



Nordic Council
of Ministers

NORDIC FOOD ALERT

Nordic Food Alert

Executive Summary	3
Chapter 1: Project Overview	5
Chapter 2: Scenario and Methodology	7
Chapter 3: Policy Ideas and Considerations	17
Chapter 4: Conclusions and Next Steps	21
Annex 1: Participant survey results	23
Annex 2: Stress-testing Methodology	29
Annex 3: References and Supplemental Reading List	43
About this publication	45

This publication is also available online in a web-accessible version at:
<https://pub.norden.org/temanord2025-528>

Executive Summary

The Nordic region's food system, though resilient in certain respects, remains highly vulnerable to global food supply shocks, especially those triggered by climate change and geopolitical tensions. Despite a high degree of regional cooperation, food security across Nordic countries is heavily reliant on imports and interconnected global supply chains, leaving it susceptible to external disruptions. Given the significant portion of Nordic food consumption attributable to imports - estimated to be around two fifths of all food consumption, by weight - the region is particularly vulnerable to disruptions in key exporting countries or transport routes. Compared to other regions with greater domestic food production capacity, the Nordics face heightened risks from external food supply volatility, amplified by factors like their geographic location, limited arable land, and high dependency on imported energy and agricultural inputs.

In response to these threats, the Karlstad Declaration, signed on June 19, 2024, underscored the need for robust Nordic cooperation in food preparedness. This agreement highlighted the importance of enhancing regional resilience to protect the food supply chain against climate-induced events, such as droughts, floods, and crop failures, as well as geopolitical events that may restrict trade or raise food prices globally. Addressing these vulnerabilities through coordinated policy and preparedness initiatives is critical not only for the stability of food supplies but also for maintaining public trust and resilience in the face of future crises.

These are the chief reasons why, on October 8-9, 2024, food systems experts from across the Nordic region gathered in Stockholm, Sweden, for a workshop aimed at "stress-testing" the resilience of the region's food supply under a series of fictional climate-driven and geopolitical shocks. Known as the "Nordic Food Alert" project, this workshop was hosted by the Nordic Council of Ministers Secretariat and organized by the Centre for Systems Solutions, based in Poland, in partnership with Chris Hegadorn, Adjunct Professor at Sciences Po and founder of 'Food Alert' crisis simulation workshops. The event brought together a diverse group of governmental practitioners, industry representatives, academics, and civil society experts to explore the region's capacity to withstand food system disruptions and adapt to an increasingly volatile global environment.

With food systems worldwide significantly destabilized by a combination of climate change, economic and geopolitical tensions, and additional threats, the Nordic Council of Ministers recognized the urgency of assessing regional preparedness. Therefore, the

“Nordic Food Alert” simulation created a fictional yet plausible set of scenarios, challenging participants to address worsening climate impacts, potential cyber and infrastructure attacks, pandemic outbreaks, and other crises that could disrupt food supplies both domestically and internationally. Participants were tasked with developing a range of policy options, spanning immediate to longer-term responses, and presenting their proposals to senior officials responsible for the Swedish food system including the Director General of the Swedish Food Agency and the Political Advisor to the Swedish Minister of Rural Affairs.

Working in small teams, the experts examined a number of policy-focused ideas and considerations they felt were appropriate for addressing a variety of pressing food system threats in the Nordic region, including such things as creating new regional mechanisms for fostering innovation and preparedness, protecting vulnerable consumers and producers, and building networks of support both in, and beyond, the region. These ideas and considerations put forward by participants reflect a holistic, multi-level approach intended for consideration by policy makers and interest groups at regional, national, and local policy levels across the Nordic countries.

The Nordic Food Alert crisis simulation project highlighted both the urgency and opportunity for Nordic countries to strengthen their food system resilience through enhanced stress-testing, cross-sector (and cross-border) collaboration, and creative, innovative policy-making that engages a diverse cross-section of communities and stakeholders. To move forward, the Nordic Council of Ministers and other regional stakeholders are encouraged to build on the principles and political commitments of the Karlstad Declaration of June 19, 2024, by adopting more systematic stress-testing schedules and processes that simulate real-world supply chain disruptions across political, economic, social and environmental contexts. By better integrating these ideas and considerations into forward thinking and planning, Nordic governments can take proactive steps to bolster regional food resilience, safeguard public trust, and reduce future dependencies on increasingly unstable global food supply chains.

Acknowledgements:

Workshop organizers extend their sincere gratitude to the Nordic Council of Ministers for their sponsorship, funding and leadership in convening this critical exercise. Special thanks are due to Secretariat staff members Katja Svensson and Jonathan Eng for their strong support, as well as the ‘Technical Working Group’ participants who contributed their time and expertise to ensure the scenario’s accuracy and relevance. By proactively addressing these identified risks, Nordic policymakers and stakeholders can build a more adaptable and resilient food system capable of sustaining the region’s food security in an uncertain global future.



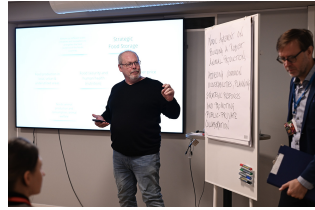
Chapter 1: Project Overview

In this two-day, custom-designed crisis simulation workshop held in Stockholm, Sweden on October 8-9, 2024, representatives of seven Nordic governments (Greenland was not represented), along with several non-government food systems actors, gathered in person to experience what might occur in the face of multiple climate-driven supply “shocks” and other challenges to the respective regional food system. This carefully researched and curated stress-testing table-top exercise introduced participants to ideas and tools meant to deepen awareness of pressing climate risks, create a community of practice to deepen collaboration and understanding, and generate creative thinking and new ideas to strengthen food system resilience through enhanced multi-party engagement, communication, and collaboration. Utilizing a bespoke mobile phone-based application and other communication tools, participants crafted policies, made difficult decisions, and experienced first-hand how decisions and actions might influence responses to national, regional and global food security shocks.

The *Food Alert* food system “stress-testing” methodology is designed as a practical and direct means to help bridge the gap between policy analysis and practical application by individuals from various walks of life involved in the complex process of transforming food systems. This workshop built upon a February 2024 *Food Alert* workshop held in Brussels, Belgium, designed to stress-test the European Union's food system, with an eye toward strengthening systemic resilience to increasingly severe climate change and related sustainability challenges. In the wake of both the COVID-19 pandemic and Russia's invasion of Ukraine, the workshop benefited from increased global recognition of, and attention to, the growing risks and overlaps between food security and social and political instability. It also benefited from work performed in the *CASCADES* EU Horizon project and earlier EU-funded projects linked to addressing climate risks and their likely impacts on social, economic, and environmental sustainability and food security.

While better prepared than many other regions in Europe and further afield, the Nordic region over the past several years has witnessed a series of crises that have driven widening fissures in institutional arrangements, exposed vulnerabilities in supply chains, and unearthed deep divisions between different competing visions of how best to respond and adjust to mounting challenges (and, who pays for those responses and adjustments). The societal and economic costs of supply shocks have been staggering, but even these costs may pale in comparison to foreseeable future shocks if European and regional decision-makers do not come together to design and direct effective and systematic responses to the rapidly escalating climate crisis.

The Nordic region is no stranger to large-scale natural disasters (e.g., oil and gas spills, pandemics, volcanic eruptions), and has lived with serious political-security risks for many decades. Still, food system threats for the region are growing. Without clear policies and plans to confront these risks head on, Nordic populations remain vulnerable to serious disruptions in food supply chains – whether caused by natural, or man-made disasters. In that light, the Nordic Food Alert workshop will contribute to increased awareness of food system risks, strengthen public-private collaboration, and help decision-makers adjust accordingly.



Chapter 2: Scenario and Methodology

The Scenario

The carefully-researched scenario of the Nordic Food Alert workshop was prepared with the help of a technical working group comprised of the project organizers and around a dozen government officials from all Nordic countries, selected for their governmental experience and technical expertise on various sectors relevant to the workshop. The overall stress-testing scenario focused on an 18-month period in the immediate future, featuring multiple significant food system shocks including: 1.) a major hit to the Danish pork industry (10% of the entire EU pork supply) due to a major zoonotic pandemic linked to contaminated soybeans from Brazil; 2.) collapse of farmed fish stocks in the region from bacterial outbreaks linked to warming waters and climate change; and, 3.), intentional overfishing by Russia in the Barents Sea of juvenile fish-stocks, leading to a major decline in Nordic supplies. These shocks, combined with other emergencies generated by the intentional sabotage by organized hackers (presumed to be Russian) of key Nordic systems and infrastructure, as well as intentional environmental disasters affecting food supplies. Workshop participants, working as members of a fictional crisis task-force, were given three different updates through the course of the exercise, each providing updates at six-month intervals. Those updates, communicated via custom-designed videos, contained the following information:

Part 1

In February 2025, South America experiences a significant decrease in soy and maize production due to prolonged drought, heightened temperatures, and excessive rainfall during the harvest season. At the same time, China's demand for soybeans rapidly increases, and the continuous war in Ukraine disrupts grain and oilseed production. By mid-2025, the global agricultural situation worsens, as persistent changes in the jet stream Rossby waves bring on extreme weather events to agricultural regions like Hungary, Romania, Canada, and the U.S., and lead to simultaneous crop failures.

As the year progresses, drought hits North Africa, and political instability in Morocco disrupts phosphate production, triggering a global phosphorus crisis. Phosphates are critical for producing animal feed, especially in the Nordic countries, where this disruption threatens food supply chains. Russia uses this opportunity to circumvent sanctions and supply phosphates to Europe via Finland, which increases tensions between Russia and the Nordic region, leading to hybrid warfare activities and increased Russian fishing in the Barents Sea.

By early 2026, South American soy harvests hit historic lows, causing a further decline in animal feed exports. Concerns rise about fungal infections affecting soy crops, and feed prices soar due to general market instability. The Nordic region faces growing fears of food shortages as these cascading crises overwhelm global food production and distribution systems.

Part 2

The second part commences in the spring of 2026, showcasing the effort of officials across the Nordic countries to manage both the causes and results of plummeting fish catches. Norway suffers from reduced fish stocks largely due to overfishing by Russia in the Barents Sea. Greenland, Iceland, and the Faroe Islands experience similar reductions due to unusually warm waters, changing fish migration patterns, and massive algal blooms. Iceland faces conflicts with the EU over fishing quotas, while threatened by Russia with a total fish export ban.

As prolonged drought and heat waves hit the Arctic Circle in the summer, in Greenland, permafrost thaw leads to failures in harbor infrastructure, halting food production and fish exports. Meanwhile, Sweden and Finland are facing wildfires that worsen the security of food supply in the Far North.

In autumn, a bacterial infection (*Aeromonas* spp.) spreads through Norwegian fish stocks. Fish farming outputs fall drastically, worsened by increased fish feed prices and persistent algal blooms, and financial losses mount for fish producers. The crisis expands to food safety concerns, with fears of infection spreading to humans. Meanwhile, Denmark faces a pork production crisis as livestock farmers go bankrupt due to the import of fungally contaminated soy, causing mass animal deaths and feed and food recalls. As slaughterhouses close and layoffs spread, conspiracy theories circulate online, blaming the crises on government manipulation, fueling distrust and fear.

Part 3

The third narrative unfolds in November and December 2026. Denmark and Norway are hit by destructive hacker attacks that wipe out progress made on solving the fish and pig health crises. In Denmark, acts of sabotage halt operations at waste-to-heat power plants, further complicating pig carcass disposal. Meanwhile, a Russian shadow oil tanker spills oil, disrupting sea trade routes in the Baltic, worsening food supply issues across Denmark, Sweden, and Finland. A wave of disruptive attacks threatens Nordic critical transport and warehouse infrastructure – and opportunistic price gouging by major market players leads to soaring prices. Finland faces specific challenges with food imports to Åland, as small farmers protest against unfair grocery supply agreements. The combination of food shortages, sabotage, and price hikes leads to an erosion of trust in the political establishment, while social media extremism and populism rise. Social unrest spreads, with mass protests and violent attacks on minorities, although some activists call for hope and cooperation amidst the chaos.

The Methodology

The methodology developed by the project team builds on the general understanding of the 'stress-testing' concept, but adapts it to the food system security, and incorporates the social learning process,^[1] by using the policy simulation approach^[2]

The Nordic Food Alert stress testing methodology is presented in Figure 1. It uses the conceptual framework for cross-border impacts of climate change^[3]

Policy Simulations as a critical component of stress testing

Creating and applying a Nordic Food Alert crisis scenario provides a conceptualisation of how a succession of crisis events may play out driven by a wide range of hazards affecting food systems (both globally and regionally). This inherent complexity requires a broad stakeholder engagement in an interactive format (two-way knowledge transfer). This has been achieved by designing and applying the Nordic Food Alert Policy Simulation, that served as an exploratory and learning environment, driven by an evidence-based crisis scenario, for pinpointing vulnerabilities and existing exposures within the Nordic food market landscape.

-
1. Reed, M. S., Evely, A. C., Cundill, G., Fazey, I., Glass, J., Laing, A., Newig, J., Parrish, B., Prell, C., Raymond, C., & Stringer, L. C. (2010). What is Social Learning? *Ecology and Society*, 15(4). <https://www.jstor.org/stable/26268235>
 2. Mochizuki, J., Magnuszewski, P., Pajak, M., Krolukowska, K., Jarzabek, L., & Kulakowska, M. (2021). Simulation games as a catalyst for social learning: The case of the water-food-energy nexus game. *Global Environmental Change*, 66, 102204. <https://www.sciencedirect.com/science/article/abs/pii/S0959378020307871?via%3Dihub> – an experiential process where participants co-create desired future pathways.
 3. Carter, T. R., Benzie, M., Campiglio, E., Carlsen, H., Fronzek, S., Hildén, M., Reyer, C. P., & West, C. (2021). A conceptual framework for cross-border impacts of climate change. *Global Environmental Change*, 69, 102307. <https://link.springer.com/article/10.1007/s13753-015-0037-6> (see Annex X for a detailed description). The unit of analysis that is undergoing a stress test was the Nordic food system, including its connections with the external food markets. This methodological choice increases the level of complexity (as compared to stress testing of a single policy) that needs to be tackled - such a holistic treatment is necessary to unfold potential serious risks at a system level that could be missed by more fragmented approaches.

Policy Simulations, also known as policy exercises, are processes in which participants collaborate to immerse themselves in complex scenarios that mirror real-world issues, requiring policy decisions.^[4] The process typically involves a group of individuals who role-play stakeholders or decision-makers within a given context, representing the interests of various groups, organizations, or agencies.

A Policy Simulation uses an extended narrative layer to confront participants with a fictional yet plausible future crisis scenario, presented through a carefully crafted series of events. The storyline is presented using a series of professionally made videos, fictional news stories, social media posts, and other materials, such as maps or infographics. While it unfolds, participants work to respond to the constantly changing situation.

Drawing upon existing scientific data and expert consultations,^[5] Policy Simulations bring together diverse experts to collaboratively tackle challenges, and to engage them in collective problem-solving activities. The method serves as the platform for critical analysis to foster consensus-building and generate innovative solutions.

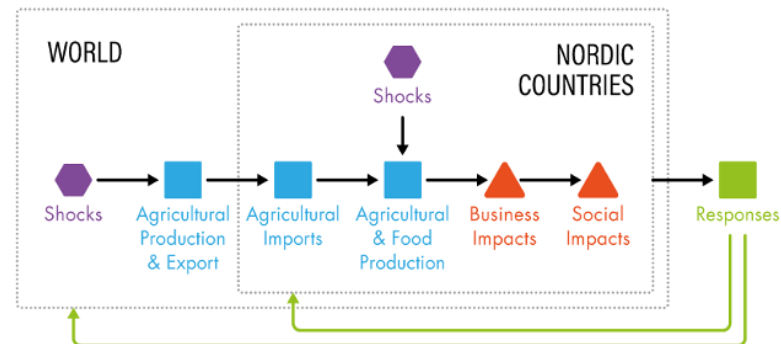
-
4. Peterson, G.D., Cumming, G.S. and Carpenter, S.R., 2003. Scenario planning: a tool for conservation in an uncertain world. *Conservation biology*, 17(2), pp.358-366. <https://conbio.onlinelibrary.wiley.com/doi/abs/10.1046/j.1523-1739.2003.01491.x>
 5. Adam, D. (2020). "Design fiction" skirts reality to provoke discussion and debate. *Proceedings of the National Academy of Sciences*, 117(24), 13179–13181. <https://doi.org/10.1073/pnas.2008206117>

NORDIC FOOD ALERT STRESS TESTING METHODOLOGY

POLICY SIMULATION



CRISIS SCENARIO



Stress-Testing Objectives

Focus areas of food stress-testing and relevant space and time scales

Problem Owner and Stakeholders

Risks, Challenges

Existing Resilience Mechanisms

Key Vulnerabilities of the Food System

Core Trade-offs

Discourse Landscape

Inclusive Solutions - Societal Compromises

Recommendations on how to build food system resilience

Figure 1. The methodology for the stress testing of the Nordic countries food system.

Policy Simulation process steps:

1. Participants enter the simulation performance room with their newly acquired roles, goals, and backstories. Within their roles, participants experience real-world-like pressures (via lobbying messages), but they are free to experiment and follow their own expertise and beliefs.
2. Participants experience a challenging crisis that can be played out at the local, regional, national, or global scales.
3. Immersed in their roles, participants engage in dialogue about different ways of apprehending the problems. They discuss solutions such as new policies, changes in governance, or specific projects and investment decisions. They create pathways towards different futures – some of them more desirable than others.
4. After intensive negotiations and experiencing the perspectives of other stakeholders, participants drop their roles and leave the performance room with diverse new insights and ideas. In the debriefing, the assumptions used for the simulation are revealed, and experiences are shared between participants. The learning and insights from the simulation experience can be applied to improve the real-world situation by proposing new policy propositions and governance improvements.

Policy Simulations share the following characteristics.^[6]

Problem statement

Participants encounter a complex real-world problem, demanding collaboration, inventive solutions, and the use of diverse data.

Different perspectives

The simulation offers a narrative-driven depiction of the issue, linking stakeholders with varied backgrounds, values, tasks, and goals. This allows them to explore the problem from multiple perspectives inherent in the simulation roles.

Communication

Through sharing viewpoints, suggestions, and negotiations, participants foster open dialogue and facilitate communication across differing perspectives.

Complexity

During discussions, participants uncover the key interconnections, and interdependencies within the complex system and propose policy responses to the problem.

6. Duke, R.D. and Geurts, J., 2004. *Policy games for strategic management*. Rozenberg Publishers.

Creativity

Participants discover their creative potential as abstract ideas become tangible, opening new pathways into the unknown.

Commitment to action

After reconciling differences, participants commit to implementing their jointly developed strategy, using their expertise to tackle real-life challenges.

Nordic Food Alert Crisis Scenario Background

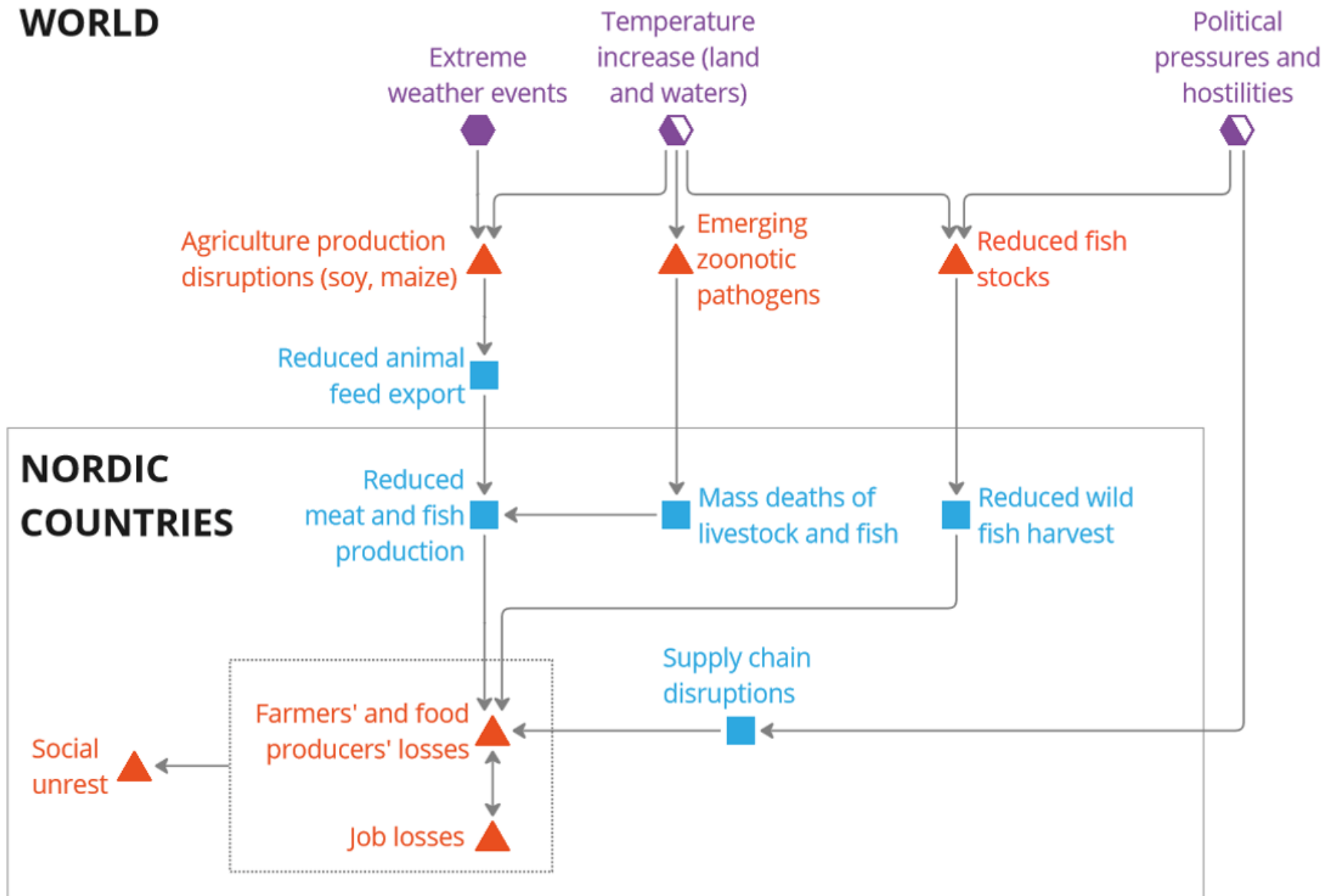
To shape a narrative tailored to a stress-testing exercise focused on Nordic food systems, choices had to be made along two key dimensions. The first was determining the nature and scope of the initial disruptive triggers. It was essential to thoroughly examine the origins of each scenario event, as their effects extend beyond their geographic origins – while maintaining a Nordic perspective. Although the initial climate triggers are global in span, they are quickly reframed within a detailed Nordic context.

The second important factor was selecting the vulnerability areas where the impacts would be felt most acutely. The Karlstad Declaration^[7]

Figure 2 illustrates the simplified concept of the developed crisis scenario, and Annex 1 provides a comprehensive overview with a detailed description of its regional components.

7. Nordic Council of Ministers for Fisheries, Aquaculture, Agriculture, Food and Forestry (MR-FJLS). (2024). The Karlstad Declaration – Nordic co-operation for preparedness and robustness related to food supply and forestry. *Norden.org*. <https://www.norden.org/en/deklaration/karlstad-deklaration-nordic-co-operation-preparedness-and-robustness-related-food> has served as early guidance in this process, in terms of both trigger selection and determining which parts of the system would be affected. Key fields underlined by the 'Technical Working Group' included critical goods transportation and storage methods, protection of cultivated and arable land, sustainability in Nordic commercial fishing & aquaculture, and food safety in veterinary medicine & public health. These areas remain exposed to natural crises and disasters, biological threats (such as antibiotic resistance or newly emerging toxinogens), and security threats – including geopolitical, cyber, and logistical challenges. The stress-testing scenario presents a chain reaction of cascading impacts along those lines that affect food producers, retailers, buyers, and consumers alike.

WORLD



Policy Simulation Workshop elements

Video Narratives for Policy Simulation

The predominant narrative medium in policy simulations is videos, often stylized as news programs, documentaries, commercials, political advertisements, phone calls, recordings of expert discussions, and so on. Additionally, videos are complemented by other narrative forms such as newspaper headlines, screenshots from news websites, infographics, headlines of scientific articles, and social media snapshots. These videos and other narrative content, including news and social media entries, are intricately linked to the Crisis Diagram, illustrating the relationships between different elements of the system that the simulation aims to represent. By weaving them together, designers aimed to ensure that the co-creation efforts of the crisis diagram were not lost in the process, while simultaneously striving to create a compelling and immersive narrative that accurately reflected the complexities of the food security landscape.

Policy Simulation Roles

To fully engage participants in the Nordic Food Alert policy simulation, they were assigned a variety of roles based on various worldviews and perspectives in the field of food regulation, production, trade, and consumption. The formulation of roles was informed by a thorough literature review and consultation with experts. Subsequently, the design team identified the most prevalent ideologies and used them as the basis for developing specific roles. These ideologies encompassed a diverse range of perspectives, underlining ideas such as Social Solidarity, Eco-modernist Development, Economic Rationalism, Agro-centrism, or Conservative Neo-realism. Examples of roles given to participants include governmental institutions, companies, public and private organizations, e.g. Swedish National Food Agency, Department for Industry and the Environment (Åland), Nordic Business Council, Pork Producers Federation, Farmed Animal Welfare Alliance, or Nordic Sustainability Hub.

Run of show

The Policy Simulation workshop presents the crisis scenario in the video narrative form to the participants enacting various roles in order to respond to the imposed challenge. Their first response often recreates the typical real-world problems of short-term focus, decision silos, confirmation bias, underestimating uncertainty, narrow discourse range included, etc. Experiencing these pitfalls opens participants to a more systemic and participatory approach to developing solution options in the post-simulation session that is used as a platform for a discussion about contingency plans to mitigate present and future risks.

The workshop participants were grouped together to produce ideas for ways out of the crisis scenario in three focus areas. The first field, Crisis Responses,

looks at short-term measures to alleviate acute food shortages. The second, Agriculture and Food Production, explores possibilities of gearing the Nordic food sector towards a more sustainable and less crisis-prone production. This is about preparing for a crisis in the long run. The last category, Trade and Finance, investigates how food value and supply chains could be distributed and financed inside and outside the Nordic region to guarantee the highest possible degree of food security.

Discussions within the working groups were additionally sparked and oriented with an initial set of fictional policy suggestions and demands, created based on the suggestions from the Technical Working Group and designer desk research, and showcasing the interests and wishes of various lobbying groups. Simulation participants were asked to vote on the initial propositions, but later they could also jointly develop their policy recommendations.

During the course of the workshop, the participating experts and practitioners from food security-related fields produced 8 recommendations in the three focus areas, each of which was agreed via an app-based voting procedure. These policy ideas reflected the outcomes of the discussions and compromises among the workshop participants made under time pressure. They are therefore neither exhaustive nor do they represent a coherent plan of action. They should not be seen as a definite or ideal set of recommendations but rather as the result of the Nordic Food Alert crisis simulation.



Chapter 3: Policy Ideas and Considerations

While all workshop participants were notionally part of a fictional "Nordic Food Security Task Force" assembled by regional governments to collectively deal with a series of climate-driven supply risks and shocks and other supply chain disruptions, they were split into three roughly-equal groups, with each group asked to consider either short, medium, or long-term policy considerations. The first group was directed to focus on 'crisis preparedness and response'; the second group was asked to focus on agriculture and fisheries production; the third group was focused on trade, supply chains and finance. All participants were instructed to identify and consider various policy "trade-offs" such as maintenance of national sovereignty for political decisions versus decision-making by a regional institution; or, profitability versus biodiversity or lowered green-house gas emissions.

On Day One of the workshop, prompted by a series of "lobbying emails" received on their mobile phone application from fictional interest groups, participants were asked to identify several potential policy responses to the crises presented in several videos prepared specifically for the workshop and tailored to the risks and vulnerabilities of the Nordic region as identified by the project organizers with help from regional government experts. By the end of the workshop, participants working in small groups agreed on a list of eight specific topics where policy action among the Nordic governments might specifically focus, to address significant risks and weaknesses identified by the exercise. Those policy proposals centered on the following areas:

1. Establishing a **Nordic Food Forum for Resilience** to foster bottom-up innovations and strengthen food resilience across the region.

Premised on the conviction that Nordic nations can do more to elicit citizen engagement regarding the structure and operation of regional networks along with the fostering of more innovative thinking at local and regional levels, this group focused on the need for establishing common understandings of the risks and vulnerabilities of the region's food supply as a basis for this Forum. Starting from the principle of transparency, such a forum, they argued, should be governed by Nordic leaders, meet quarterly, and include government representatives, farmer groups, food producer organizations, food retailer representatives, and academics/experts. This approach would, at its core, strengthen common understandings of food environment challenges and lead the way to more resilient systems and societies, prepared to respond more effectively to future crises.

2. Implementing **strategic food stockpiling** to ensure emergency supply security for the Nordic countries.

Starting from the notion that a common, regional situational understanding was needed, this group looked at the possibility of having a single, regional system for strategic food stockpiles that would benefit from national programs and experience, starting from a clear mapping of risks, resources and response capabilities. Such an approach, they reasoned, would spread the risk of bottle-necks and shortages, and allow for a broader regional responses to a given food-supply crisis. Premised upon a strong foundation of public-private cooperation, including the possibility of joint procurement agreements with the private sector managing stock-piles and any subsequent exchanges, this approach relies heavily on the principles of shared trust and regular and reliable communication systems.

3. Expanding **local food production** in urban and underutilized areas to reduce reliance on imports.

This group examined how to reduce dependencies on foreign food supplies, including by proposing strengthened local production of essential products and closer collaboration at various policy levels. This group proposed enhanced cooperation among producer groups within the region, along with enhanced public-private collaboration. Joint procurement agreements could be established to enhance cooperation and economies of scale, along with strengthened networks of producers and retailers, accompanied by appropriate legal tools to facilitate the augmentation of such enhanced ties and arrangements.

4. Enhancing **food security and nutrition** to ensure health outcomes amidst shortages.

This group examined how to prepare and sustain a coherent policy environment that can ensure positive human and environmental health outcomes, simultaneously, while strengthening regional self-reliance in anticipation of future external disruptions to the importation of key food supplies. Among their various policy recommendations, enhancement of local production and improved diets was particularly emphasized, to reduce import dependency on foreign-supplied products and reduction of unhealthy food options. This approach would prioritize strengthening of citizen food literacy and education along with heightened awareness of the impacts of food environments on societal resilience.

5. Introducing **consumer price protections** for staple foods, alongside policies like price caps, allowances for vulnerable groups, and revised trade agreements.

This group reasoned that during any significant food supply crisis prompted by military conflict directly affecting their region, a key aspect of resilience would be the ability of Nordic governments to quickly identify and respond to the social needs of its most vulnerable populations through effective social safety net programs. Not only is a clear and common understanding of such “vulnerable” groups needed for prompt delivery of required services, but also certain restrictions could be immediately applied on the import/export of certain goods deemed critical to safeguarding regional food supplies – considered in light of international rules, treaties and obligations (e.g., EU, NATO). First among proposed crisis responses would be the application of “price caps” for consumers on essential food products, intended to avoid price-gauging and profiteering to ensure availability and access to a basket of nutritionally-adequate and affordable foods.

6. Crafting a **Nordic agreement on animal production** to address common vulnerabilities, promote public-private collaboration, and facilitate strategic responses.

This group, after choosing to minimize attention on the thorny topic of reduced consumption of animal proteins – in lieu of more environmentally sustainable, plant-based food sources, focused on how to develop a regional agreement on animal production, to safeguard both livelihoods, regional food supplies, and enhanced public-private collaboration during times of crisis. A regional response, they assured, would facilitate quicker responses at regional level, including additional collaboration on alleviating supply shortages across Nordic cooperation when/where needed.

7. Increasing **Nordic food resilience through international cooperation** to strengthen food system support networks.

This group first looked into the possibility of developing and/or strengthening ongoing diplomatic and commercial ties with trading and development partners in food exporting countries where - in times of emergency - special trading preferences could be established to prioritize exports to the Nordic region. Eschewing this approach, deemed as overly colonialist/mercantilist by group members, this response sought instead to strengthen the overall open, global trading system which would ensure the free and smooth flow of food supplies even in the face of supply-side disturbances – whether from climate change or international conflict.

8. Addressing **food safety challenges** to ensure standards under crisis conditions.

This group focused mainly on the issues linked to a “One Health” approach to food systems, involving the holistic view of human, animal, and environmental health. Among its recommendations and suggestions for further policy attention was a close look at the impacts of over-use of antibiotics on domesticated animal herds, and the resulting anti-microbial resistance (AMR). The group proposed that Nordic governments establish regional standards on antibiotic usage in food production, produced by a regional task force working together in lab settings during peacetime, and together in response to any significant external crises.



Chapter 4: Conclusions and Next Steps

It is anticipated that, as a result of this workshop and with the publication of this report, Nordic policy-makers will consider further steps they might consider taking to strengthen the resilience of their food systems and its key supply chains – both individually as sovereign nations as well as together as a single bloc.

The Nordic Food Alert crisis simulation project highlighted both the urgency and opportunity for Nordic countries to strengthen their food system resilience through enhanced stress-testing, cross-sector (and cross-border) collaboration, and creative, innovative policy-making that engages a diverse cross-section of communities and stakeholders. The workshop underscored the complex vulnerabilities of the Nordic food system, particularly its significant reliance on global supply chains and import-dependent commodities, which expose the region to significant risks from cascading geopolitical conflicts and climate change. It is hoped that the insights gained and the social connections made during this simulation can serve as a catalyst for reinforcing and expanding the region's activist and progressive approach to food security, food sovereignty, and supply chain robustness.

To move forward, the Nordic Council of Ministers and other regional stakeholders are encouraged to build on the principles and political commitments of the Karlstad Declaration of June 19, 2024, by adopting more systematic stress-testing schedules and processes that simulate real-world supply chain disruptions across political, economic, social and environmental contexts. Integrating this with "bottom-up" approaches that empower local communities, farmers, and businesses to co-create adaptive strategies will strengthen Nordic preparedness against future food supply shocks. As NATO members, all Nordic states now have the added imperative to align food security with broader national security objectives. By taking these steps, Nordic governments can create a more resilient and cohesive food system that stands

resilient against future disruptions, ensuring availability and access to food across the region for years to come.

In alignment with the principles outlined in the Karlstad Declaration of June 19, 2024, which calls for strengthened Nordic cooperation in food security preparedness, participants identified several priority areas for action. A key recommendation would be to establish regular, scenario-based stress tests across the region that model various food supply chain disruptions and responses, similar to those conducted during the workshop. Additionally, the workshop emphasized the importance of fostering bottom-up, collaborative planning with farmers, supply chain actors, and local governments to enhance adaptability and innovation across the food system. By integrating these recommendations into forward thinking and planning, Nordic governments can take proactive steps to bolster regional food resilience, safeguard public trust, and reduce future dependencies on increasingly unstable global food supply chains.

Annex 1: Participant survey results

Nordic Food Alert: Evaluation survey of participants' experiences - Summary

21 respondents took part in the post-workshop survey. **The majority of them (14) have never participated in a similar experience before.** 11 participants represented governmental institutions, 6 academia or third sector, and 3 business (one person chose the "other" category). 12 participants work on the national level, 3 combine it with international work beyond Nordics, 1 works on their local level, 1 on the Intra-Nordic level, and 4 represent some combination of the above mentioned ranges.

Participants' key takeaways from the workshop can be grouped into 4 major themes:

COLLABORATION	INSIGHT
- Existing need and positive attitude towards collaboration. - Recognizing common challenges. - Power of collaboration: exchanging knowledge will bring solutions. - Considering different perspectives, need for cross-sectoral discussion. - Feeling of strengthening and broadening the network already. - Need to overcome coordination problems in order not to reinvent the wheel, repeat mistakes etc. - Fundamental similarities between Nordics.	- Simulations as a way of gaining insight into complexity. - Thinking out of the box may bring solutions. - Preventing narrow-mindedness and siloes. - Awareness of conflicting positions/agendas. - Increased awareness and feeling of urgency thanks to plausible scenarios. - Identifying salient questions.
PREPAREDNESS & RESILIENCE	INTEGRITY
- Vulnerability of food systems. - Need for more attention on defining regulatory boundaries better. - Preparedness for extreme scenarios easy to overlook when busy with Business as Usual. - Collaboration essential for resilience.	- Compliance with existing agreements. - Courage to set targets/ take pledges. - Potential conflict between resilience and sustainability or equity. - Including all perspectives in handling extreme situations.

When it comes to participants' **opinions about the workshop**, most of them started their response to the question "Did the policy simulation meet your expectations?" with a "Yes". When it comes to details, their feedback proves to be a little more mixed both about the format and the outcomes of the workshop.

Respondents expressed favourable opinions about the whole process being interesting as well as researched, conceptualised, and prepared well. They appreciated both the networking opportunity and diving deep into complexity and comparing differing agendas. Participants praised the format of two complementary days providing a long break for processing. The value from day 2 has been highlighted by many. The app and the size of groups were satisfactory as well.

The following aspects of the workshop process have received an ambivalent reception:

- Day 1 (being too slow or too confusing for some), especially the aspect of role-taking and immersion. On the one hand, scenarios were considered realistic and, together with visuals and app, setting the right mood. On the other hand, some participants needed more time to get into character + more instruction on policy making.
- Time constraints as a force driving solution-oriented thinking but also not allowing for a deeper conversation.
- Accuracy of topics selection: those which were included were relevant but some important ones were omitted.

Participants' feedback has been rather negative regarding the lack of clarity about the next steps and impact of the meeting. Some expressed concern that their policy propositions were too underdeveloped to be useful for the Nordic Council of Ministers.

When asked about the **mechanisms of the policy simulation which allowed them to co-create real-world recommendations**, respondents indicated:

1. Group work without assigned roles + summary presentations on day 2 (this aspect appeared most frequently in the survey). It was even more useful than day 1 for some and essential to extract value from day 1 for many.
2. Different parties + the element of having to come to a compromise.
3. Emails with opinions and lobby messages.
4. Sparking creativity with time and input limits.
5. Comfortable two-hour windows for discussions.
6. The combination of in and out of game discussions.
7. Imagination: taking participants into the future and into someone else's mindset.

In general, immersion was appreciated but further development and consolidation during day 2 even more so, leaving participants with an unsatisfied appetite to translate the exercise into further steps in the real world and continue Inter-Nordic collaboration.

Respondents' expressed conflicting **views on the potential of simulation for allowing them to take into account disagreements** over facts, interests, and values.

Framing disagreements well, thanks to:	Framing disagreements poorly, due to:
• freedom of playing someone else; • highlighting trade-offs in policy making ("no easy solutions"); • setup with preexisting disagreements; • emails in the app showing new perspectives; • sandbox environment, freedom of testing and reshaping "policy"; • highlighting complexity.	• time constraints (leading to focus on common ground instantly and/or not being able to get into character); • restrictive roleplay; • not enough time and instruction to achieve realism/ immersion in roleplay; • weak commitment; • natural preference/ tendency to focus on similarities and agreement.

Respondents were encouraged to propose **next steps and ways of further collaboration**. They came up with a number of both institutional and "soft" actions, either based on something that is already functioning or completely novel.

	institutional	soft
novel	• Agreement on improvement of food environments. • Strategic collaborations on decreasing dependencies on imported inputs. • Nordic Fund subsidising transition to more plant-based production. • Strategic Inter-Nordic trade agreements, especially for times of crisis.	• Seed sharing among farmers. • Forum or thematic joint focus groups for follow-ups, creating synergies, resource mapping, increasing diversity and decreasing redundancy.
based on something already existing	• Using the NATO Forum to discuss mitigation of Nordic vulnerabilities. • Following the Karlstad Declaration. • Including calls on research in the field from Norfund.	• Keeping up the work on nutritional recommendations and food waste. • Facilitating action based networks. • Filling gaps in cooperation between different actors. • Inter-Nordic desiloeing: networking regularly, learning about the structures and who to contact.

Together with **missing perspectives** of some groups of stakeholders (consumers, farmers, retailers, industry experts), respondents identified the following important but **underrepresented topics**:

1. Social topics, i.e. immigration trends and supporting parts of the world with higher food security risks; equity & justice; practicalities and social aspects of cooperation.
2. Systemic topics, i.e. resilience vs. mere preparedness/ coping; innovation; economic sustainability within the food system; interdependencies between infrastructure, energy, water resources, and transportation.

One participant noticed that the topic of EU Common Agricultural Policy should have been discussed more and another one would like to see more conversation around pollinators.

When it comes to **suggestions for improving the simulation and workshop formula**, two appeared especially frequently: giving more time and more/ better instructions.

The latter is straightforward: participants would prefer better instruction on: current state of policy, agreements, positions etc. as well as roleplay, app and what to do with emails. The former is more problematic as some suggestions about the use of more time seem contradictory. Some respondents wanted to see more time allocated to getting into and staying in character, even envisioning a third immersive stage that would build upon the outcomes, develop actionable recommendations, and allow for moving around different groups. Other participants would prefer having more time for discussions as real selves, networking, and unstructured conversations, not carrying simulated scenarios into day 2: less focus on tools, films, and briefings, more on topics and reacting to the working groups' results.

Perhaps, better communication of the expected value (i.e. simulation as an exercise of selected elements of policy-making and not a whole process). Many participants underlined that real policy making takes real expertise and more in-depth research & discussion.

A number of procedural suggestions appeared: reducing the influence of lobbyists and preset goals for recommendations, making invitations more informative, allowing for changes in texts after they were open for vote, debating policies before voting, providing a list/ presentation of participants, separating short- and long-term actions, and organising sub-thematic workshops.

Annex 2: Stress-testing Methodology

The Food Alert Crisis Scenario

Cross-border impacts of climate change methodology

The conceptual framework for understanding cross-border impacts of climate change focuses on understanding how a climate impact originating in one location can extend across borders, posing risks to distant, and apparently unrelated regions. It distinguishes an initial impact triggered by climate events within specific regions, followed by downstream consequences propagating through an impact transmission system, with adaptation responses spread through a response transmission system. Understanding cross-border impacts and responses necessitates recognition of various climate triggers, impact categories, transmission scales, and dynamics. It also requires understanding response targets and dynamics, as well as the socio-economic and environmental context, including factors beyond climate change. The methodology serves as a tool for identifying relevant causal relationships and understanding adaptation strategies and their broader implications within resilience planning. Additionally, it aids in assessing probable risks, identifying new avenues for mitigation and adaptation, and strengthening food resilience within the chosen (macro)region.

In Figure X we provide a visual representation of the cross-border impacts of climate change,^[8] with a brief description of its components. The figure visually depicts how a climate impact (climate trigger), originating in one location, can spread across borders, posing a potential risk to a distant region. This may necessitate a response not only from actors within that region but also from those outside the location.

The Nordic Food Alert crisis scenario conceptual diagram

The Crisis Scenario diagram represents a sequence of climate change-induced interconnected triggers, impacts and events as they might unfold, considering the interdependencies within the world and the Nordic food system. Drawing from the framework detailed above, the diagram portrays a plausible scenario combining global events with specifically Nordic events and impacts, embedded in social and policymaking realities. Collaborative efforts with the Technical Working Group experts ensured that the created diagram was comprehensive

8. Carter, T.R. et al. (2021).

and realistic, encompassing a wide range of risks and possible futures for the Nordic countries. Each of the events and its hypotheses within the crisis scenario has been meticulously crafted, based on past events, drawing from available data, news sources, current affairs, and expert insights. Despite their hypothetical nature, these events are rooted in existing evidence found in the scientific literature. The evidence used to craft these scenarios has been referenced in brackets, allowing for further investigation and a deeper understanding of the nature of shocks applied in the scenarios.

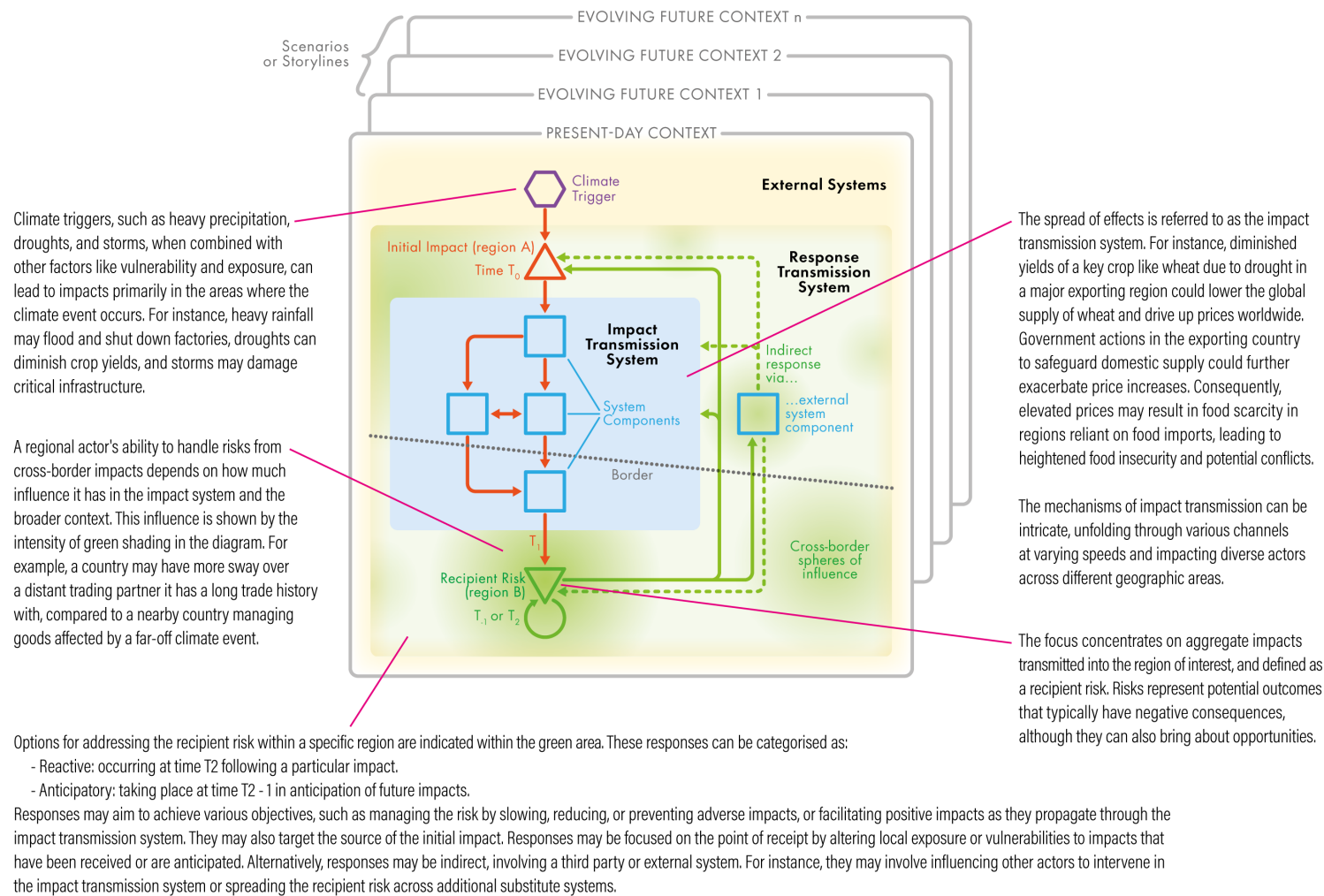


Figure 1: A conceptual representation of the cross-border impacts of climate change developed by Carter et.al., (2021) with components' description.

As previously noted, the scenario initiates with climate triggers, yet the negative impacts are amplified by political tensions, supply chain dynamics, and societal behaviors. Even though most of the climate triggers originate outside of the Nordic territories, the highly interconnected and interdependent food network causes a ripple effect throughout the entire supply chain system.

In general, areas of pressure include (a) the monopolized nature of production and export of phosphates, crucial to global agricultural outputs as well as in animal feed production.^[9] (b) reduction in wild fish stocks, affected both by climate change and its consequences, and by security tensions related to catchment territories, (c) climate-related instabilities in fish farming, affecting the production output as well as fish welfare and consumer safety, (d) climate change-related and man-made threats to critical logistical infrastructure, and (e) soy production monopolization and export-dependence in the supply and quality of animal feed resources.

9. Lee, S. A., Lopez, D. A., & Stein, H. H. (2023, February 1). — Invited Review — Mineral composition and phosphorus digestibility in feed phosphates fed to pigs and poultry. *Animal Bioscience*. Asian Australasian Association of Animal Production Societies. <https://doi.org/10.5713/ab.22.0322>

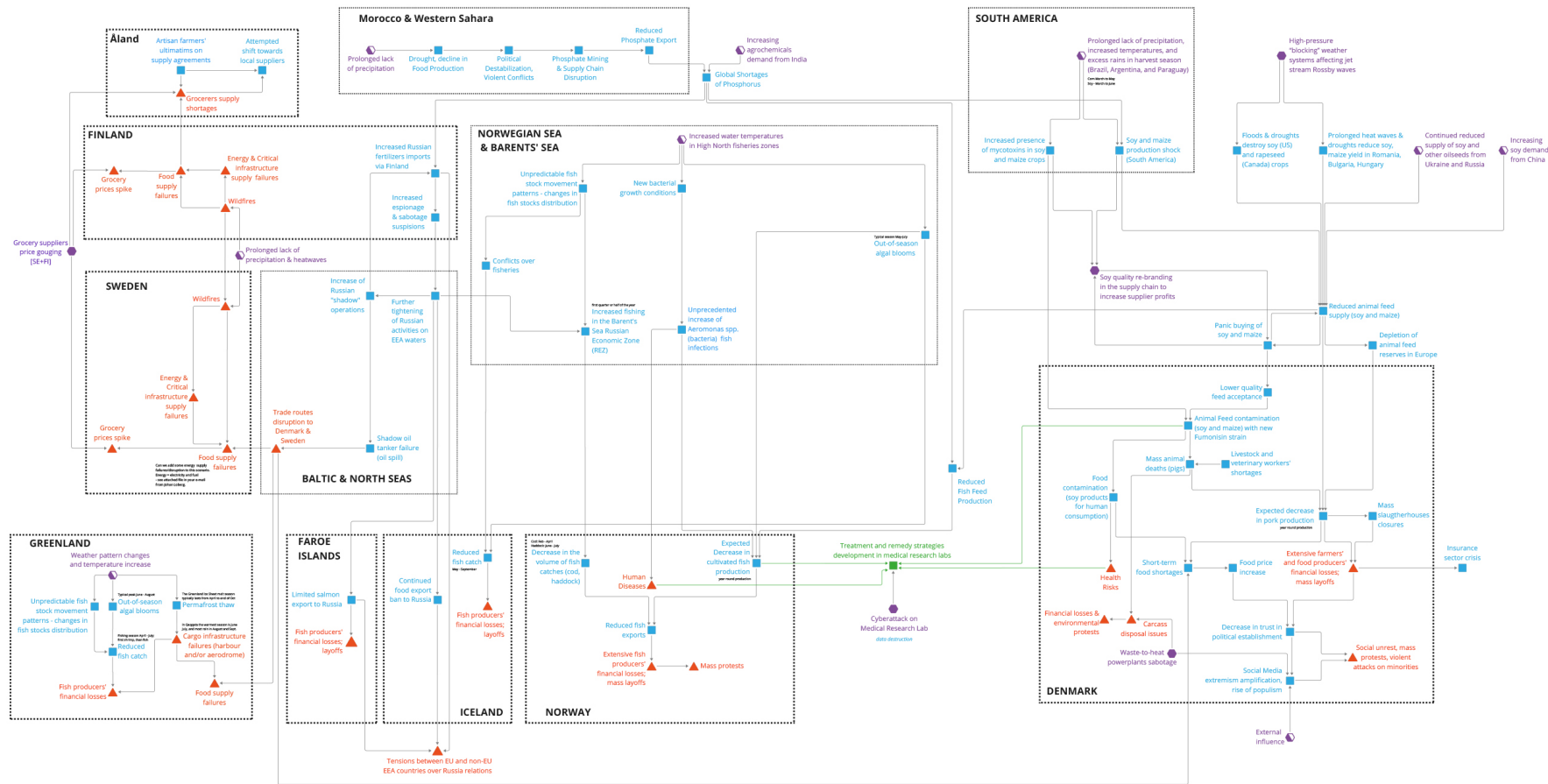


Figure 2 Food Alert Crisis Scenario for the Nordic countries, based on cross-border impacts of climate change

Apart from direct impacts on food systems due to the decline in the Nordic feed imports (soy, maize), coupled with reduced production and exports (wild and farmed fish, pork), disruptions in the food supply chain lead to major political, economic, health, and societal repercussions.

Political

- pressure for government intervention to rescue several big players,
- global food traders' hoarding for speculation.

Economic

- risk of global financial crisis,
- rising inequalities, and the standard of living decline,
- extensive farmers' and food producers' financial losses.

Social

- disruption of social cohesion,
- social unrest, mass protests, violent attacks on minorities,
- social media, extremism amplification,
- rise of populism,
- decrease in trust in the political establishment.

Health

- forced changes in consumer food choices,
- health risks

Nordic Food Alert – Diagram Components

(a) Phosphate crisis

A severe drought in North Africa and Sahel is triggered by a prolonged lack of precipitation. The drought – and resulting decline in food production – significantly contribute to an increase in local and regional conflicts, exacerbating political instability in the North African and Sahelian countries. One example of the hypothetical conflicts partially caused by the drought is the clash between Morocco and the Western Sahara Independence Movement.^[10] In the crisis scenario, the ongoing conflict leads to major disruptions in phosphates production and trade. Morocco is a key global supplier of phosphates used for fertilizer production, as well as for enhancing animal

10. Dworkin, A. (2022). North African Standoff: How the Western Sahara Conflict is Fuelling New Tensions Between Morocco and Algeria. *European Council on Foreign Relations*.
<https://ecfr.eu/publication/north-african-standoff-how-the-western-sahara-conflict-is-fuelling-new-tensions-between-morocco-and-algeria/>

feed.^[11] The combined effects of the phosphates disruption in Morocco and the surge in short-term demand for agrochemicals in India (explored further in part (e) of the diagram presentation) cause spectacular increase in agrochemicals prices worldwide, affecting crop yields of feed resources as well as feed production itself, and resulting in shortages and price increases.

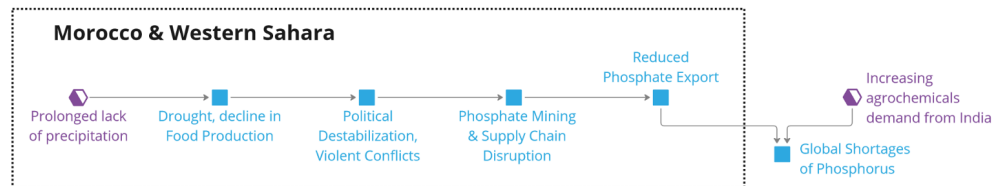


Figure 3 Phosphates Crisis Diagram Component

(b) (c) Wild fish catch reduction – Farmed fish and emerging biohazards

The Nordic aquaculture industry, like other sectors affected in this crisis scenario, faces significant challenges due to disruptions in the soy products market, which is essential for fish feed production. Similarly, any disruption in phosphate acquisition impacts the availability of fish feed, further straining aquaculture operations.

In the Norwegian Sea, Barents Sea, and North Atlantic, rising water temperatures in northern fisheries zones are leading to unpredictable fish stock movements and shifts in stock distribution, creating adverse fishing conditions for all coastal communities.^[12] ^[13]^[14] Warmer waters also promote out-of-season algal blooms, which harm both wild fish populations and aquaculture productivity.^[15]^[16] Additionally, these higher temperatures foster conditions conducive to new bacterial growth, such as the proliferation of *Aeromonas* spp., which poses health risks to farmed fish, particularly affecting Norwegian aquaculture.^[17]

Heightened geopolitical tensions with Russia related to the ongoing Russo-Ukrainian war threaten established fishing and trade agreements with Nordic

11. Tanchum, M. (2022). Morocco's New Challenges as a Gatekeeper of the World's Food Supply: The Geopolitics, Economics, and Sustainability of OCP's Global Fertilizer Exports. *Middle East Institute*. <https://www.mei.edu/publications/moroccos-new-challenges-gatekeeper-worlds-food-supply-geopolitics-economics-and-sustainability>
12. Stenevik E. K., Sundby S. (2007). Impacts of climate change on commercial fish stocks in Norwegian waters. *Marine Policy*, vol. 31/1, 19-31. <https://doi.org/10.1016/j.marpol.2006.05.001>.
13. Ono K., Katara I., Eliassen S. K., et al. (2024). Effect of environmental drivers on the spatiotemporal distribution of mackerel at age in the Nordic Seas during 2010–20. *ICES Journal of Marine Science*, vol. 81/7, 1282–1294. <https://doi.org/10.1093/icesjms/fsae087>
14. Ottersen, G., et al. (2023). Observed and expected future impacts of climate change on marine environment and ecosystems in the Nordic region. Havforskningsinstituttet. <https://hdl.handle.net/11250/3057234>
15. Violand, A. (2023). A Bloom in a Changing Barents Sea. NASA Earth Observatory. <https://earthobservatory.nasa.gov/images/151667/a-bloom-in-a-changing-barents-sea>
16. Karlson, B., et al. (2021). Harmful algal blooms and their effects in coastal seas of Northern Europe, *Harmful Algae*, vol.102, 101989. <https://doi.org/10.1016/j.hal.2021.101989>
17. The Fish Site. (2024). Fresh insights into *Aeromonas hydrophila* in aquaculture. <https://thefishsite.com/articles/fresh-insights-into-aeromonas-hydrophila-in-aquaculture>

countries.^[18] The Faroe Islands, for example, could see restrictions on salmon exports to Russia,^[19] while Iceland faces ongoing challenges due to Russia's food import ban.^[20] These tensions could also drive divisions between EU and non-EU EEA countries regarding trade policy with Russia,^{[21][22]} as well as strain EEA-EU fishing agreements,^[23] including those on quotas.

In retaliation over attempts to control Russian activity in EEA waters,^[24] more intensive fishing within the Russian Economic Zone (REZ) in the Barents Sea takes place, where competition over cod and haddock has intensified.^[25] Overfishing of juvenile fish within the REZ risks depleting stocks vital to Norwegian fisheries, exacerbating tensions between Russian and Nordic fishing interests.^[26]

-
18. Østhagen, A. (2020). Fish, Not Oil, at the Heart of (Future) Arctic Resource Conflicts. *The Arctic Yearbook*. 43-59. https://arcticyearbook.com/images/yearbook/2020/Scholarly-Papers/3_Osthagen.pdf
 19. High North News. (2022). Faroe Island's Fishery Cooperation With Russia Up For Discussion. <https://www.highnorthnews.com/en/faroe-islands-fishery-cooperation-russia-discussion>
 20. Medetsky, A., Tanas, O. (2015). Russia Deals Blow to Fish Trade, Adds Iceland to Import Ban. *Bloomberg*. <https://www.bloomberg.com/news/articles/2015-08-13/russia-deals-blow-to-fish-trade-as-iceland-added-to-import-ban>
 21. Cirić, J. (2022). Russia-Ukraine Conflict Means Losses for Icelandic Fishing Industry. *Iceland Review*. <https://www.icelandreview.com/news/economy/russia-ukraine-conflict-means-losses-for-icelandic-fishing-industry/>
 22. Rutkowski, L. (2015) The Faroe Islands don't play by EU rules. *The Murre*. Archived at: <https://web.archive.org/web/20151208074117/http://murre.dk/articles/the-faroe-islands-dont-play-by-eu-rules.383.html>
 23. Levengood, Z. (2021). Arctic Politics and the EU-Norway Fishing Dispute. *The Arctic Institute*. <https://www.thearcticinstitute.org/arctic-politics-eu-norway-fishing-dispute/>
 24. Edvardsen, A. (2022). Finnmark Chief of Police: "I Share the Concern About the Civilian Footprint in the North. *The High North News*. <https://www.highnorthnews.com/en/finnmark-chief-police-i-share-concern-about-civilian-footprint-north>
 25. Bye, H. G. (2023). Russia Fishes Less and Less Cod in the Norwegian Zone in the Barents Sea. *The High North News*. <https://www.highnorthnews.com/en/russia-fishes-less-and-less-cod-norwegian-zone-barents-sea>
 26. McBride, O. (2024). Norway to Tighten Regulations for Russian Fishing Vessels. *The Fishing Daily*. <https://thefishingdaily.com/latest-news/norway-to-tighten-regulations-for-russian-fishing-vessels/>

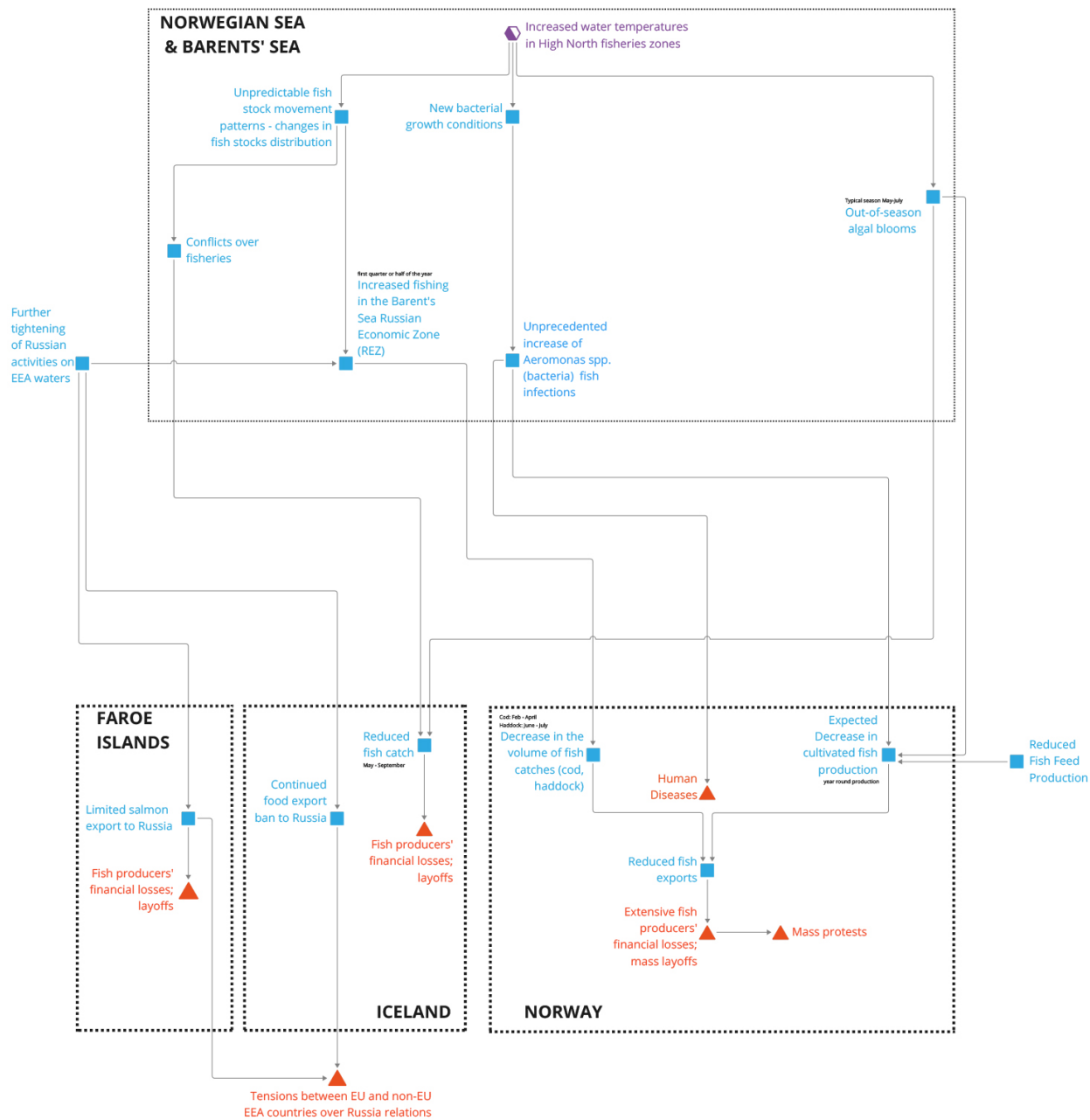


Figure 4 Fish Crisis Diagram Component

The combined pressures of reduced fish catches, lower aquaculture output, and diminished fish exports are likely to result in severe financial losses for major fish producers. These economic impacts could lead to mass layoffs across the sector, sparking social discontent and potentially fueling widespread protests among affected communities.

(d) Critical infrastructure on land and sea

Arctic fires, fueled by climate change, are growing longer, more intense, and more frequent. Rising temperatures dry out landscapes, increasing fire risks. In some areas, lightning-caused fires could rise by up to 65% per 1°C of warming.^[27] For Sweden and Finland, Arctic fires pose escalating climate risks, including pollution, higher disease rates, and economic pressures on energy and food supplies. Regional food security, already sensitive to geographic and logistical challenges,^[28] is further strained by market dynamics that amplify scarcity in remote regions.^[29]

Critical infrastructure in the High North also faces threats from thawing permafrost, which compromises land stability. This risk is especially severe in southern Greenland, where population density and economic activity are concentrated.^[30] Here, infrastructure—particularly freight and transportation systems—are at risk, with locations like Sisimiut, a vital fish and shrimp processing hub, facing increased vulnerability.^{[31][32]}

Another intertwined challenge involves supply chains that rely on remote coordination, making them susceptible to increasingly sophisticated cyber threats.^{[33][34]} Such disruptions, whether caused by intentional attacks or accidental errors, can lead to regulatory issues, bottlenecks, and eventually affect end-consumers.^{[35][36]} These effects, depending on the severity and timing of supply chain failures, rebound especially on less resilient economies, such as those of small island regions. In the case of the Åland Islands, another factor is related to tax dependencies on mainland Finland^[37] and the varying levels of self-sufficiency of small-scale farmers.^[38]

These vulnerabilities highlight several man-made factors impacting the security and continuity of food supply chains and infrastructure, including international relations and geopolitical tensions. Within the scenario, current trends are logically developed. Namely, relations between Nordic countries and Russia continue to decline, while Russian activities in Nordic waters have intensified.^[39] The use of

-
27. McCarty, J. L., et al. (2021). Reviews and syntheses: Arctic fire regimes and emissions in the 21st century. *Biogeosciences*, 18(18), 5053–5083. <https://doi.org/10.5194/bg-18-5053-2021>
 28. Sandanger, T., Heimstad, E., (2017). Food and health security in the Norwegian–Finnish–Russian border region. *Framsenteret*. <https://framsenteret.no/arkivet/food-and-health-security-in-the-norwegianfinnishrussian-border-region-5982316-146437/>
 29. Molthe, R. (2023). Raid against grocery suppliers in Sweden and Finland. *NHH Food Research Project*. <https://www.nhh.no/en/research-centres/food/food-news/2023/raid-against-grocery-suppliers-in-sweden-and-finland/>
 30. Cela, M., & Hansson, P. (2020). Geopolitics and Neglected Arctic Spaces: Three Northern Perspectives on Balancing External Interests. *Center for Strategic and International Studies (CSIS)*. <http://www.jstor.org/stable/resrep26993>
 31. Andersen, P. (2015). Grønland vil udvide og nybygge fem lufthavne. *Ingeniøren*. <https://ing.dk/artikel/groenland-vil-udvide-og-nybygge-fem-lufthavne>
 32. Marcer, M., et al. 2024. Modelling present and future rock wall permafrost distribution in the Sisimiut mountain area, West Greenland. *The Cryosphere*, 18, 1753–1771, <https://doi.org/10.5194/tc-18-1753-2024>
 33. Cassotta, S., & Pettersson, M. (2019). Climate Change, Environmental Threats and Cyber-Threats to Critical Infrastructures in Multi-Regulatory Sustainable Global Approach with Sweden as an Example. *Beijing Law Review*, 10(03), 616–642. <https://doi.org/10.4236/blr.2019.103035>
 34. Eriksson, C., Fischer, K., & Ulfbecker, E. (2020). Technovisions for Food Security as Sweden Restores Its Civil Defence. *Science, Technology and Society*, 25(1), 106–123. <https://doi.org/10.1177/0971721819889924>
 35. Tidy, J. (2021). Swedish Coop supermarkets shut due to US ransomware cyber-attack. *BBC News*. <https://www.bbc.com/news/technology-57707530>
 36. Martin, A. (2024) Sweden's liquor shelves to run empty this week due to ransomware attack. *The Record*. <https://therecord.media/sweden-ransomware-liquor-shortage-skanlog-systembolaget>
 37. Aalto-Setälä, V., Kinnunen, J., & Koistinen, K. (2004). Reasons for high food prices in small market areas: The case of the Åland Islands. *Agribusiness*, 20(1), 17–29. <https://doi.org/10.1002/agr.10083>
 38. Rytkönen, P. I., Oghazi, P., & Mostaghel, R. (2023). Food entrepreneurship and self-employment in an island context. *British Food Journal*, 125(13), 237–252. <https://doi.org/10.1108/BFJ-06-2022-0537>
 39. Schaller, C. (2024). Russia's Mapping of Critical Infrastructure in the North and Baltic Seas – International Law as an Impediment to Countering the Threat of Strategic Sabotage?. *Nordic Journal of International Law*, 93(2), 202–236. <https://doi.org/10.1163/15718107-bja10083>

aging, non-code-compliant oil tankers by Russia poses a growing risk of operational failures within Nordic territorial waters.^{[40][41]} Given the close interdependence of these countries for secure, fluid traffic, any accident necessitating prolonged intervention would cause significant chain disruptions.

-
40. Reuters. (2024). Denmark seeks to stop shadow tanker fleet carrying Russian oil. <https://www.reuters.com/world/europe/denmark-aims-limit-shadow-fleet-russian-oil-tankers-2024-06-17/>
41. Wintour, P. (2024). 'Russia doesn't care': Sweden sounds alarm over unsafe oil fleet. *The Guardian*. <https://www.theguardian.com/world/2024/apr/18/swedish-foreign-minister-tobias-billstrom-unsafe-russian-oil-fleet-baltic-sea-environmental-catastrophe>

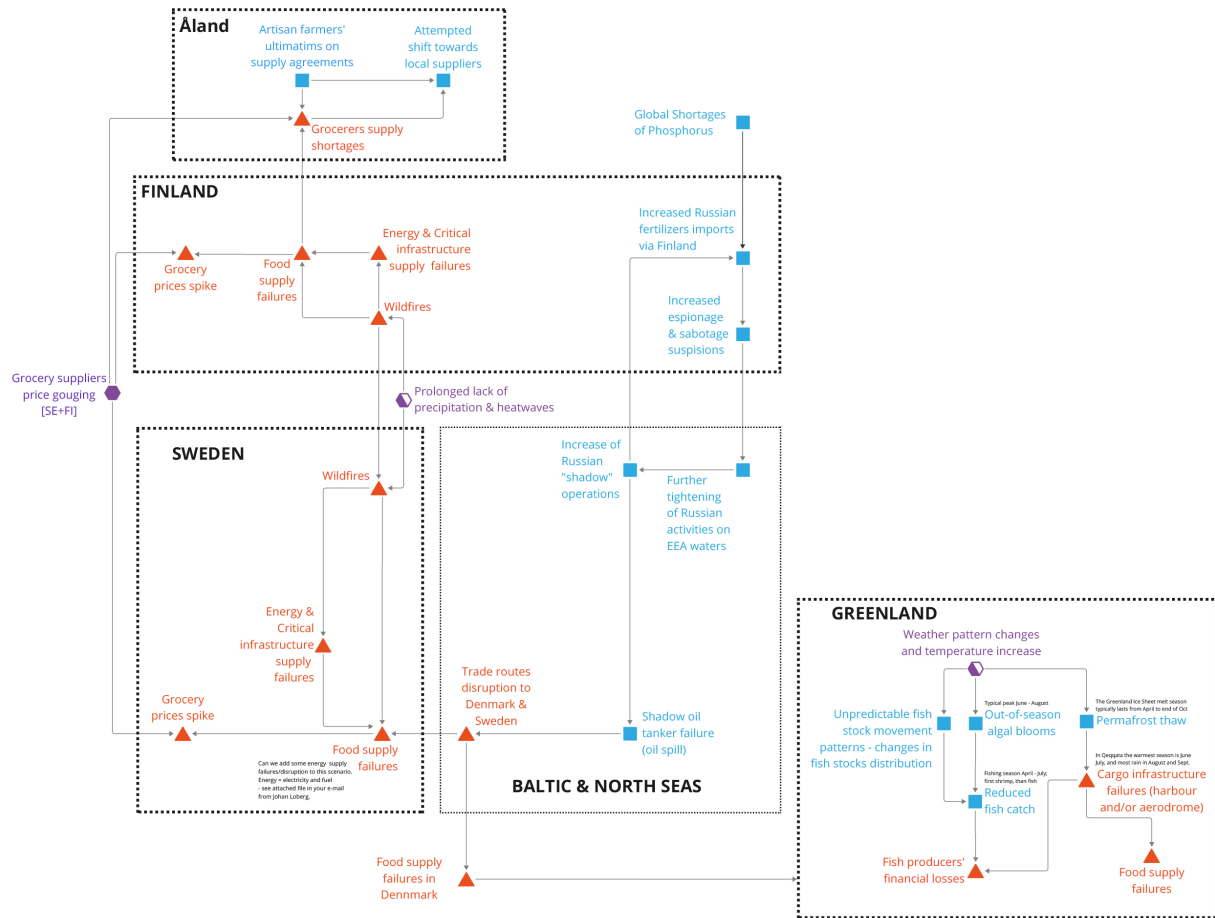


Figure 5 Critical Infrastructure Crisis Diagram Component

(e) Soy Mycotoxin Crisis – From North and South America to Denmark

A prolonged absence of precipitation, rising temperatures, and excessive rainfall during the harvest season in Brazil, Argentina, and Paraguay lead to a significant shock in soy and maize production.^[42] Meanwhile, in the United States and Canada, farmers grapple with the challenges of producing soy and rapeseed due to the disruptive influence of high-pressure “blocking” weather systems affected by jet stream Rossby waves.^[43]

These compound events result in the wide disruption of soy and maize exports from North & South America leading to panic buying of soy and maize. Following the panic buying trend, China and India increase their soy demand.^[44] Compounded with the continued reduced supply of soy and other oilseeds from Ukraine and Russia due to warfare,^[45] the Nordic countries face a significant reduction in animal feed imports. Due to this shortage, exporters push lower and lower quality products to a highly receptive market. This creates a space for abuse of quality procedures, that have already had precedent on various EU markets when it comes to soy quality branding^[46] or (non)compliance with deforestation regulations.^[47]

However, prolonged droughts and increased temperatures increase the development and toxicity of fungal infections in soy and maize, including Fumonisin.^[48] This confluence quickly results in undetected contamination, leading to the death of animals (specifically pigs in Denmark)^[49], as well as recalls of both animal feed and soya meat substitutes for human consumption.

Apart from exacerbated food shortages and increased prices, farmers and food producers face extensive financial losses and layoffs, resulting in consolidation and intensification pressure. Another crisis dimension is connected with outside socio-political and ideological pressures, in the form of hybrid warfare attempts, critical infrastructure sabotages and social media extremism.^[50]

-
42. Baethgen, W. E. (1997). Vulnerability of the agricultural sector of Latin America to climate change. *Climate Research*, 9(1-2), 1-7. <https://www.jstor.org/stable/24864605>
 43. Lupo, A. R. (2021). Atmospheric blocking events: A review. *Annals of the New York Academy of Sciences*, 1504(1), 5-24. <https://doi.org/10.1111/nyas.14557>
 44. Gandhi, V. P., & Zhou, Z. (2014). Food demand and the food security challenge with rapid economic growth in the emerging economies of India and China. *Food Research International*, 63, 108-124. <https://doi.org/10.1016/j.foodres.2014.03.015>
 45. Gheibdoust, H., Gilaninia, S., & Taleghani, M. (2023). The impact of the Ukraine war on the global food supply chain security: A literature review. *International Journal of Logistics Economics and Globalisation*, 10(2), 186-208. <https://doi.org/10.1504/IJLEG.2023.10056759>
 46. Vorotnikov V., (2022). Fraud scandal hits Polish feed industry. *All About Feed*. <https://www.allaboutfeed.net/animal-feed/feed-additives/fraud-scandal-hits-polish-feed-industry/>
 47. Coyne, A. (2024). 'Greenwashing': Danish Crown misled consumers, court rules. *Just Food*. <https://www.just-food.com/news/danish-crown-misled-consumers-court-rules-in-greenwashing-case/>
 48. Casu, A., Camardo Leggieri, M., Toscano, P., & Battilani, P. (2024). Changing climate, shifting mycotoxins: A comprehensive review of climate change impact on mycotoxin contamination. *Comprehensive Reviews in Food Science and Food Safety*, 23, e13323. <https://doi.org/10.1111/1541-4337.13323>
 49. Bosselmann, A. S., & Dolmer, S. E. N. (2023). Monitorering af ansvarlige og afskovningsfrie landbrugsråvarer i Danmark 2022: Status på implementering af handlingsplan mod afskovning. Institut for Fødevare- og Ressourceøkonomi, Københavns Universitet. IFRO Udredning Nr. 2023/04
 50. Olszewski, P. (2022). Terroryzm we współczesnej Danii. *Studia i Analizy Nauk o Polityce*, (2), 15-28; 29. <https://doi.org/10.31743/sanp.14601>

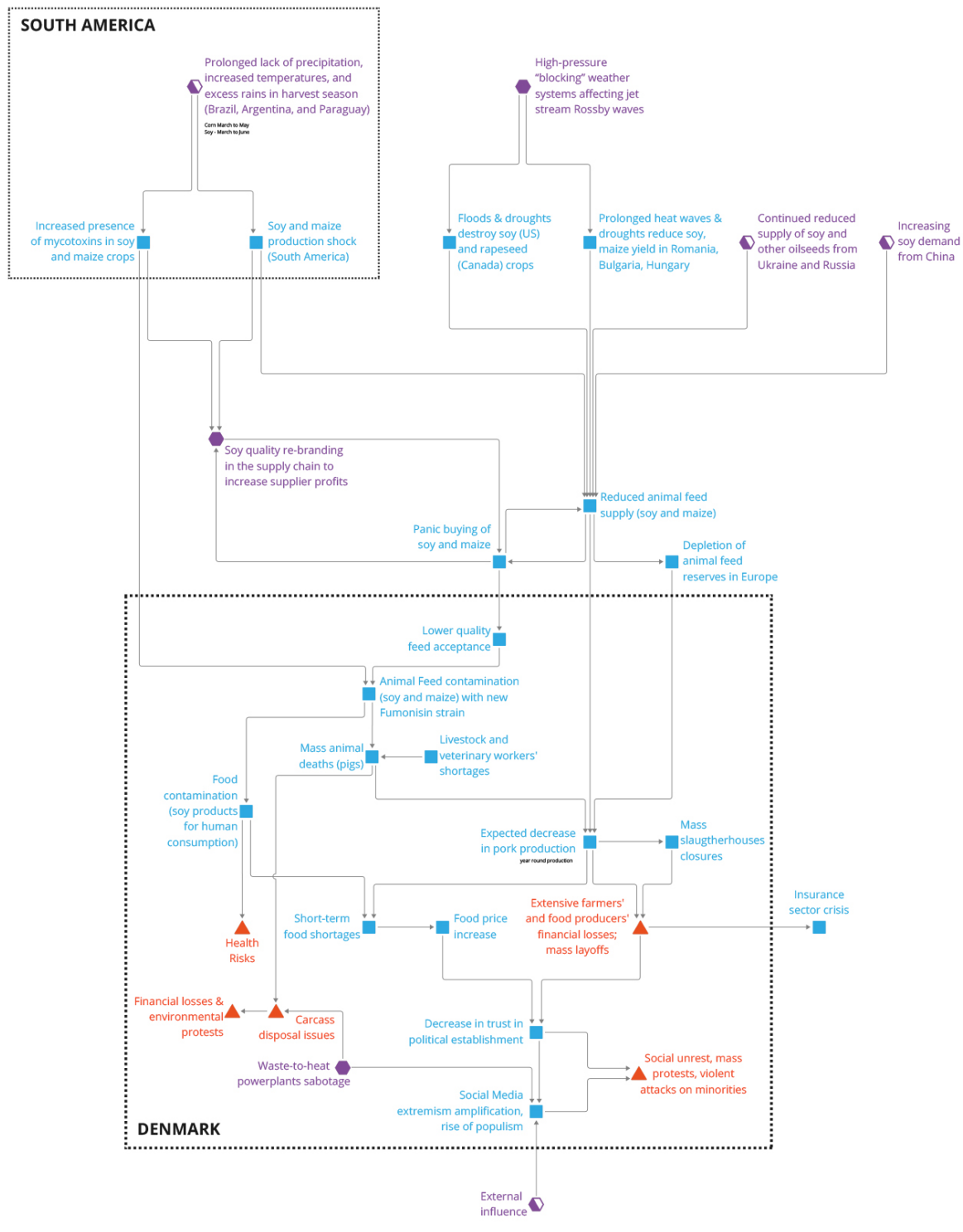


Figure 6 Soy Mycotoxin Crisis Diagram Component

Annex 3: References and Supplemental Reading List

October 8-9, 2024, Stockholm, Sweden. Venue: 7A Odenplan

Recommended reading list for Nordic Food Alert

The 'Nordic Food Alert' crisis simulation workshop is an opportunity to convene a group of top-level subject-matter experts from the Nordic region to converge around the topic of strengthening systemic resilience to food supply shocks caused by climate change and related issues. Many participants will be extremely knowledgeable on these topics already, and may have even been involved in researching and drafting of some of the papers referenced below. It is not expected that everyone will have the time or inclination necessarily to read all of these materials. However, we believe a general familiarity with these resources will be helpful for all of us, as a common baseline for reference and shared understanding. For this reason we hope you can briefly review these materials, to be cognizant of the wealth of research, policy papers and relevant reference materials already publicly available on the subject of Nordic food systems and climate resilience. This can help us, as a group, to determine where additional policy attention might be focused, or further research initiated, in order for our recommendations to have maximum utility and relevance.

Key European Documents:

The EU's core food and agriculture policies derive from the Rome Treaty of 1954, and the Common Agriculture Policy (CAP) - **Article 39**, in particular. See: https://www.europarl.europa.eu/erpl-app-public/factsheets/pdf/en/FTU_3.2.1.pdf

Following the outbreak of COVID-19 and Russia's invasion of Ukraine, the European Commission published a '**Contingency plan for ensuring food supply and food security in times of crisis**' along with an Action Plan: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2021:689:FIN>

The Commission also published details on a "[European Food Security Crisis preparedness and response Mechanism \(EFSCM\)](#)" composed of the EU's 27 Member States, a small group of non-EU countries, and around 45 relevant stakeholders' organizations, including a group of observers.

Nordic Policy Documents:

On June 19, 2024 at their annual meeting chaired by the Swedish Presidency, Nordic Ministers for Fisheries, Aquaculture, Agriculture, Food and Forestry agreed to the '[Karlstad Declaration](#)' to address preparedness and robustness

related to regional food supply and forestry. The Karlstad Declaration is based on the two Haga Declarations from 2009 and 2013, the Nordic Declaration on Solidarity, 2011, the Nordic prime ministers' joint statement on deepening co-operation in the field of security of supply and preparedness, 2021, and the declaration by the Ministers for Nordic Co-operation on Working Together in Times of Crisis, 2022.

From the Finnish Institute of International Affairs: '[Nordic Resilience; Strengthening Cooperation on Security of Supply and Crisis Preparedness](#)'; Wigell, Hagglund, Fjader, Hakala, Ketola, Mikkola.

Additional Readings:

Ingram, et al., 'Further concepts and approaches for enhancing food system resilience'; Nature.com website: <https://www.nature.com/articles/s43016-023-00762-5>

Website of [Nordred](#), a rescue service cooperation arrangement between Denmark, Finland, Iceland, Norway, and Sweden. The purpose of Nordred is to promote collaboration within the rescue services between and among these countries.

Deconinck, et al. OECD Ch14, "Building systemic resilience in practice: examples from key systems." <https://www.oecd-ilibrary.org/sites/4d3e8ef0-en/index.html?itemId=/content/component/4d3e8ef0-en>

Schiavo, M., Le Mouël, C., Poux, X., Aubert, P.-M. (2023). The land use, trade, and global food security impacts of an agroecological transition in the EU. *Frontiers in Sustainable Food Systems*, Volume 2, 2023. <https://www.frontiersin.org/articles/10.3389/fsufs.2023.1189952/full>

Various research and reports from the [EU's Joint Research Center](#).

Also, INRAE - France's premier Agriculture research center - offers many reports, including a "Resources Dossier" on sustainable and healthy food. See: <https://www.inrae.fr/en/reports/towards-healthy-and-sustainable-food>.

About this publication

Nordic Food Alert

Christopher Hegadorn, Katarzyna Szewczyk, Piotr Magnuszewski, Justyna Figas-Skrzypulec

Layout Ted Lindroos

TemaNord 2025:528

ISBN 978-92-893-8241-0 (PDF)

ISBN 978-92-893-8242-7 (ONLINE)

<http://dx.doi.org/10.6027/temanord2025-528>

© Nordic Council of Ministers 2025

Cover photo: Boris Dunand (Unsplash)

Photos: Annelie Riggo

Published: 12/03/2025

Nordic co-operation

Nordic co-operation is one of the world's most extensive forms of regional collaboration, involving Denmark, Finland, Iceland, Norway, Sweden, and the Faroe Islands, Greenland and Åland.

Nordic co-operation has firm traditions in politics, economics and culture and plays an important role in European and international forums. The Nordic community strives for a strong Nordic Region in a strong Europe.

Nordic co-operation promotes regional interests and values in a global world. The values shared by the Nordic countries help make the region one of the most innovative and competitive in the world.

The Nordic Council of Ministers

Nordens Hus

Ved Stranden 18

DK-1061 Copenhagen

www.norden.org

Read more Nordic publications on www.norden.org/publications

