

# Resili

**Resilience** in the blue bioeconomy, food and agriculture, and forestry sectors:  
What can COVID-19 teach the Nordic region about the impact of crises on value chains?

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# Preface

**THE FOLLOWING REPORT** summarizes the key findings from the project "Resilience in the blue bioeconomy, food and agriculture, and forestry sectors: What can COVID-19 teach the Nordic region about the impact of crises on value chains?".

The Nordic Council of Ministers has initiated an investigation into the impact of COVID-19 on value chains in FJLS-sectors, to which this project aims to contribute by providing an initial understanding based on available literature and the experiences of expert stakeholders. The FJLS sectors are policy areas defined by the Nordic Council of Ministers to include Fisheries and Aquaculture, Food, Agriculture, and Forestry (1). For the purposes of this project and due to its limited timespan and scope, these sectors were grouped accordingly: 1) Blue bioeconomy (including both Fisheries and Aquaculture), 2) Food and Agriculture, and 3) Forestry.

The project was managed by The Nordic Joint Committee for Agricultural and Food Research (NKJ) and Nordic Forest Research (SNS) and was carried out by Nordic Sustainability between May and September of 2021.



# Table of contents

<b>Preface</b>	<b>2</b>	<b>Food and agriculture</b>	<b>23</b>
<b>Executive summary</b>	<b>4</b>	The impact of COVID-19 and effect on resilience	24
Summary of project process	4	How policy can improve value chain resilience	27
Framing the impact of COVID-19 and effect on resilience	4	Opportunities for collaboration between Nordic countries to improve value chain resilience	28
Summary of findings by sector	5	<b>Forestry</b>	<b>29</b>
Summary of overall findings	8	The impact of COVID-19 and effect on resilience	30
<b>Introduction</b>	<b>10</b>	How policy can improve value chain resilience	34
A perspective on value chain resilience	11	Opportunities for collaboration between Nordic countries to improve value chain resilience	35
Project approach	12	<b>Conclusion</b>	<b>36</b>
<b>Blue bioeconomy</b>	<b>15</b>	<b>Works cited</b>	<b>37</b>
The impact of COVID-19 and effect on resilience	16		
How policy can improve value chain resilience	21		
Opportunities for collaboration between Nordic countries to improve value chain resilience	22		



# Executive summary

**THIS REPORT SUMMARIZES** an initial investigation into what the impacts of COVID-19 can teach the Nordic region about the significance of crises for value chains in the blue bioeconomy, food and agriculture, and forestry sectors.

The aim of the report is to provide policy makers with preliminary insights into how value chains have been impacted by COVID-19, to what degree they were resilient, and suggestions for how policy and collaboration across Nordic countries can improve resilience in the long-term.

## Summary of project process

The project began with a literature review on the impact of COVID-19 on value chains with a focus on the Nordic region. As the impacts of COVID-19 are a recent field of study with limited publications available, interviews and workshops were conducted with stakeholders including four expert interviews, a workshop for each sector, and a questionnaire conducted with the workshop participants.

Across the three sectors (blue bioeconomy, food and agriculture, and forestry), there was a total of 39 participants that attended the workshops or completed the surveys. The project aimed to engage a participant group that was diverse and representative according

to gender, Nordic countries and territories, area of work including businesses, policy, research, innovation, and civil society, and included youth representation.

## Context and limitations of the main findings

The main findings are the topics most emphasized by the project participants with context from the literature review. The findings are by no means exhaustive, as there were many ideas expressed by participants.

It was found that value chain disturbances, significant changes, and the resilience of value chains varied greatly between countries due to political response, geography, and specific industries. Therefore, the main findings aimed to highlight areas that seem to be experienced across many Nordic countries and territories, however further research would need to confirm these findings according to local contexts.

## Framing the impact of COVID-19 and effect on resilience

The understanding of value chain resilience in this report is an interpretation of the concept of social-ecological resilience (2; 3; 4). Fundamental to this per-

spective is that resilience is often thought of in the short-term, for example, if value chains can “bounce back” after disturbances. Social-ecological resilience adds that for value chains to be resilient in the long-term, disruptions should be used as an opportunity to transition towards a system that goes beyond economic considerations and operates with respect to social and ecological sustainability.

**The perspective of value chain resilience that frames this report is as follows:**

- **Short-term resilience:** The persistence of value chains faced with disturbances due to the pandemic, and to what degree they continued as if undisturbed or to went back to their previous state.
- **Medium-term resilience:** The adaptability of value chains to disturbances, interpreted by significant changes seen in the wake of the pandemic, and could be indicated by new ways of working or adoption of new technologies.
- **Long-term resilience:** The systemic transformation of value chains towards greater social and environmental sustainability with the goal of operating within planetary boundaries. This perspective was used to frame the suggestions for how greater value chain resilience could be supported by policy and collaboration across Nordic countries.

# Summary of findings by sector

## Blue bioeconomy

### **Disturbances were experienced, but value chains were resilient in the short-term**

Value chain disturbances were related to market access being restricted, operations were not allowed at full capacity, and transportation was disturbed by border closures. Although significant disturbances were experienced, many value chains continued as normal and returned to previous states following disturbances. For example, the shut-down of the mink industry in Denmark was felt in blue bioeconomy, as the rest-raw materials were previously used for animal feed. However, value chains were adapted to find new uses for these resources including petfood and fish feed. All workshop participants stated in the questionnaire that they experienced value chains being somewhat or very resilient in the short-term.

### **There are many examples of value chains adaptation, but this was not experienced equally**

Significant changes seen in value chains include the adoption of digital technologies, changes in the types of products offered by firms, and production processes were adapted to operate under social distancing regulations and automated where possible.

These changes provide some examples of value chains that were able to adapt to disturbances, indicating resilience in the medium-term, but cannot be generalized across all blue bioeconomy value chains. The workshop questionnaire showed that most parti-

cipants thought value chains were somewhat or very adaptive, with a quarter of participants reporting they were not adaptive.

### **Suggestions for how policy could help improve resilience in the long-term include:**

- Creating a coordinated crisis planning approach across Nordic countries to ensure access to resources, labour, and export markets during value chain disturbances.
- Incentivising sustainable fishing and aquaculture practices, by promoting the development of fishing methods that do not harm the seabed and the marine environment, including avoiding bycatch.
- Enable traceability of Nordic products, creating a more premium product offering with assurance of origin and thereby enabling the funding of sustainable practices.
- Harnessing digital and modern tools to support fisheries control and inspections, such as electronic monitoring systems of fishing practices. These monitoring systems could support traceability and documentation of sustainability claims.
- Encouraging innovation in utilizing rest raw materials, especially for human grade consumption, to reduce waste and move towards a more sustainable and resilient system.

### **Participants saw an opportunity for collaborations between Nordic countries to bring added value by:**



- Creating testbeds and centres for innovation that promote research collaborations across Nordic countries, create greater connections between research and production, and assist with scaling innovative products.
- Establishing data collection and research at a Nordic scale to further enable evidence-based policymaking, on topics including the impact of pausing fisheries due to COVID-19 on fish stocks and ecosystems.
- Developing a shared plan for conservation and re-

## Food and agriculture

storatorion of marine and coastal areas at a Nordic scale to enable long-term resilience of the sector.

### **Disturbances brought significant vulnerabilities to light, but value chains were resilient in the short-term**

The main disturbances were related to closed borders and restrictions on movement of people, which led to significant shortages of labour. Market volatility affected both the producers and suppliers of food, and transportation disturbances halted, delayed, or limited access to products. Literature points to severe short-term disruptions bringing to light vulnerabilities in the food system such as a lack of crisis preparedness, low self-sufficiency, and reliance on low-wage migrant labour (5; 6). Despite these vulnerabilities and disruptions, all participants in the workshop found food and agriculture value chains to be somewhat or very persistent overall and credited early political action and good collaboration in helping to reduce disturbances.

### **Value chains were adaptable with digital technologies and new business models, and show potential for transformation as actors have become more aware of risks**

Significant changes seen most frequently by project participants include digital platforms creating closer connections between producers and consumers and the adoption of new business models and technological solutions. Most participants thought the value chains were very or somewhat adaptive, although one stated they were not adaptive.

Participants also mentioned that many value chain actors showed more awareness of risks, such as pandemics and climate change. This awareness could indicate that actors have incentive to transform value chains towards long-term resilience after COVID-19. However, many participants thought it was too early to make any conclusions if this is taking place.

### **Suggestions for how policy could help improve resilience include:**

- Improving employment conditions for agricultural workers, for example by ensuring hygienic living quarters for resident workers to prevent spread of future pandemics, or to make jobs desirable for locals to reduce dependence on migrant labour.
- Building public support in paying the cost of sustainable and resilient food systems by educating consumers and enabling greater connections to local producers.
- Enabling the establishment of alternative practices that support more resilient and sustainable food and agriculture systems, including urban farming, development of plant-based foods, and the replacement of imported crops with domestic alternatives.
- Ensuring regulations do not hinder entrepreneurs in the development of innovative food products and



providing them with simplified information to help navigate regulation.

- Enabling more sustainable management of the large areas of land under private ownership to enable their resilience in the long-term, by fostering cooperation and knowledge sharing amongst farmers and large landowners.

### **Participants saw an opportunity for collaborations between Nordic countries to bring added value by:**

- Establishing a Nordic innovation system, that closes the gap between research and commercialization of products by connecting cross-border R&D initiatives, innovation labs, and testbeds and also helps to scale small innovative businesses.
- Creating shared Nordic plans for crisis management including a framework for cooperation between countries and planning for scenarios including shortages of agricultural inputs, enabling cross-border trade, and removing regulatory barriers for manufacturers to adapt to changes in demand during pandemics.
- Enabling standardised data gathering and analy-

## Forestry

sis across Nordic countries to further support evidence-based policymaking.

### **Disturbances were experienced, yet perhaps not as significant as other natural disasters**

The main disturbances in the forest sector were related to a shortage of forestry workers, sudden changes in demand, and higher prices due to shortages. However, disturbances varied according to the product, for example, participants noted spikes in demand for timber yet decreases in graphic paper. Participants remarked that there were significant disturbances because of COVID-19, but that other disruptions such as natural disasters have resulted in even greater disturbances. Most participants thought value chains were somewhat or very resilient in the short term, although one responded that they were not resilient.

### **Adaptations included new ways of working and technological solutions**

Participants saw significant changes in working standards and procedures following COVID-19. For example, increased adoption of technological solutions, more remote work and learning, and greater use of forest and greenspaces for recreation. In response to the questionnaire, most participants said value chains were somewhat or very adaptive to disturbances, yet two respondents stated they did not think forestry value chains to be adaptive.

### **Suggestions to improve resilience with policy include:**

- Ensuring necessary movement of labour and that

borders remain open for migrant workers during crises.

- Improving training opportunities for local workers. This could include online courses, which some participants reported being successful to aid in training and recruiting locally during the pandemic.

- Improving cooperation between national governments to harmonize regulatory frameworks, could enable economic growth and development in the sector following the disruptions of the pandemic, especially in innovative sectors that are more sustainable. For example, harmonizing building regulations in wooden construction.

- Supporting entrepreneurs to bring innovative products to market, for example, those that utilize side streams or lower grade wood, could enable both improved environmental sustainability and economic growth in the long term. Participants expressed a need to assist innovators and small businesses with navigating regulation, which was mentioned as a significant barrier.

- Ensuring the ecological and social benefits of forests are valued in policy. Participants expressed the need for ecosystem services such as recreational use, biodiversity, and carbon sequestration to be protected to ensure the resilience of the sector in the long-term, and not sacrificed to meet short term pressures, such as demand spikes during the pandemic.

### **Participants saw an opportunity for collaborations between Nordic countries to bring added value by:**

- Creating Nordic innovation centres and living labs to develop sustainability driven growth in the sector

in the long term by promoting interdisciplinary research on areas including commercially novel species, improved use of side streams and lower grade wood, and developing innovative uses of non-wooden forest products.

- Establishing the Nordics as a global leader in forestry education to retain youth and trained forestry professionals in the region and enabling the growth of a local workforce.

- Improving recycling and re-use of wooden construction materials by establishing a Nordic market for recycled products. This market could enable the sustainable use of materials in the long term, and buffer demand spikes as experienced during the pandemic.





## Summary of overall findings

### **Value chains faced disturbances, but generally were resilient in the short-term**

Overall, many value chains in Nordic countries proved to be resilient, despite experiencing initial disturbances.

The disturbances were variable according to industries and shed light on vulnerabilities in the value chain such as a reliance on migrant workers. Volatility in the market relating to shifts in demand, price, and availability of goods also created disturbances in some value chains.

### **Many value chains showed signs of adaptation, indicating resilience in the medium-term**

Signs of adaptation included the use of new technologies and business models, which could indicate greater resilience in the face of future disturbances. Where new adaptations have shown to be successful,

policy can have a role in enabling these adaptations to be scaled across the sector to create greater resilience in the future.

### **No significant evidence of systemic change towards long-term resilience in value chains**

Improvement of resilience often focuses on the ability of value chains to persist in the short term and "go back to normal", with too little focus on systemic change towards a more sustainable system in the future (4). As stated by value chain scholars Andreas Wieland and Christian Durach:

*"The debates about planetary boundaries relating to the biodiversity and climate crises make it reasonable to assume that business models that rely on eternal material growth, fossil fuels, and harmful ingredients will likely have no future. If organizations were to strive for their supply chains to return to the*

*old normality as quickly as possible, they would thereby risk their survival after all."* (p.4)"

Many of the workshop participants expressed a lack of systemic change towards long-term resilience in the wake of COVID-19, but also thought it was too early to tell if systemic changes have happened. The disruptions related to COVID-19 were expected to be short term, which put the focus on going back to normal rather than systemic changes. However, too great of a focus of enabling short-term resilience without addressing the sustainability of business models could create a missed opportunity to enable resilience for future crises. As stated by Andreas Wieland, "The pandemic is a hiccup in supply chains in comparison to climate crisis and biodiversity loss."

Participants provided suggestions for how policy



could enable greater social and environmental sustainability in value chains the wake of the pandemic, and thereby create greater resilience in the face of future crises.

**The policy suggestions had many similar themes across sectors, including:**

- Encouraging innovation and increasing adoption of technological solutions, including improving traceability of value chains and enabling innovators to bring products to market.
- Reducing waste by encouraging innovative initiatives to utilise rest raw materials.
- Ensuring sustainable resource use and agricultural practices.
- Protecting natural resources by creating coastal and marine reserves to ensure ecosystems are valued for ecological and social benefits in addition to economic value, to ensure the foundations of resilient bio-economy value chains in the future.
- Enabling greater collaboration between national

authorities in designing resilience policies and efficient risk- and crisis management.

**The need for improved collaboration across Nordic countries to build resilience was emphasized by project participants, with knowledge gaps and opportunities for greater collaboration suggested in the following areas:**

- Creating a Nordic narrative on the transition to long-term resilience in value chains that guides policy development and creates public awareness about the need for greater integration of social and environmental considerations into business models.
- Developing Nordic wide plans for crisis management including a framework for cooperation between countries during emergencies. Similar initiatives are occurring on a national basis, such as the Swedish Civil Contingencies Agency (MSB) (7), but there is an opportunity for greater collaborative planning across Nordic countries.
- Analysing areas of common risk and value chain

vulnerabilities shared between Nordic countries, especially where a high risk is shared across borders, such as droughts and fires. It is also recommended to conduct a mapping of value chain vulnerabilities in greater depth in each sector to enable better crisis preparedness in the future.

- Establishing initiatives to enable collaboration across Nordic countries to address long-term issues in value chains, for example, on topics including the maintenance of natural resources, ecosystem services, and socio-economic issues. This could include forums, groups, or networks, and enabling knowledge sharing between academia, public, and private sectors. The majority of workshop participants responded that they would join such an initiative if it were available.
- Continuing further research on sustainability and resilience after COVID-19. Further analysis is needed to understand if sustainability and resilience is improving or deteriorating, and how they can be enabled by policy.



# Introduction

**THE SPREAD OF COVID-19** was an extreme global event that was unforeseen but not unexpected. Similarly, vulnerabilities have been predicted in value chains as they have become increasingly complex and globalized. During the pandemic value chains were put to the test, with severe and sudden disruptions in transportation and logistics, labour shortages, and sudden shifts in demand (8). Some industries and value chains were not able to persist, such as the loss of the entire industry of mink breeding in Denmark due to a fear of zoonosis (9; 10). However, one opportunity that can be seen is that the pandemic offers the possibility to better understand how value chains are impacted by disruptions, to what degree they are resilient, and what lessons can be gained to enable greater resilience in the future.

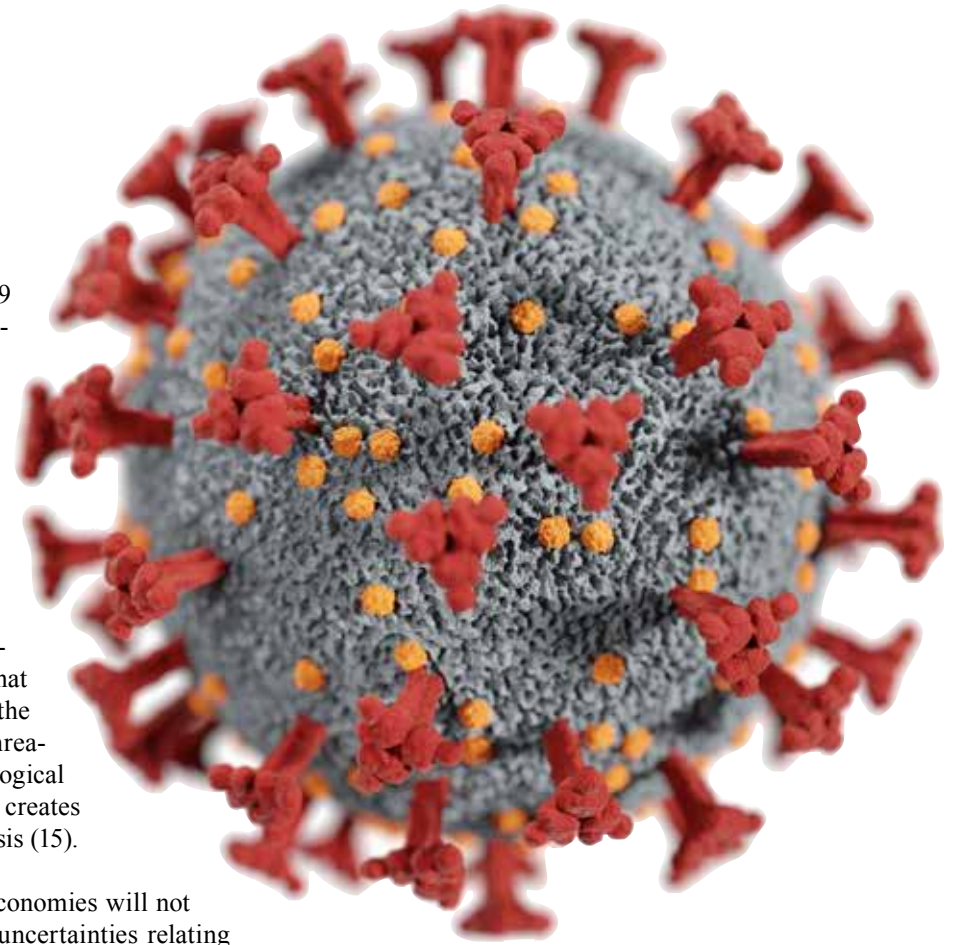
Industries of fundamental importance in the Nordic region are fisheries and aquaculture - which will be referred to as the blue bioeconomy in this report - food and agriculture, and forestry. These sectors are foundational to the region's economy, supply basic resources to meet fundamental needs, and are integral to local culture and ways of life. As the value chains in these sectors function to transform natural resources into economic products, their function is closely linked to the health of ecosystems.

While COVID-19 caused significant disruptions in the production and flows of goods and services, the evidence is clear that even greater disturbances await.

The origins of COVID-19 have been linked to land-use change and biodiversity loss, highlighting the risk of the emergence of other infectious diseases in the future as natural systems are under increasing stress (11; 12). Value chain disruptions are only to become more likely as human activity has “warmed the climate at a rate that is unprecedented in at least the last 2000 years,” (13), is threatening the stability of ecological systems, (14), and thereby creates an impending migration crisis (15).

Value chains and global economies will not only be forced to adapt to uncertainties relating to climate change, biodiversity loss, and social crises, but must undergo a transformation in order to help prevent future them (11; 4). As stated by resilience scholar Andreas Wieland, “COVID-19 has emphasized the importance of a systems-based approach to resilience. The pandemic is a hiccup in supply chains in comparison to climate crisis and biodiversity loss.”

Policy plays a central role in helping guide the transformation of value chains into systems that fulfill so-



cietal needs in a way that is sustainable and thereby prevents future social and ecological crises. The aim for this project is to present policymakers with findings from an initial investigation into the impact of COVID-19 on blue bioeconomy, food and agriculture, and forestry value chains and their resilience, in addition to provide suggestions to how this transformation can be achieved via policy and collaboration across Nordic countries.

# A perspective on value chain resilience

**THIS PROJECT BUILDS** on an interpretation of the concept of social-ecological resilience, originally established by scholars including Carl Folke (2006) (16), Wieland (2021) (3), and Wieland and Durach (2021) (4). The term value chain (17) is used instead of supply chain in this project to encompass a broader range of activities that add value to raw materials across the stages of production, manufacturing, retail, and consumption.

Fundamental to the social-ecological perspective, is that resilience is more than “bouncing back” after disturbance and maintaining stability in value chains, although the persistence of value chains in the face of disturbance would indicate resilience in the short-term. The social-ecological perspective adds that to achieve resilience in the medium and long-term, value chains must have the capacity to adapt to new ways of working with an end goal to transform towards a system that goes beyond purely economic considerations and operate with respect to social and ecological sustainability.

The urgency for a focus on long-term resilience through value chain transformation is framed by scholars Wieland & Durach (2021): *“The debates about planetary boundaries relating to the biodiversity and climate crises make it reasonable to assume that business models that rely on eternal material growth, fossil fuels, and harmful ingredients will likely have no future. If organizations were to strive for their supply chains to return to the old normality as quickly as possible, they would thereby risk their survival after all.”* (p.4)

**Based on this understanding, this report frames the understanding of value chain resilience on the following perspectives on resilience:**

● **Short-term resilience: persistence of value chains**

Value chains that are resilient in the short-term, or in the immediate aftermath of a disturbance, continue as if undisturbed or bounce back as quickly as possible to the previous system. Short-term resilience is

explored in this report in the context of the degree to which were value chains were persistent in the face of disturbances experienced because of COVID-19.

● **Medium-term resilience: adaptation of value chains**

Value chains that are resilient in the medium-term adapt through reorganization, new measures, or slowly changing over time to a state that could ena-



ble them to be more resilient to future disturbances. This could include the adoption of new technologies or ways of working. Medium-term resilience is explored in this report in the context of what significant changes were experienced in value chains because of COVID-19, and if these changes indicate a reorganization of the value chain or adoption of new measures indicating a capacity to adapt.

### ● Long-term resilience: systemic transformation of value chains

Value chains that are resilient in the long-term use disturbance as a catalyst to transform into a system that embraces innovation and acknowledges social and ecological boundaries, in addition to economic considerations. Long-term resilience was explored in this report by asking participants if they experienced any signs of transformation of value chains following COVID-19, and to frame the development of suggestions for how greater value chain resilience could be supported with policy and collaboration across Nordic countries.

## Project approach

This report summarizes the findings developed in a four-step knowledge gathering process undertaken from May to June 2021, including: a literature review, expert interviews, a questionnaire for workshop participants, and finally a workshop for each of the three sectors.

This approach was developed to gain an overview of the limited literature available on COVID-19 and value chain resilience at the time of writing, and to supplement this information with the first-hand expe-

rience of experts in each sector. The details of this approach are described in the following section.

## Literature review

The literature review carried out made use of Web of Knowledge (Web of Science), Scopus, and Google Scholar primarily searching for peer-reviewed papers published between 2020 and 2021. In addition, interviewees were asked for suggestions on literature on the topic of COVID-19, value chains, and resilience in their respective sector (18) (19) (20) (21). In total, 50 papers were examined in categories of short-term scope (25) on blue bioeconomy (22) (23) (24) (25) (26) (27) (28), food and agriculture (29) (30) (31) (5) (32) (33) (34) (6) (35) (36) (37) (38) (39) (40) (41) (42), and forestry (43) (44) (45) (28) (25) (40) (26) (46). Studies with a long-term perspective on the impact of COVID-19 (47) (48) (49) (50) (51) (52) (53) as well as non-European case studies related to export markets (54) (55) (56) (57) (58) (59) (60) (61) (40) (62), the mink crisis (9) (10) and lastly papers related to the theoretical understanding of value chain resilience (4) (3) (63) (2) (64).

Since the findings of the literature review was limited in sources focused on the Nordic region, sources were included from a global and European perspective in order to provide a starting point to confirm the findings with project participants in the interviews and workshops.

## Expert interviews

Four 30-minute interviews were conducted with experts representing each of the three sectors and a

supply chain resilience researcher. The interviews with sector experts offered an initial understanding of the main disturbances and significant changes experienced in value chains due to COVID-19, the perceived resilience of value chains, and the potential for transformation towards long-term resilience via policy and collaboration across Nordic countries.



Interviewees were selected based on having broad knowledge of the value chains in their sector and the impact of COVID-19, through either professional experience or either being authors of relevant research or publications. Certainly, the findings from these interviews cannot be generalized to the entire Nordic



region but were intended to provide insights to inform next steps in the project process including the design of the workshops. The interviews were conducted as video calls over Microsoft Teams and with the use of Mio, a digital whiteboarding tool, to test the approach that would later be used in the workshops.

The interview with the supply chain resilience researcher, Andreas Wieland, was conducted to discuss the perspective of socio-ecological resilience, as described in the previous section, and its adaptation for use in this project.

#### **Participants interviewed**

- **Blue bioeconomy:** Árni Mathiesen, currently Senior Advisor at Icelandic Ocean Cluster and former Assistant Director of General Fisheries and Aquaculture Department at FAO and Icelandic Minister for Fisheries

- **Food and agriculture:** Erika Öhlund, Analyst at the Swedish Defense Research Agency and Doctoral

Researcher on the topic of food systems and impacts of COVID-19

- **Forestry:** Camilla Widmark, PhD, Associate Professor at Swedish University of Agricultural Sciences, Head of Department of Forest Economics, and Head of Office for the Forest Bioeconomy Network

- **Resilience:** Andreas Wieland PhD, Associate Professor of Supply Chain Management at Copenhagen Business School and Program Director of the Graduate Diploma in Supply Chain Management

### *Workshops*

#### **Participant selection**

Participants were individually selected and invited to participant in online roundtable workshops. Three 2.5-hour workshops were conducted, with one for each sector including 1) blue bioeconomy, 2) food and agriculture, and 3) forestry. Participants were selected based on having deep knowledge of the value chains

they work with, but that are also diverse and representative according to gender, Nordic countries and territories, representation of youth, and area of work including businesses, policy, research, innovation, and civil society.

Across all three sectors there was a total of 39 participants that joined the workshop discussions or completed the questionnaire, including 14 participants in the Blue Bioeconomy workshop, 12 in Food and Agriculture workshop, and 13 in the Forestry. Not all participants in the workshop completed the questionnaire, with 13, 9, and 9 responses, respectively.

Project organisational partners who actively contributed to workshop discussions are counted as project participants.

In this report, the term ‘participants’ and ‘workshop participants’ are used interchangeably to reference the comments of stakeholders that have contributed to the project. References to interviews are sourced specifically, and quotes are shared with permission from participants.

### **Workshop participant questionnaire**

All participants invited to the workshops were asked to answer a questionnaire in the week prior. The development of the questionnaire was guided by insights from the literature review and interviews and the results would furthermore be used to support the discussions in the workshops.

The questionnaire asked participants to reflect on their experiences of significant changes observed in value chains, their perception of resilience in value chains in the wake of COVID-19, and their experiences (if any) of initiatives such as groups or networks that are addressing long-term issues related to value chain resilience.

The participants were also invited to provide a response to how they think policy and Nordic collaboration can contribute to value chain resilience, which would later be the focus of the brainstorming activity in the workshops. This was intended to improve the quality of discussions in the workshops by allowing participants to reflect in advance, as well as to gather individual responses that could otherwise be lost in group discussions.

### **Workshop brainstorming and discussions**

The workshops served as a group interview to validate findings from the literature review in a Nordic context, generate insights on how policy and Nordic collaboration can improve resilience, while also having the added benefit of building a stakeholder network.

The workshops featured a brainstorming activity where participants were asked to ideate on policy suggestions and ideas for collaboration between Nordic countries that could improve value chain resilience in the wake of COVID-19. To do so, workshop participants were divided into groups and engaged in an online brainstorming exercise in Miro, a digital whiteboarding platform. For this activity, participants were asked to focus on ideas that they think could build long-term value chain resilience in the wake of COVID-19 via a systemic transformation.

To develop ideas for policy suggestions, participants were offered to build on, or disagree with, suggestions that have been found in the literature review, and to reflect on how they could be relevant in a Nordic context. Participants were also asked to ideate on op-


portunities where greater value can be created with collaboration between Nordic countries to improve value chain resilience, for which they were not offered suggestions and ask to speak from their own experiences. The activities featured time for participants to brainstorm individually, then engage in a group discussion and debate.

### ***Project limitations***

The main findings of this report are a summary the topics most emphasized by the project participants, and references to where these views are supported or contrasted by the literature are added where possible and relevant. There were many topics and ideas were expressed by project participants, therefore the main findings are by no means exhaustive. In addition, the Nordic region is as vast and diverse as the value chains that operate within its borders; therefore, it cannot be said that all findings are relevant for all countries. In this project, it was found that the impacts of the pandemic and the resilience of value chains varied greatly between countries due to political response, geography, and specific circumstances. Therefore, the main findings aimed to highlight areas that seem to be common across many or most Nordic countries and territories, however further research would need to be conducted to confirm or deny these findings according to local contexts.

Despite these limitations, this project aims to provide an initial investigation to contribute to the limited body of work on the impact of COVID-19 and value chain resilience in the Nordics, and to provide ideas for policy makers to integrate a transformative approach to develop long-term resilience in value chains.



A close-up photograph of a fish, likely a salmon, lying on a bed of ice cubes. The fish is positioned horizontally, with its head to the right and tail to the left. The ice is dark and glistening, reflecting light. The background is black. Two large, semi-transparent blue text overlays are present: 'BLUE BIO' at the top right and 'ECONOMY' at the bottom left.

**BLUE BIO**

**ECONOMY**

# Blue bioeconomy

**THE FOLLOWING SECTION** summarises the most emphasised findings from project participants in an interview, workshop, and workshop questionnaire as compared to findings found in the literature review. It should be noted that limited literature was available at the time of review in May-June of 2021. One study was found focusing on Europe conducted by the European Commission in January of 2021 on the main effects of the COVID-19 pandemic on the EU fishing and aquaculture sectors (22). Additional relevant literature utilised in this section includes reports by the FAO and OECD, however these are global datasets with limited generalisation to the Nordic region (23), (65) (24).

## The impact of COVID-19 and effect on resilience

### *Disturbances of value chains due to COVID-19*

In the early stages of COVID-19, the disturbances to value chains in the blue bioeconomy were logical consequences of the lockdowns and physical restrictions applied in most regions. However, there may have been significant differences in the experienced effects of these disturbances between fishers and companies depending on their specific situations and contexts. For example, where in some countries fishing was halted due to travel restrictions, Norway was

able to continue largely as normal (OECD, 2020) with the exception of small boats partaking in the seasonal fishing reported by the Norwegian Seafood Federation in the workshop.

This example highlights what has been a consistent observation throughout this project: that the effects of COVID-19 related disturbances tend to vary greatly between small and large actors in the sector. Another main factor is the difference in national characteristics, which have played a significant role in the varying effects of these disturbances. This mostly relates to transport and whether the country is connected via land and road transport or whether it is reliant on air-freight and shipping and naturally, how the complexity of unprecedented travel restrictions made import and exports more difficult for some nations than others. In fact, the main negative effect on large, pelagic fisheries was due to travel restrictions (22) as the closure of fresh fish markets (a consequence of the closure of the HORECA) caused an increase in demand for canned and frozen fish. However, while the large, pelagic fisheries may have thrived, the closing of the fresh fish markets negatively impacted both demersal fisheries as well as some aquaculture production systems (22).

**The most frequently experienced disturbances cited in the literature and by the workshop participants can be summarised in the following three areas:**

- Market access was restricted by overnight closure of the food service and hotel industries (HORECA). The consequences that followed were stated by workshop participants and evident in reports by the EU and OECD (22) (23). The sudden change in demand led to sharp falls in price forcing suppliers to sell fresh cuts at a much lower price. In addition to the closure of restaurants, a global cancellation events resulted in a near collapse of particularly high-end products such as lobsters and oysters, which was reported both in literature and by workshop participants (OECD, 2021).

As supermarkets became the single source of food for the majority of people worldwide, their suppliers, such as aquaculture producers, were able to maintain both production and sales during the pandemic as these were already accustomed to meeting their specific requirements for processed and pre-packed food. Consequently, large export firms had to seek out new markets dealing with volatile environments during the pandemic, according to a representative from Royal Greenland. As such, COVID-19 resulted in a necessity to diversify markets for many businesses and underlined issues around dependency on a single market segment.

- Operations were not allowed at full capacity due to restrictions of physical distancing between workers, and hygienic requirements to limit contamination of the virus between people in production and proces-



sing facilities. For example, in onshore fish processing facilities and fishing vessels, workers operate in confined spaces making it challenging, if not impossible, to implement social distancing while maintaining the entire crew. (66). A participant from the Faroe Islands expressed that workers in rural areas were more highly impacted by layoffs due to pandemic restrictions since other employment opportunities are more limited.

● Transportation, including air and road freight services, were disturbed by border closures. Global air freight was temporarily halted and consequently became much more expensive as passenger flights were cancelled (OECD, 2021), in particular to large export markets, such as Japan or China, as emphasised by workshop participants. In countries where exceptions to travel weren't made for professional fishing, fishers, especially in rural areas, were financially impacted by the inability to access boats and the sea. For these in particular, fishing is a primary source of income and consequently, their financial resilience is low (22).

### *Disruption and value chain resilience in the short-term*

There are a few studies and reliable statistics on the topic of COVID-19 and blue bioeconomy value chains, especially concerning the resilience of value chains, which was the main conclusion of a recent study on the effects of the COVID-19 pandemic on the EU fishing and aquaculture sectors (22). From the lack of specific data, it is difficult to distinguish how resilience has been experienced by segments of the value



chain. For this project, literature from April 2020 to January 2021 was reviewed, and from the sources include the European Climate, Infrastructure and Environment Executive Agency, FAO, and OECD. From these sources, it seems as though value chains were generally found to be robust to disturbances related to COVID-19 but with varying impacts between segments, national restrictions and support, and financial and operational capacity of actors (22), (23), (24), (65).

From global perspective, it can be seen that there is a notable difference in the level of disruption when

comparing Nordic and EU operators to global south, who were more severely impacted related to for example access and availability of transport and logistics as well as social measures to limit the impacts on livelihoods (24; 22; 67). Due to the globalized nature of value chains, this is not to say that there are implications for Nordic countries as well, being in many cases one of the export destinations in the later value chain stages of these goods. Shrimp fisheries in the North Sea are an example with low resilience due to a globalized value chain, as fishers are reliant on workers in Morocco to peel shrimp, where labour

was disturbed due to COVID restrictions (Mytlewski et al., 2021). Despite disturbances, in the literature review it was found that for several countries including Denmark there was an expectation that after the end of COVID-19 restrictions, the sector would return to normal operation (22).

Workshop participants reported value chains to have been disturbed due to the areas listed above and other factors, but many saw blue bioeconomy value chains to be fairly resilient in the short-term, and able to persist in the face of disturbances or return back to normal. In the questionnaire, the majority of participants stated that value chains were somewhat persistent (10/12 participants) or very persistent (2/12 participants). However, the short-term resilience of value chains was reported to vary widely by location, part of value chain, and sector. For example, a participant from Iceland stated that wild fisheries were more able to persist while aquaculture needed more time to adapt. A participant from Greenland stated that fisheries continued, despite knowing there would be a drop in price.

### *The significant changes as a result of COVID-19*

Due to the disturbances of COVID-19, blue bioeconomy value chains had to adapt to operate under new conditions. The three most frequently mentioned and most significant changes in the literature review and by the project participants, include:

- Adoption of digital technologies as a response to

pandemic freedom of movement restrictions. This resulted in new opportunities, both the literature and workshop participants reported increasing online sales and providing new avenues to sell to customers (22). For example, project participants representing Nordic firms exporting to Asian markets remarked on opportunities to benefit from increased e-trade in Asia, an opportunity arising because of COVID-19. Some initiatives have increased resilience through

enabling diversified revenue streams for fishers, such as establishing a fresh fish vending machine and direct marketing channels from the coast to cities. Other initiatives include direct sales to consumers, increased use of online platforms, and investment in diversification in general. Fishers, particularly through associations, have tried to decrease their dependency on established value chains, for example by making use of new marketing channels directing sales from coast to city (22).



● Product mix, or the types of products offered by firms, changed during the pandemic. For example, workshop participants reported an increase in frozen foods as compared to fresh cuts, a change also found in the literature. By freezing fish, it prolonged its shelf-life and helped it reach export markets despite disturbances to transport, logistics, and uncertainties about the speed of delivery (68). In addition, smaller and more convenient packaging has been developed in order to adapt to the systematic shift in demand from the HORECA segment to retail sale and direct sales from businesses to consumers via the internet. This was also emphasised by the Danish Seafood Association as one of the main changes. The shift towards retail has led to signs of improved cooperation in the value chain as observed by the Norwegian Seafood Federation. While it is too early to make any certain conclusions, these trends could continue beyond the pandemic.

● Production processes were adapted to COVID-19 preventative measures and automated where possible. Both in the literature and roundtables, it was emphasised that producers had to integrate preventative measures to prevent virus transmission, which created a challenge to maintain typical work processes and profitability (65) (21). For example, in fish processing facilities or fishing vessels, social distancing was reported to be difficult or impossible while maintaining normal operations (65; 67). Some producers were able to adapt with technological measures, as Oddur Már Gunnarsson, CEO of Mátis in Iceland stated in the roundtables, *“Automation in processing has increased as suppliers want to be less dependent on human recourses.”*



*“Home delivery and online services really picked up during COVID-19. Brick and mortar operations had to find other ways to operate if they were going to stay alive”*

Christine Hebert, Founder of Blue Lobster, Denmark

### **Significant changes show value chain adaptation in the medium-term**

Value chains with greater capacity to adapt are more resilient during and following a disturbance (4), and it can be seen in the points listed above that there were adaptations experienced in blue bioeconomy value

chains. The literature review and experience of roundtable participants offered examples of adaptation, such as use of digital sales platforms, direct sales to consumers (Mytlewski et al., 2021), but is not to say all blue bioeconomy value chains were able to adapt in these ways.

Not all producers had equal capacity to adapt, especially producers reliant on the HORECA sector were reported to not be resilient (22). The capacity of individual fishers or producers, for example by having existing storage capacity, was key to be able to adapt and supply to new local demand (21). In an interview with Árni Mathiesen, he hypothesised that due to a lack of data the true financial impact and adaptive capacity of value chains will only begin to be understood when the yearly reports are published by companies. A participant working at Royal Greenland expressed that the company continued normal supply chain operations despite knowing that the market would fall for certain species. However, it can now be seen that despite the pandemic, the company published their strongest half-year result ever recorded in August 2021 (Royal Greenland, 2021).

The workshop participants also had a mixed view of whether blue bioeconomy value chains are adaptable. Most participants that replied to the questionnaire stated that they experience blue bioeconomy value chains to be somewhat adaptive (6/12) or very adaptive (3/12), with a quarter of respondents stating they are or not adaptive (3/12). Some participants stressed the need for government support to help aid adaptation.

*“The focus for Royal Greenland was on staying strong enough to reestablish growth and earnings on*

*the other side of the pandemic. Early in the year it was already clear that COVID-19 would have very negative impact on earnings, Nonetheless, Royal Greenland decided to maintain the activity at approximately the same level as planned. This was based on the fact that in supply terms Royal Greenland operates in areas*

*where the company’s activities dominate employment and economic activity... a drastic reduction of fisheries and production would have entailed significant socioeconomic problems for local communities.”*

Nikoline Ziemer, Business Development Manager at Royal Greenland



## How policy can improve value chain resilience

It can be seen that despite disturbances, many value chains in the blue bioeconomy were generally able to persist and, in many cases, also adapt. However, signs of transformation towards greater acknowledgement of social and ecological boundaries which could make value chains more resilient in the long-term, were generally not seen in the literature or by project participants.

Many project participants expressed however that it would likely be too early to see if COVID-19 has had this effect, but others suggested that the primary focus had been to get value chains “back to normal” rather than create systemic change.

Suggestions for how the resilience of blue bioeconomy value chains can be improved for the long-term was only mentioned in a few articles found in the literature review (49; 68). Where it was mentioned, suggestions include creating more transparency in policy responses, enable learning from crisis and innovation to achieve greater sustainability and improving the protection of natural resources (49; 68). One example is electronic monitoring and surveillance systems for fisheries control, which will be explained in greater detail below (69).

Workshop participants were asked to discuss how the role of policy in how value chain resilience could be improved by building on suggestions found in the literature review, and the following suggestions emerged.

### Suggestions for how policy can improve value chain resilience include:

- Creating a coordinated crisis planning approach across Nordic countries. Participants suggested that crisis planning could be better coordinated to secure access to resources, labour, and export markets to ensure short-term resilience. For greater resilience in the long-term, it was suggested to improve coordination of natural resource management. Participants debated the differences in policy approaches necessary for small-scale aquaculture in comparison to fisheries, emphasising that policymakers should aim to be sensitive to the local context.

- Incentivising sustainable fishing and aquaculture practices. Literature suggest that the blue bioeconomy can build long-term resilience by incentivising low-impact fisheries that do not harm the seabed and the marine environment, avoid bycatch, improve co-management of marine areas, incentivise more sustainable forms of aquaculture, and ensuring the restoration and protection of ecosystems (68). Participants agreed that policy plays a key role in supporting these efforts, prioritising ecological and social sustainability to build resilience in the long-term.

- Enable traceability of Nordic products. Digital traceability was suggested by many participants as an opportunity to benefit the competitiveness of Nordic products by providing customers with an assurance of product origin and sustainability. Traceability could support a premium price, and thereby the cost of developing fisheries that are resilient and sustainable in the long-term. In addition, this could be supported by sharing standards on product labelling in the Nordic region.

- Harnessing digital and modern tools to support fisheries control and inspections. For example, electronic monitoring systems involve the use of cameras to capture still images or video to document the activities on board individual fishing vessels. These cost-effective systems can enable enhanced registration of fishing activities, which may facilitate increased traceability and documentation of sustainability claims (69). Electronic monitoring has been successfully implemented in Australia, Canada and the US and piloted in dozens more countries, including in Denmark, and could have the potential to provide similar benefits if scaled up in the Nordic region (69; 70).

- Enabling innovation to reduce waste and utilizing rest raw materials. Blue bioeconomy value chains already have examples of use of rest raw materials, but participants stressed that there is a need for improvement and innovative approaches. The loss of the mink industry due to risk of zoonosis (9) disrupted the supply chain of rest raw materials being used as mink feed, yet participants saw that the industry was able to adapt to redirected into fish feed components, pet-food and the protein market. Participants emphasised the opportunities in utilising seafood resources that are currently wasted and focusing innovation efforts to utilise these resources as human grade as much as possible.

*“Mandated traceability systems can go a long way in tackling sustainability and food quality issues and ensure that objectives are being met. It allows for better control on for example degraded stocks and the exploitation of workers. It could add value and create a competitive edge for Nordic products by making it*

*possible to have more robust claims about the product and its origin.”* Katrin Vilhelm Poulsen, Senior Advisor on Fisheries and Aquaculture, Nordic Council of Ministers

## Opportunities for collaboration between Nordic countries to improve value chain resilience

Workshop participants expressed strong support for improved and increased collaboration between Nordic countries in all steps of the value chain to realise greater resilience in value chains, both in the short and long-term. Participants emphasised shared cultural values across the Nordic countries which offers the benefit of providing a common ground to tackle mutual problems. Many ideas were proposed and discussed, and the points below represent some of the most emphasised by the project participants.

### Opportunities for Nordic collaboration to improve value chain resilience include:

- Establishing data collection, monitoring, and research at a Nordic scale. An article by the FAO (2021) suggests that improving data collection systems from

fisheries, could help improve resilience. (68). Multiple participants expressed the need to collect more data, coordinate fisheries control and monitoring, and conduct research at a Nordic scale to better enable evidence-based policymaking and industry action. There are still many unknowns about the impact of COVID-19, such as the impact of the crisis on fish stocks and ecosystems (68), where value could be gained from further research.

- Developing a shared vision for conservation and restoration of marine and coastal areas. Participants stressed the importance of the vision to be supported by common standards, targets, and communication at a Nordic level. A participant expressed their support for the target of 30% protection of global land and ocean by 2030 as set out by a United Nations initiative (71), and others suggested even more ambitious targets. Participants agreed that key to conservation targets that support long-term resiliency is a Nordic-wide approach.

*“A restoration policy for the Baltic region and the Atlantic Ocean would be a great step towards greater resilience, in combination with protection of between 30-50% of our coastal waters”.*

Joel Lindholm, Former Chairman and Vice Chairman, and currently an active member of Ålands Natur och Miljö

- Creating testbeds and centres for innovation. Participants suggested that policy could support the sector to become technology-driven by facilitating a greater connection between research and production, which could be particularly beneficial if done at a Nordic scale. Such centres could help connect innovators with private funding and provide administrative support, for example for small scale aquaculture projects or circular economy projects that find novel uses for residual raw materials. In general, innovation in the value chain has been suggested as key to supporting a transition to long-term resilience (72).

*“There is much potential for Nordic value added through boxed clusters, universities, and labs. By closer cooperation in these areas funding can be coordinated and better ensure that research of technologies is implemented and brought forward to commercialisation. For example, how to ensure we have no waste and better upgrade off-cuts and rest-raw materials. ”*

Poul Melgaard, Director, Danish Seafood Association

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# Food and agriculture

**THE FOLLOWING CHAPTER** summarises the findings from the interview, workshops, and questionnaire of workshop participants in context of a literature review. The topics aim to represent the information that was most emphasised by the participants. This section integrates the findings from the literature review, which of all the three sectors has the largest volume of studies extending from the earliest period of the pandemic (29) to June of 2021 (5). In this search, only four studies had examined Nordic countries (5) or the region as a whole (6) including a national economic review in Finland (34). A large volume of European studies was analysed alongside FAO reports as well. At the time of writing, the literature examining the impacts of COVID-19 included several studies within both food and agriculture, however, studies looking at the impact through the lens of resilience thinking were limited to three studies (6) (5).

## The impact of COVID-19 and effect on resilience

### *Disturbances of value chains due to COVID-19*

The disturbances most emphasised in the immediate and near-term wake of the pandemic, centred mainly around labour shortages, market volatility, and transportation disruptions. These appear to be disturbances experienced to varying degrees at a global scale

and across the EU, and have also been echoed from a Nordic perspective by project participants.

### **Value chains experienced disturbances in the following three areas:**

- Closed borders and restrictions on movement lead to significant shortages of labour. Agricultural operations were halted or delayed especially in labour-intensive segments, either because of a lack of workers or due to efforts to reduce virus transmission (30; 33). Disruptions in the flow of migrant workers and the increased transmission rates due to low standards in working conditions and housing, all highlighted vulnerabilities related to the dependence on low-wage workers from outside of the EU (5; 33). It was reported that Nordic farmers were forced to call for local labour, which was generally answered by those who have lost their jobs in the restaurant and tourism industries yet were inexperienced in farming (6). Labour shortages were reported to be one of the most significant disruptions by the project participants, who echoed the points above found in the literature.

- Market volatility affected food producers and suppliers. The overnight closure of the HORECA segment and tourism sector in and outside the Nordic region affected both producers and suppliers of food (29). This was echoed by a participant, who noted a shift in demand away from restaurants and canteens, creating a sudden pressure on grocery stores. In addition, farmers were affected as prices of agricultural

inputs rose on soy, grains, and fertilisers and supply chain disturbances resulted in a lack of spare parts for machinery disturbances (29; 6).

- Transport disturbances halted, delayed, or limited access to inputs and disrupted exports. This was most severe, according to workshop participants, when all transport briefly stopped in Europe, in the spring of 2020. Freight costs then increased causing difficulty in continuing international exports. For smaller actors, it was beneficial to adapt to using more local supply channels, while workshop participants representing larger companies exporting products internationally or representing trade associations reflected that this was not possible in many cases.

### *Disruption and value chain resilience in the short-term*

The disruptions listed above highlighted vulnerabilities with food security and a lack of crisis preparedness in the Nordic region (6). For example, the degree of self-sufficiency of food and agriculture varies between the Nordic countries, however overall, the reliance on imports of labour and products remains alarmingly high and a potential source of vulnerability identified both by participants and in the studies examined in the literature review (6). The current approach by food retailers, where inventories are kept low by frequent and precise ordering, has been chal-



lenged by spikes in demand during the pandemic. It is hypothesised that the awareness of this vulnerability could catalyse a shift towards having a greater buffer of essential goods in case of short-term supply chain disruptions (5; 6).

The workshop participants agreed to have experienced these disturbances and vulnerabilities to some degree, but in contrast, many participants thought that overall, food and agriculture value chains were able to persist with minimal disruptions. Participants that responded to the questionnaire thought that value chains were either somewhat persistent (5/9) or were very persistent (4/9). A participant from Finland stated that they did not see any major disruptions other than the short-term wave of hoarding. A participant from Denmark credited strong cooperation in the food cluster to resilience from disturbances, while another stated that large Danish food associations delivered record results despite restrictions. Quick action and coordination from the politicians, companies, and authorities reduced disturbances, as reported from the perspective of a participant from Sweden.

These findings from the workshops may suggest that the disruptions were minimal in the Nordic region and that while there is room to improve on vulnerabilities, value chains are overall generally robust in the face of disturbances. A study from the International Food Policy Research Institute (2020) supports this claim, finding that supply chains in rich countries that are more capital and knowledge intensive were more resilient during COVID-19 than supply chains that rely more heavily on labour (37). Further research would need to be done to confirm this connection.

### *The significant changes as a result of COVID-19*

In terms of significant changes that occurred as a result of the pandemic and are expected to continue, most participants expressed that they did not expect any major changes in the value chain to last. The most frequently

mentioned changes by project participants include a renewed focus on risks and sustainability and new ways of working with digital platforms and technologies.

**Significant changes in food and agriculture value chains as a result of the pandemic are seen in the following three areas:**



- Digital platforms created closer connections between producers and consumers. When the regular flows of value chains were disrupted, for example when producers could not sell their products to canteens or restaurants, the use of digital platforms created new opportunities to sell directly to consumers. This opportunity was taken up by small and large producers alike. Supermarkets relied more heavily on online ordering and delivery, while local growers started selling goods online as well (6). These linkages could help to further increase the opportunities for consumers to choose local foods and products, which was mentioned as an opportunity in workshop discussions.

- The adoption of new business models and technological solutions were accelerated, although changes were already underway prior to COVID-19. A shift to e-commerce was led by large companies and encouraged by governments and NGOs, accelerating a shift to greater digitalisation of trade, logistics and delivery, and mobile payments (5). An overall shift from brick-and-mortar establishments towards a larger presence of online retailers is evident (5; 6). In addition, it has been hypothesised that greater use of smart technology such as fruit picking robots or spraying drones may see increased uptake by farmers to overcome labour shortages as a result of COVID-19 but raises social dilemmas by reducing opportunities for unskilled labour (42).

- A greater awareness of risks on topics including pandemics in general, spread of diseases in animals, food security, sustainability, and climate change was inspired by COVID-19 in both the private and public



sector. The project participants reported a stronger focus on climate change and sustainability in supply chains and expect this trend to continue. In addition, participants observe that food has risen on the political agenda with increased awareness of the need for resilient production systems. Evidence of increased awareness of risk was not found in the literature at the time of writing, however it could be relevant to see

if there is data that supports this shift in the Nordic region.

*“I don’t think COVID-19 has changed that much in the value chain. In short-term there has been a shift in the consumption from the closing down of society, but I believe it will bounce back to normal. The focus on climate and sustainability on the other hand has*

*changed the value chain tremendously and will do so in the years to come.”*

Marie-Louise Boisen Lendal, CEO of Tænketanken Frej, Denmark

### **Significant changes show value chain adaptation in the medium-term**

The ability for value chains to employ new technologies and ways of working following a disturbance, is an indication of their ability to adapt (4). This can be seen in the areas described above with examples of both small producers and large businesses which seems to use digital platforms to sell their goods, and even integrate e-commerce and new business models more concretely into their ways of working.

The majority of participants had the perspective that food and agriculture value chains were either very adaptive (4/9) or somewhat adaptive (4/9), with one participant thought they were not adaptive. These responses support the overall findings from workshop discussions that value chains were able to find ways to continue despite disruptions caused by the pandemic.

The indication of a greater awareness of risks by actors in the value chain, as mentioned by the workshop participants, could be the starting point towards building greater resilience in the value chains in the long-term. For instance, where the value chains begin to take on an organisation that allows a preventative approach to systemic societal issues. This could include addressing biodiversity loss through regene-

rative agriculture or improving social sustainability by acknowledging the risks associated with the poor conditions of low-wage labour.

*“There was a relatively quick response in the agricultural value chain and the entire food cluster, and an impressive adaptation to new market conditions on international markets”*

Jan Laustsen, Director of Trade, Markets & Nutrition of Danish Agriculture & Food Council

### **How policy can improve value chain resilience**

The strategies employed to adapt value chains as a response to the pandemic were limited to improving the delivery of private goods, and it is uncertain whether these strategies will be enough to address systemic vulnerabilities to improve resilience in the long-term (6; 31). As an immediate consequence of the pandemic, the food and agriculture value chains saw disturbances including labour shortages, market volatility, and transportation disruptions. To adapt to these circumstances and improve resilience, value chains employed digital platforms, new business models and technologies, all contributing to increased resilience to shocks in the near future.

Meanwhile, a greater awareness of risks could point to early-stage transformation of the value chains into a system that prevents risks such as climate change, biodiversity loss, or even takes into account social factors such as the exploitation of migrant workers. Policy plays a unique role in being a primary tool to further enable this transformation.

During the workshops as part of this project, participants were asked to brainstorm and discuss how policy can help improve the resilience of value chains in the long-term. They were invited to add their perspective to the suggestions found in the literature, in order to build, expand, or contradict the suggestions. From the discussions, the following suggestions emerged.

#### **Suggestions for how policy can improve value chain resilience include:**

- Improving employment conditions for agricultural workers. The pandemic brought to light the vulnerability of relying on underpaid labourers, as the harsh living and working conditions of migrant workers created a “perfect breeding ground for the outbreak of new infections” during the pandemic (33). Ensuring agricultural work is decent work in the Nordic region could help end exploitative practices, create desirable jobs for local residents, and create greater stability of labour and thereby resilience in the sector.

- Building public support in paying the cost of sustainable food systems. Many participants expressed a concern regarding the willingness of consumers to pay for the higher cost of sustainable and resilient food and agricultural systems. Despite this risk, participants emphasise that there is an opportunity for Nordic policy makers to enable a shift via customer education and connection to local vendors. This includes a shift to systems that focus on the connection between animal and human health, as COVID-19 brought to light vulnerabilities of animal-based farming systems with the closure of mink-farms in Denmark (35) (10).

- Enabling the establishment of alternative practices that support more resilient and sustainable food and agriculture systems. These practices could include urban farming, development of plant-based foods, and replacement of imported crops with domestic alternatives (34; 68; 36).

- Ensure regulations do not hinder the development of innovative food products. Participants emphasised the need for a more cohesive approach regulations in Nordic countries, which were frequently remarked by project participants as a hindrance towards the development of innovative food products, such as insects for food. Participants also stressed the need for better policy communication. This could include simplified guides for small businesses and entrepreneurs to help them access support for the investment and adoption of new technologies.

- Fostering cooperation and knowledge sharing amongst farmers and large landowners. Workshop participants noted that commercial farmers are responsible for large swaths of land, and thereby directly responsible for its sustainability. Participants recommended to develop a stronger business-to-business knowledge sharing network to enable agricultural production built on quality and sustainability.

*"Policymakers could support companies to be more flexible in times of crisis. For example, there were companies that wanted to change production, for example from vodka to hand-sanitiser. They were faced with a long procedure that took a lot of time. Policymakers could simplify the process in times of crisis and help companies to change more quickly."*

Erika Öhlund, Analyst at the Swedish Defence Research Agency Doctoral Researcher at Södertörn University, specializing in food systems and the impact of COVID-19

## Opportunities for collaboration between Nordic countries to improve value chain resilience

The Nordic region's tradition of knowledge sharing provides a strong foundation for the improvement of resilience via greater collaboration. Participants emphasised the importance of the common values of trust, transparency, and sustainability in both regional development and in connection with globalised food chains.

### Participants saw the following opportunities for improved collaboration:

- Establishing a Nordic innovation system that are rooted in common values of trust, transparency, and sustainability. This platform is suggested to connect cross-border R&D initiatives, innovation labs, and testbeds. In addition, this system could serve as a connection between research and commercialisation. Thereby, it could help to close a gap reported by workshop participants between research and commercialisation while connecting universities and micro-companies across the region.

- Creating shared Nordic plans for crisis management including a framework for cooperation between countries. Workshop participants emphasised that crisis management plans could cover planning for scenar-

ios in case of shortage of agricultural inputs, creating systems to enable trade to flow across borders during pandemics, and removing red tape to help companies adapt to changes in demand. In addition, government advisory services could include alternative tools and methods and sharing best practice in food safety and risk management.

- Enabling standardised data gathering and analysis across Nordic countries to further promote evidence-based policymaking. In the workshop discussions, many participants reported cooperation and research are being hindered across Nordic countries due to a lack of shared and cohesive data gathering approaches, which they see as essential to improving resiliency in the wake of COVID-19. They emphasised that evidence-based policy is essential and supported the idea for more coordinated and cohesive data gathering across countries. Workshop participants stated they could benefit from having more specific forums for Nordic collaboration, on shared challenges or themes such as droughts or fires.

*"Establishing common goals across Nordic countries is key to increasing resilience."*

Gustav Helmers, Crisis Management Officer at Jordbruksverket (Board of Agriculture), Sweden



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# Forestry

**THE SECTION BELOW** summarises the sector interview, workshop, and workshop participant questionnaire, building upon information found in the literature review.

The key findings included represent the information that was most emphasised by the participants. At the time of writing, limited literature was available on COVID-19 and the impact of forestry value chains. The most relevant sources identified was one European study from the European Commission's Knowledge Centre for Bioeconomy (49) and reports from the FAO covering a global survey on the impacts of COVID-19 on the sector (25), policy recommendations on how to respond to crises (25), a summary of a series of webinars on the topic of Building back better: COVID-19 pandemic recovery contributions from the forest sector (27), and lastly the brief based on the webinar on the forest sector and COVID-19 held in June of 2020 by the Advisory Committee on Sustainable Forest-based Industries (28). The challenge of working with these sources is the difficulty in generalising from the limited knowledge of specific data related to the Nordic region, and the sources are therefore added where they support or add insights from the views of the project participants.

## The impact of COVID-19 and effect on resilience

### *Disturbances of value chains due to COVID-19*

The disruptions of value chains due to COVID-19 in the forestry sector are varied from the perspective of the project participants, and highly variable depending on the particular value chain and geographic region. For example, Sweden was a notable exception where its workshop participants expressed that they were often able to continue business as usual due to lack of COVID-19-related physical restrictions. The disturbances most frequently mentioned in workshop discussions and in the literature are summarised below.

#### **Value chains experienced disturbances in the following three areas:**

- A shortage of forestry workers in all parts of the value chain was experienced, especially where a high degree of physical labour was needed. This shortage was the most significant disturbance due to COVID-19, from the perspective of representatives of forest industries in the project workshop and supported by a global survey on the impact on the sector (25). At the beginning of the pandemic, many European factories closed, which affected both supply and demand of labour and business activities were immediately halted or made difficult to execute due to res-

trictions on travel and physical distancing. The shortage of workers was exacerbated in segments with high reliance on workers coming from outside the EU, in particular on plantations. A workshop participant from Sweden expressed that they attempted to recruit more local labourers, yet they found local labourers unwilling to cope with the physically demanding tasks with low levels of mechanisation. However, a Norwegian workshop participant had a contrasting experience, reporting successful mobilisation of local workers, indicating that responses vary.

- Sudden changes in demand resulted in shortages. Workshop participants credited these developments as connected to lifestyle changes because of COVID lockdowns. For example, a participant from Sweden reported shortages of sawn timber, suspecting that people stayed home to work on DIY projects rather than travelling. Others echoed this trend, seeing a higher demand for timber as well as paper packaging materials for the shipment of goods, while they saw a decrease in graphic paper

- Higher prices because of shortages puts value chains under strain. Shortages of timber in the Nordic markets drove prices up, which participants reported creating challenges for processing, retail, and construction companies to continue business operations as usual. A participant working in the wooden construction industry in Finland reported a doubling of prices coupled with difficulty in securing wood. They reasoned this was due



to increased exports to Asia as well as increased demand by local consumers with additional disposable income due to economic health packages. Participants reported higher wood prices as part of a global trend and expressed uncertainty if this is a long-term trend or an immediate result of the pandemic.

*“It is very hard to find domestic workers for plantation work, and the industry is very dependent on migrant workers. Plantation work is very hard and not highly mechanised. The labour shortages as a result of COVID-19 highlighted the need to increa-*

*se mechanization, which would improve the working conditions in the forest..”*

Viveka Beckeman, Director General, Swedish Forest Industries Federation, Sweden

### **Disruption and value chain resilience in the short-term**

In the literature, in addition to the areas listed above it was reported that some of the most evident disturbances, as an immediate result of COVID-19, across

forestry value chains included the layoff of workers, temporary closure of commercial outlets, and temporary reduction of salaries (25).

The workshop participants expressed that although many areas of the value chain experienced disturbances as a result of COVID-19, other recent disruptions in value chain have had even more significant impacts, such as the effects of natural disasters including forest fires or storms.

Overall, forestry value chains were reported to be

somewhat resilient to disturbances by workshop participants. From the seven workshop participants that replied to the questionnaire, most thought value chains were somewhat resilient (5/7 participants) or very resilient (1/7), while one responded that they did not think value chains were resilient. Participants from both Sweden and Finland commented that the variability in value chain resilience between forestry sectors was connected to the severity of lockdowns and the reliance on human labour in the sector.

### *The significant changes as a result of COVID-19*

Many of the workshop participants expressed that they experienced no or few significant changes due to COVID-19 in the value chains in their industry that they expect to last. The changes that they did experience were connected to lockdown restrictions or disruptions described in the previous section. However, they may be more significant changes that were not found due to the limited scope of this study and the selected group of participants.

Another possibility is that there are simply fewer immediate changes that have been experienced. The adaptability of the forestry sector is a major challenge given that it can take almost a century to grow a tree. With this long-time horizon, workshop participants expressed the challenge that the supply of raw materials is not flexible in this sector. Working standards and procedures, however, can be adapted.

**Significant changes in forestry value chains as a result of the pandemic are seen in the following three areas:**



● Increased adoption of technological solutions. A global survey of 237 forestry stakeholders by the FAO in June 2020, reported experiencing increased adoption of digital technologies and labour-saving innovations as a key part of their organisation's medium- to long-term COVID recovery strategy. The report also found that COVID-19 has sped-up industry stakeholders' incorporation of new technologies and advanced analytics into all parts of the value chain, including

sourcing, processing, reporting, and surveillance and control. Examples given of technological solutions that could transform the management of forestry supply chains are for example by DNA fingerprinting and mapping that can be used to trace and verify the origins of timber products and validate sourcing claims to support legal, ethical, sustainability, and accountability goals. Workshop participants reported greater incentive to mechanise forestry work, but the



actual implementation of the technologies listed above were not discussed in detail and could be an area of further research.

- More remote work and learning. The global trend of remote working to adjust to the immediate impacts of the pandemic was the most common strategy adopted by the private forestry industry to adapt to the pandemic, as reported by the FAO (25). This was echoed by workshop participants, who reported increased remote work for marketing, sales, and at the customer end of the value chain. A workshop participant from Norway said that they saw a substantial increase in online training and courses within the sector relating to foresters and forestry machine operators.

- Greater use of forests and green spaces for recreation. While not a direct change in commercial value chains, a shift in the public perception of the recreational value of forest resources could have future implications for policy. There has been a global trend of increased visitation of public parks since COVID-19, which has also been documented in Norway and anecdotally across the Nordics by workshop participants. (44; 43). A number of the workshop participants expressed a growing tension between uses of forests for recreation, conservation, and commercial harvesting.

*“The pressures on forests are reaching a boiling point. The harvesting of the forest is under strain from spikes in demand, there has been increased need for forests for addressing climate change and biodiversity loss, while there is also greater pressure on forests as a main source of recreation during lockdowns.”*

Interview with Camilla Widmark (20)



### *Significant changes show value chain adaptation in the medium-term*

It can be said that the capacity for adaptation in value chains, such as the use of new technologies and ways of working following a disturbance, can improve their resilience in the wake of shocks. In a survey of forestry stakeholders by FAO (2020), increased uptake of technologies was reported following the immediate impacts of the pandemic and seemed to be a significant change, but whether this was experienced in the Nordic region was not

discussed in detail by project participants. It can be seen in the questionnaire that workshop participants had the perspective that forestry value chains were either very adaptive (3/7 respondents), or somewhat adaptive (3/7 respondents) to disturbances, with only 1 participant stating they did not think them to be adaptive. Supporting reasoning including the ability to adapt sales and services to digital ways of working.

However, others stated that they thought it was too early to tell, or that the discrepancy in adaptability between product lines was so varied that they could not generalise.

## How policy can improve value chain resilience

During the immediate impacts of COVID-19, the market was quickly evolving and dynamic according to changes in demand and supply and reduced availability of workers. In the workshops, when discussing how policy could improve the resilience of value chains to persist during disturbances, many suggestions focused on these aspects.

Overall, participants stressed the importance of ensuring stable governance to create long-term resilience that helps prevent impacts from disruptions such as COVID-19 in the future. When making changes

to policy, due to the long timelines the forestry sector must operate, participants emphasized that there is a strong need for stable and long-term policy. As one participant aptly expressed, “When we change policy, we better get it right!”

COVID-19 shed light on vulnerabilities in the value chain and accordingly where the sector should steer to in the future (28). Creating value chains that foster opportunities innovation, improve knowledge sharing and collaboration, and take into account systemic social and ecological considerations such as biodiversity are all elements supported by literature to build long-term resilience in value chains (4). During the workshop, participants were asked to reflect on sug-

gestions from literature and build on those from their experience in order to provide recommendation on how to improve resilience, which are summarized below.

### **Suggestions for how policy can improve value chain resilience include:**

- Ensuring necessary movement of labour and borders remain open for migrant workers, was mentioned by workshop participants as important to ensure value chains can continue during future disturbances. During COVID-19, one of the most difficult challenges has been the shortage of labour that has not been able to be supplemented by local laborers to the extent needed.

- Improving training opportunities for local workers could improve the robustness of value chains. A participant from Norway mentioned a digital course that successfully helped train and recruit foresters and machine operators, in contrast to the experiences of participants from Sweden that expressed greater difficulty recruiting locally. Whether not such an education program could make a difference, could be a question for future investigation.

- Increasing resource efficiency and labour-saving innovations is a suggestion to improve resiliency suggested by a study by the FAO, which was also echoed by workshop participants. (25).

- Improving cooperation between governments to harmonize common laws, regulations, and standards. Participants expressed that creating common standards and predictable laws and regulations would



promote willingness to invest in the forestry sector and welcomed the EU Taxonomy as an upcoming development that will help in this respect. Another idea from a participant from the private sector in Finland, is to ensure that building regulations are harmonized across the Nordics. Ensuring common reporting standards and measuring using comparable units was also mentioned by workshop participants as holding the potential to improve the ability to share knowledge across countries.

- Enabling innovators to bring products to market. Project participants expressed that for small businesses and innovators, there is a difficult maze of regulations, rules, and policy that complicate the realization of innovative forestry products. Possible support options include providing clearer information to help innovators and small businesses, and to enable greater consistency across countries and establish the Nordic region as a cohesive market rather than smaller markets within individual countries.

- Ensuring the valuation of ecosystem services in the management of the forestry sector. A participant expressed concern that the demand-driven market does not adequately value the ecosystem services of forests such as providing a recreational space, cleaning air and water, preserving biodiversity, and regulating climate. As greater pressure is put on forest resources from competing uses, ensuring ecosystem services are valued in policy helps ensure the ecological and social benefits of forests are protected.

*“In order for the forest related value chains to be sustainable we need to balance all three aspects - so-*

*cial and ecological boundaries and economic considerations. Policy makers should invest in research to promote more initiated discussions and decisions.”*

Viveka Beckeman, Director General, Swedish Forest Industries Federation, Sweden

## Opportunities for collaboration between Nordic countries to improve value chain resilience

Despite the national nature of the response to COVID-19, as one participant aptly described, “value chain disturbances will not stop at the border”. A concern was expressed that COVID-19 increased legitimacy for nationalism, at a time where greater international threats are occurring that require an international response, such as climate change. Greater collaboration across Nordic countries to improve resilience in the short and long-term was emphasised by the participants to be key in weathering future shocks to the value chain. Many ideas were discussed and brainstormed in the workshops, and the points below represent some of the most emphasised by the project participants.

### Opportunities for Nordic collaboration to improve value chain resilience include:

- Creating Nordic innovation centres and living labs to foster joint research efforts and promote cross-sector and interdisciplinary initiatives is an idea both mentioned by participants and suggested in the literature to improve long-term resilience in the forestry sector (28). Participants suggested these labs could experiment with commercially novel plant and tree species and investigate opportunities in improving

use of side streams, use of lower grade wood, and innovations with non-wooden forestry products.

- Collaborating to establish the Nordic region as a leader in forestry education by creating connections amongst university programs and fostering Nordic experiences within academia. In the workshop, participants expressed a challenge to attract and retain youth and trained forestry professionals, as there is a lack of leading forestry education centers in the Nordic region. Participants see the value in establishing world-class opportunities for young people in forestry management, monitoring, and enterprises.

- Improving recycling and re-use of wooden construction materials by establishing a Nordic market. Participants emphasised that although there are high rates of recycling in Europe, capacity to recycle construction materials and wood is an area that is lagging behind. A participant explained that individual Nordic countries are a small market for recycled products, but by joining the markets across the region, it would increase the effectiveness and ability to market recycled products.

*“In the Nordic countries we are spoiled with easy access to waste facilities, and perhaps this is why we are not recycling wood products very well. Individual countries are too small to provide an attractive market for recycled wood, but together as a Nordic market, there is a possibility to increase recycling rates of wood products and thereby the effectiveness of the industry.”*

Matti Mikkola, Managing Director, Finnish Woodworking Industry Federation

# Conclusion

**THERE IS A NEED** for greater collaboration across Nordic countries to enable long-term value chain resilience

It can be seen that overall, with some exceptions, value chains in Nordic countries in each sector were generally able to persist and adapt to the disturbances relating to COVID-19. However, in each sector, the disturbances shed light on areas in need for political support to improve the resilience of value chains and support a transformation towards resilience in the long-term.

The participants expressed a need for greater collaboration between Nordic countries, and their ideas on how to do so were numerous. Overall, it was frequently expressed that greater cohesion and coordination in policy, innovation, and research across the Nordic region is key to building greater resilience in the long-term.

This supports a finding from a recent analysis for the Nordic of Council of Ministers on COVID-19 and food systems resilience, that current efforts to improve resilience are fragmented and could be supported

by completing a mapping in order to avoid redundancy, scale-up efforts, and to share knowledge (6).

Respondents indicated a need and a willingness to participate in collaborative initiatives to address long-term resilience in their sectors, such as forums, groups, or networks. In the questionnaire of workshop participants, the majority (85%) across the three sectors responded that they would join such an initiative. The forestry sector seemed to have the greatest need for such a forum, as the questionnaire respondents indicated that they are not aware of one to exist.

Areas for future investigation include a more detailed analysis on regional responses and mapping vulnerabilities and opportunities in specific industries

This report provides a broad overview of the disturbances and significant changes because of COVID-19 that were most emphasized by project participants in the Nordic region, and therefore a more targeted investigation could yield more specific findings. This can especially be seen as participants reported the impact of the pandemic and the resilience of value chains

varied greatly between political responses. Therefore, insights could be gained from investigating how different countries addressed the pandemic individually, as well as the regional responses in specific industries. In doing so, the implications of different responses regarding collaboration between Nordic countries and regional cohesiveness during the pandemic could be better understood.

To better understand how policy and Nordic collaboration can improve resilience in the long-term, there could be a benefit to conducting further stakeholder engagements, research, and value chain mapping to establish a more specific understanding of value chain vulnerabilities and pathways to greater resilience in individual industries or sectors. Due to the broad nature of this investigation and limitations, it was not possible to explore participants' suggestions and ideas in detail. However, it is hoped this initial investigation of the impacts of COVID-19 and value chain resilience in the Nordic region can enable greater awareness of the need for transformative change towards greater social and environmental responsibility in value chains to help prevent disruptions from future crises that lie ahead.

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