 13, 2024. REUTERS/Lisi Niesner Purchase Licensing Rights

GEADGEBARJAVRI, Norway, April 4 (Reuters) - Driving slowly on his snowmobile, reindeer herder Nils Mathis Sara spreads animal feed for hundreds of his reindeer gathered in the Finnmark mountain plateau in Arctic Norway - something he wished he did not have to do.

"This is an emergency situation," said the 65-year-old indigenous Sami herder. "I am not supposed to feed them. They are supposed to feed me."

Avalanches

- More precipitation and thus more snow
- More changeable weather conditions
- More unstable snow
- More tourists coming to the North for skiing
- More risk takers

HIGH NORTH NEWS

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Hotter in Svalbard – Increased Risk of Avalanches and Land Slides

The temperature reaches new and dramatic heights in Svalbard. Changes since 1871 are equivalent of the annual temperature difference between Oslo and Tromsø. (Photo: Longyearbyen by Marcela Cardenas/Nordnorge.com)

Published at: Feb 05 2019 - 15:43 / Updated at: Nov 12 2021 - 08:58

The temperature in Svalbard has increased by four degrees Celsius since 1971, and is set to increase even more. At the same time, the risk of avalanches and landslides increases.

TEXT
ARNE E. FINNE

Since 1971, the average temperature on Svalbard has increased by three to four degrees Celsius, and the heat increase is at its highest in winter, according to recent figures from a Met Office report.

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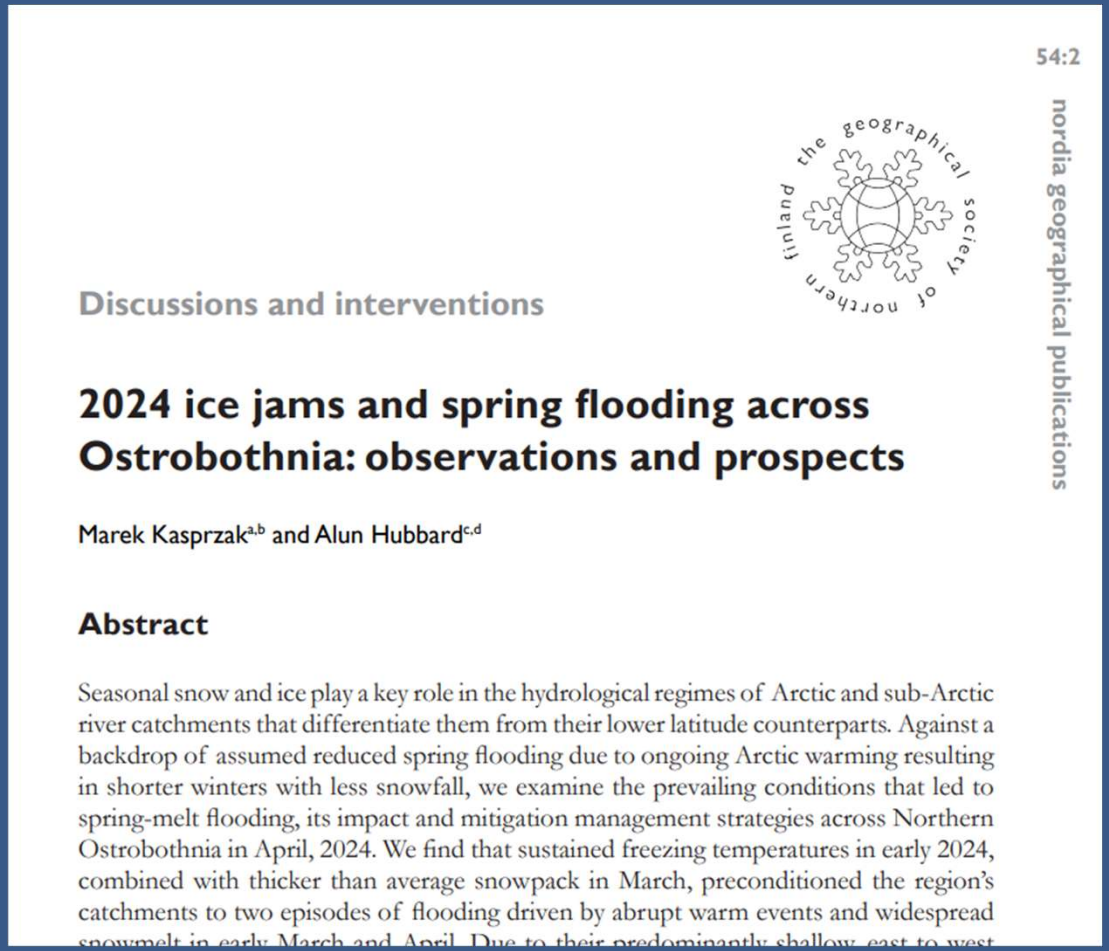
Floodings

- Ice-jam floods and extreme rainfall events are becoming more common in river basins



54:2

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Discussions and interventions

2024 ice jams and spring flooding across Ostrobothnia: observations and prospects

Marek Kasprzak[a,b] and Alun Hubbard[c,d]

Abstract

Seasonal snow and ice play a key role in the hydrological regimes of Arctic and sub-Arctic river catchments that differentiate them from their lower latitude counterparts. Against a backdrop of assumed reduced spring flooding due to ongoing Arctic warming resulting in shorter winters with less snowfall, we examine the prevailing conditions that led to spring-melt flooding, its impact and mitigation management strategies across Northern Ostrobothnia in April, 2024. We find that sustained freezing temperatures in early 2024, combined with thicker than average snowpack in March, preconditioned the region's catchments to two episodes of flooding driven by abrupt warm events and widespread snowmelt in early March and April. Due to their predominantly shallow, east to west

Landslides

- Landslide activity in northern Finland is changing because of:
  - permafrost warming, altered precipitation (more heavy rain and rapid snowmelt)
  - glacier/permafrost-related geomorphic change are destabilizing slopes.

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Research article | 03 May 2024

Frost quakes in wetlands in northern Finland during extreme winter weather conditions and related hazard to urban infrastructure

Nikita Afonin, Elena Kozlovskaya, Kari Moisio, Emma-Riikka Kokko, and Jarkko Okkonen

Abstract

The paper reports the first results of an experiment in northern Finland during winter 2022–2023 that aimed at studying seismic events caused by seasonal freezing in the so-called critical zone (CZ) of the Earth. These events have attracted public attention recently, as multiple reports about them from local inhabitants in Arctic and sub-Arctic areas appeared on social networks. To make an instrumental study of such events, to reveal the relationship between their occurrence and winter weather conditions, and to evaluate the possible hazard, we installed two high-resolution seismic arrays with co-located soil temperature stations at two sites in Finland, one of them being in the city of Oulu in the sub-Arctic area (65.04° N, 25.61° E) and the other one above the polar circle in the municipality of Sodankylä (67.36° N, 26.63° E). The equipment recorded continuous seismic and soil temperature data during November 2022–April 2023. Based on reports from the inhabitants of Talvikangas (Oulu) about the ground shaking and unusual noises on 6 January 2023 and their observations of new fractures on the roads there, we selected the time interval for the identification of frost quakes that originated during that day from continuous seismic records in Talvikangas and in Sodankylä. During the selected time interval, the extremely rapid air temperature drops of about −1.4 °C h^{-1} in Talvikangas and −0.88 °C h^{-1} in Sodankylä were observed. We identified and located two types of seismic events – namely, frost quakes with frequencies of about 10–20 Hz, with waveforms like those of tectonic events, and irregularly shaped frost tremors with frequencies of about 120–180 Hz. The sources of frost quakes in Talvikangas are mainly located on irrigated wetland, while in Sodankylä, about 50 % of registered frost quakes were caused by ice fracturing on the Kitinen River. However, several relatively strong events, with their origin in the wetlands, were also recorded. A significant number of sources of frost tremors are confined to wetland areas cut by irrigation channels and to roads cleaned from snow during winter both in Talvikangas and in Sodankylä. We calculated ground accelerations and ground velocities for the strongest events from both groups and compared them to equivalent properties of other seismic signals, like distant local earthquakes in the area, mining production blasts, and cargo train vibration. Our study shows that high-frequency frost tremors corresponding to surface fracture opening in the uppermost frozen surface layer of a thickness of up to 5 cm can directly damage infrastructure objects like roads and basements of buildings. Surface waves, produced by frost quakes and propagating inside the shallow soil layer, have large enough ground accelerations at epicentral distances of hundreds of metres. Therefore, frost quakes should be considered a phenomenon that can potentially damage infrastructures, and they have to be taken into account in seismic hazard assessments.

Our research is the first instrumental study of seismic events originating from wetland areas. These events occur as a result of the interaction between the uppermost layer of the solid Earth's CZ and atmosphere processes that deserves further study.

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Short summary
Our study shows that seismic events in the wetlands in Arctic and sub-Arctic areas are capable...
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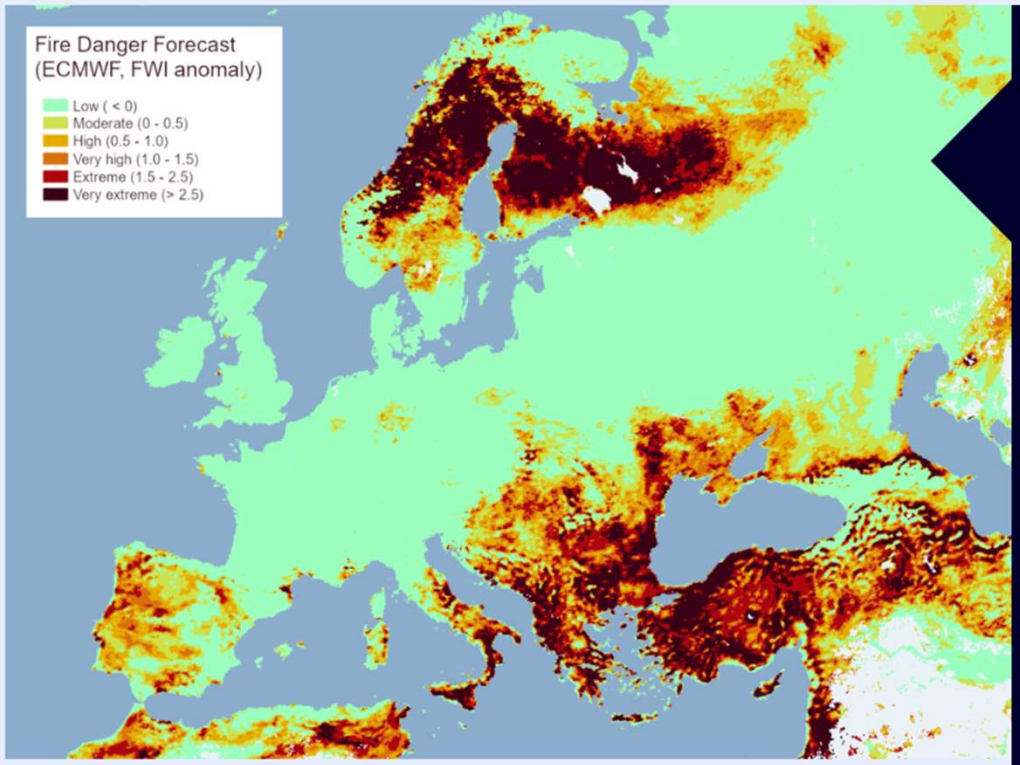
- Air and soil temperature during winter 2022–2023
- Seismic data processing
- Results and discussion
- Conclusions
- Code and data availability
- Author contributions

Wildfires



Median Fire Weather Index (FWI) anomaly map for next 7 days. Anomalies are computed as a standard deviation from the 30-year historical mean value.

Forecast from 22 to 28 July 2025

The median fire weather index anomaly map shows two distinct clusters of extreme and very extreme conditions.

One cluster covers most of Norway, Sweden, and Finland. The second one stretches across southeastern Europe, including southern Italy, the Balkans, Greece, Cyprus, Bulgaria, Romania, and Türkiye.

In contrast, western and central Europe are expected to experience low fire weather index anomalies, whereas the Iberian Peninsula will be dominated by high to very high anomalies.

Hybrid threats in the Arctic

Migrant crisis: Norway begins deportations to Russia

19 January 2016

REUTERS

Thousands of people used bicycles to cross the Arctic border between Russia and Norway

Norway has sent 13 migrants back to Russia under new rules expected to see thousands deported by bus, reports say.

About 5,500 people are due to be transported from Norway to Russia. Many crossed the Arctic border by bicycle as part of the influx of migrants to Europe in 2015.

Norway announced in November it would immediately deport people who had arrived from a country deemed safe.

The first bus left a refugee shelter in the town of Kirkenes earlier.

From BBC 19.01.2016

WORLD NEWS

Finland extends Russia border closure until April 14 saying Moscow hasn't stopped sending migrants

Finnish Interior Minister Mari Rantanen during press conference on the situation of the eastern border stations of Finland in Helsinki Thursday, Feb. 8, 2024. Finland will continue the closure of the eastern border stations until April 14, 2024. (Heikki Saukkomaa/Lehtikuva via AP)

BY JARI TANNER
Updated 3:24 PM CEST, February 8, 2024

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HELSINKI (AP) — Finland's government said Thursday that it would extend the closure of its long border with Russia for another two months until April 14, because it sees no signs that Moscow was stopping its "hybrid operation" of funneling migrants toward the frontier with the Nordic nation.

AP News 08.02.24

Finland charges tanker crew members with sabotage of undersea cables

Captain and first and second officers of Eagle S, understood to be part of Russia's 'shadow fleet', charged over incident

The Eagle S anchored in Finland last December. Photograph: Jussi Nukari/AP

Finnish authorities have filed charges against members of the crew of an oil tanker suspected of damaging five undersea cables by dragging its anchor between Finland and Estonia.

The Guardian 11.08.2025

Russian hackers seized control of Norwegian dam, spy chief says

Beate Gangås says attack in April by Norway's 'dangerous neighbour' aimed to cause fear and chaos

Europe live - latest updates

'We have seen a change in activity from pro-Russian cyber actors,' said Beate Gangås, the head of the Norwegian Police Security Service. Photograph: Fredrik Varfjell/AP

Russian hackers took control of a Norwegian dam this year, opening a floodgate and allowing water to flow unnoticed for four hours, Norway's intelligence service has said.

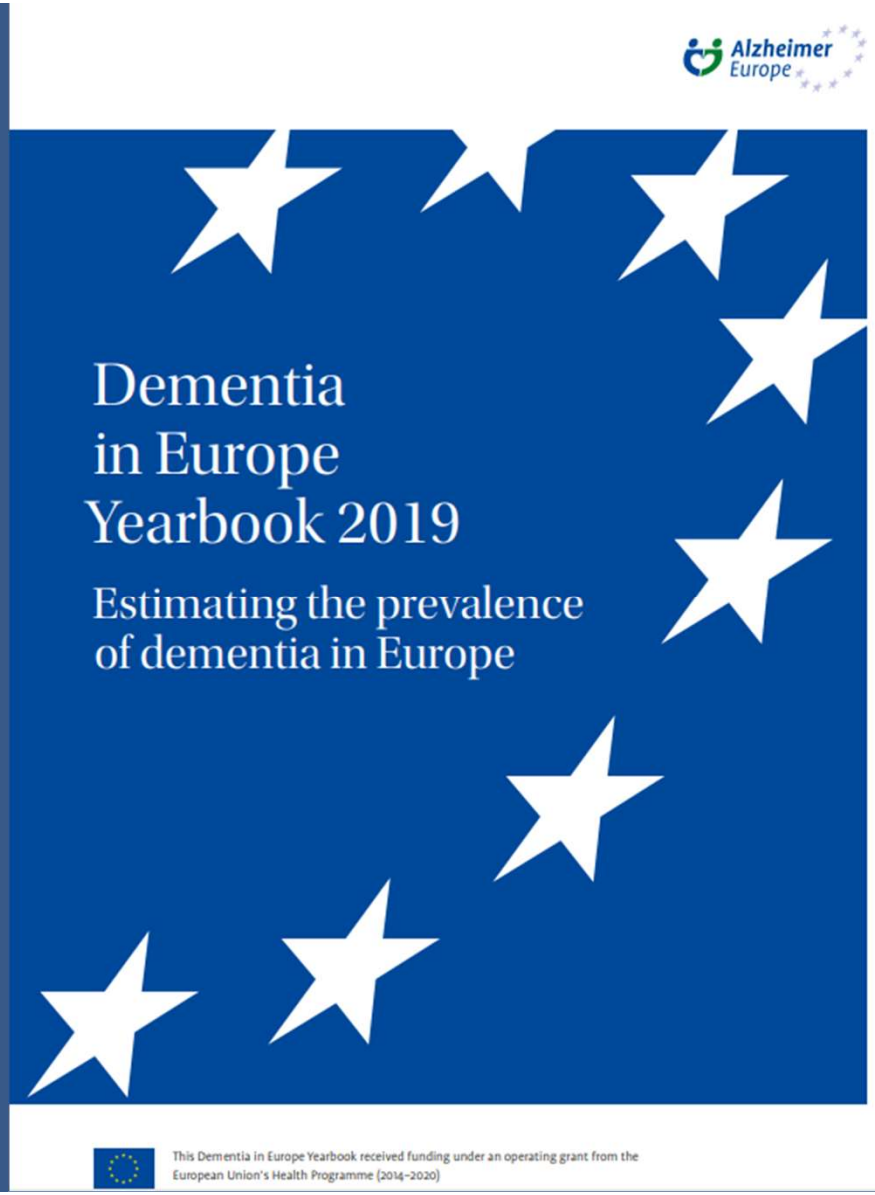
The Guardian 14.08.2025

Health in the Arctic

NordForsk

Ageing populations

- People are getting older
- Old people are living at home
- Number of people with dementia will increase in Finland:
  - 2018 - 95,836
  - 2050 - 171,599
- One can expect more missing persons situations



Pandemics

- COVID-19 was a relatively mild pandemic
- Borders were closed and all countries managed the crisis alone
- There is a lot to learn from each other
- One can be better prepared before next pandemic

Bird flu threatens Norway's wildlife

July 25, 2023

Norway's northern regions of Finnmark and Troms are battling the largest outbreak of bird flu ever seen in the country. More than 10,000 dead birds, mostly seagulls and the protected kittiwake, have been found in the Vadsø area alone and the virus was also found in a young dead fox in Tromsø.

Northern Norway is known for its seabirds, like here on the island of Hornøya off Vardø, but now they're threatened by the largest outbreak of bird flu ever. PHOTO: NewsinEnglish.no/Morten Møst

On Monday Civil Defense troops were called in to help collect and dispose of dead birds found along the coast and farther inland. Local officials have been sending out calls for help for weeks, and Agriculture Minister Sandra Borch of the Center Party responded on Tuesday with plans to visit the Vadsø area on Thursday.

NEWSinENGLISH.no

Frozen viruses, modern risks: Could melting permafrost spark future pandemics?

Douglas Johnson | May 15, 2025

Image licensed from istockphoto.com.

It starts with a crack in the ice. Then another.
Beneath the frozen soil of the Arctic, something ancient is waking up — and it's not a mammoth.

In recent years, scientists have revived viruses frozen in permafrost for tens of thousands of years. These microbes, long thought dormant and harmless, are showing signs of activity in lab experiments. As climate change accelerates the thawing of Earth's oldest ice, some researchers are asking a startling question: What happens when the microbial past collides with the modern world?

https://gradstudies.musc.edu/about/blog/2025/05/climate-meets-contagion?utm_source=chatgpt.com

“Local communities and volunteers are the backbone of Nordic preparedness” [1]

[1]Rico Kongsager, University College Copenhagen
Project leader of CliCNord Research Project and Home | LostToClimate

How to strengthen Nordic co-operation?

- Education and research
  - Joint bachelor and master programs
  - Joint PhDs
  - More joint calls for research projects
- Competence building and sharing
  - Developing and sharing course material
  - Online courses for practitioners
  - Publish more on YouTube etc.

How to strengthen Nordic co-operation?

- Capacity building
  - Map existing capacity and identify needs
  - Nordic expert database

- Institutional cooperation
  - Forming networks between institutions
  - Organise regular meetings
  - Assist each other in crises

How to strengthen Nordic co-operation?

- Strengthening collaboration between volunteer organizations
  - Regular meetings
  - Course material
- Joint emergency preparedness exercises
  - Training of personnel
  - Sharing experiences

Proposal:

The Nordic Council of Ministers should develop an Action Plan for Cooperation on Civil Preparedness and Resilience in the Arctic.

- The plan should:
  - Present an ambitious plans for Nordic collaboration
  - Articulate of a vision and clear goal for the initiative
  - Include mapping of relevant institutions and organisations in the Nordics
  - Present a mechanism for funding of joint Nordic initiatives

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