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# Industry-specific impacts of global drivers in the European Arctic

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## ABSTRACT

Natural resource-based industries in the European Arctic operate in an increasingly competitive and globalized Arctic. Knowledge of key drivers and their industrial impacts provide industries, companies, communities, and decision-makers at multiple levels with information on how to plan, manage and collaborate for the future. In this study, we explore the global drivers that affect key industries in the European Arctic – aquaculture, forestry, mining and tourism – and what impacts these drivers have on the specific industries. The study identifies eight common global drivers affecting all four industries, after applying thematic analysis of an extensive interview material with national industrial specialists in the European Arctic countries and at EU level. The global drivers identified, impact the development of key industries in the European Arctic differently and point to context-specific developments as well as a considerable uncertainty what the future holds.


## KEYWORDS

Global drivers; European Arctic; industry-specific impacts

## 1. Introduction

Globalization is not a homogeneous, uniform phenomenon, but conceals within it a variety of international processes, challenges, and opportunities that influence the different spheres of societies, communities, and individual lives (Beck, 2000; Chernilo, 2021; Urry, 2002). A basic feature of globalization is that the exercise of power is fragmented and decentralized, and held not only by states but also by transnational organizations, international companies, as well as regions and local communities obliged to exert control over their own fate (Beck, 2000; Urry, 2002). This is also felt in the European Arctic, globally connected via interlinkages and processes to the rest of the world, although political discourse and general narratives, for example in the literature, often describe it as a remote frontier and economic hinterland (Nilsson & Lundgren, 2015; Shields, 1991) far from important markets. This narrative is challenged by the increased attention to rich natural resources held by the Arctic region to solve the

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challenges of climate change, digitalization, urbanization and demographics (Fredriksen, 2021). These resources put the European Arctic in the front line for achieving important EU goals of green transition through the Green Deal (European Commission, 2019), and self-sufficiency of important minerals promoted by the Critical Raw Material Act (European Parliament, 2023). As a result, investments are needed and welcomed, promoted by national industry specific as well as Arctic strategies. Development of key industries often requires national and international financial resources. Huge companies with activities in several countries increasingly dominate the Arctic industrial landscape. Most of the key industries, situated in the North, serve the global market. Nevertheless, these global processes are realized in local northern communities and environments, a so-called 'glocal' phenomenon (Suopajarvi et al., 2017). Industrial growth requires infrastructure for transport of products and customers, and despite huge distances to markets, the European Arctic is relatively well equipped compared to other parts of the Arctic. More concern is on human capacity as industrial expansion in rural Arctic areas does not always match the population dynamics and access to qualified labor force.

Companies worldwide face having to navigate and adapt to uncertain, highly complex, and rapidly changing physical and institutional environments (Mendonça et al., 2004). The European Arctic and its natural resource-based industries – aquaculture, forestry, mining, and nature-based tourism – are no exception. Even a single incident may have global effects such as the single one case of infection in a food market in the Chinese city of Wuhan in December 2019 developed into the coronavirus pandemic. Some global challenges, such as climate change, affect the Arctic more than other parts of the world, since over the past 43 years, the Arctic has warmed almost four times faster than the global average (Rantanen et al., 2022). What happens in the Arctic can indicate future developments in other parts of the world. With this volatile background and unpredictable industrial Arctic future, we claim that the European Arctic industries cannot be understood without placing them in the context of the global interlinkages and processes that shape their futures and fortunes.

The goal of this article is to identify global drivers affecting the development of key industries in the European Arctic. We focus on four industries, aquaculture: aiming to feed the growing global population with health food, forestry: serving the market of construction, packing and as carbon sinks, mining: with much needed minerals for the green transition, and nature-based tourism: to offer the growing middle-class Arctic nature experiences.

Our hypothesis is that global drivers affect different industries differently, and the scholarly literature lack studies of cross-industrial analyses to inform these variations. The aim of this study is to fill a research gap and present a cross-industrial analysis with a holistic approach to future industrial development of the European Arctic. We believe that industrial representatives and policymakers, shaping the future for Arctic industries, need to reflect on present and possible future global drivers to prepare for the unexpected. The covid pandemic was certainly a wild card back in 2020, but war in Ukraine, occurred after the data collection of this study, indicates that unforeseen events must be considered.

We base our analysis of global drivers on interviews with industrial specialists on the national and EU-level of the European Arctic countries. The informants represent industries, industry-specific ministries, interest groups and NGOs, and provide expert knowledge to the study. The interviews are supported by a document study of national industrial and Arctic strategy papers allowing for reflections on similarities and discrepancies between the two different data sources of information.

The concept of 'global drivers' needs some clarifications as we are referring to megatrends, trends, weak signals, and wildcards that have an impact on the different industries and their environments. Saritas and Smith (2011) define these terms in the following way:

- Trends are 'change factors that arise from broadly generalizable change and innovation' and 'are experienced by everyone and often in more or less the same contexts'.

- Megatrends are different from trends in that they can extend over many generations and 'describe complex interactions between many factors'.
- Wild cards are 'surprise events and situations which can happen but usually have a low probability of doing so – but if they do their impact is very high'.
- Weak signals 'refer to the early signs of possible but not confirmed changes that may later become more significant indicators of critical forces for development, threats, business and technical innovation'.

Our following research questions will guide the analyses:

- What are the global drivers affecting key industries in the European Arctic?
- How do the global drivers identified, impact the development of different key industries in the European Arctic?

## 2. Data and methods

The definition of the European Arctic in this article is not very strict, as the interviewees give the concept their own interpretation and meaning. Some guidance can be found in the respective Northern European Countries' Arctic Strategies for geographical inclusion. This article is a part of a bigger research project, including industries located in the northern parts of Finland (Lapland region), Sweden (Norrbotten and Västerbotten regions), Norway (Troms and Finnmark regions, and Svalbard), the whole of Iceland, the Faroe Islands, as well as Greenland. The European Arctic shares some conditions related to geography and climate, and the Arctic part of Finland, Sweden, and Norway is also the homeland of the indigenous Sámi people, while the indigenous Inuit inhabit Greenland. Not all four industries are studied in each country, due to the different regional industrial profiles. Forestry is studied in Sweden and Finland, mining in Finland, Sweden, and Norway, and aquaculture in Norway, Iceland, and the Faroe Islands, while tourism is studied in all the countries mentioned, plus Greenland.

The material for this article consists of three types of data: (1) interviews with informants operating as specialists in one of the four industries (i.e. aquaculture, forestry, mining, and tourism) and/or having a special interest in the Arctic at the national and international levels, for instance organizational representatives and NGOs. Some interviews with indigenous organizations are also included, as though indigenous industries/livelihoods are not an explicit part of the selected four industries in this study, they are certainly affected by the development of these industries. See [Table 1](#) for number of informants per industry and type of informants. (2) future-oriented Arctic policy papers at the national and EU levels, (3) national industry-specific strategy documents and industry-relevant EU strategies. A full list of organizational representatives interviewed, a list of policy papers and legal documents, industry-specific and Arctic strategies, and an interview guide, can be found in the Annex (see the [supplementary material](#)). In total, the data consists of 60 conducted interviews and 59 policy papers.

**Table 1.** Number of informants per industry and type of informants.

Industry	Number of interviews
Aquaculture	9
Forestry	6
Mining	12
Tourism	14
<b>Indigenous</b>	3
<b>General</b>	16
<b>Total</b>	60

A large group of researchers took part in the data collection for this study. The selection of interviewees in each country was carried out by the researchers from that specific country using their networks and industrial contacts. This implies that a researcher specialized in mining recruited informants representing or having specific knowledge of that industry in their own country and at the EU level. This also included relevant NGOs, and international organizations. Stakeholders with a general interest in European Arctic-relevant issues were also included in the study. The joint interview guide was planned at physical and digital researcher meetings in the autumn 2020. The interview guide was sent out before the planned interview, allowing the informants to prepare and reflect on the concept 'global driver'. Interviews were conducted for all industries studied at national and EU level, and, if possible, in the interviewees' native languages. The interviews were conducted in 2021. Some were face to face, but most were online as the informants were mainly located in national capitals or Brussels and the researchers in Arctic communities. We followed an inductive approach whereby we let the informants speak, presenting their views as the main results of the study. The conversation lasted between 30 and 60 minutes. The interviews were taped and summarized by the researcher conducting the interview. The summary was then approved by the interviewee, and made available, anonymously, for the whole research group for further analysis. The interviews were conducted and analyzed by researchers located in the European Arctic, being local people themselves, and specialized in a specific industry. Third, the research team members are from different European Arctic countries, ensuring knowledge of a variety of country-specific perspectives when analyzing industries.

The interview guide covered more topics than used in this article, and the data are utilized in other publications. Informants were first asked about COVID-19 and its impacts on the industry in question, the role of geopolitics, more specifically of China in the European Arctic; and were then asked to identify global drivers, consisting of megatrends, trends, weak signals, and wildcards affecting the industry or the European Arctic; and, finally, sustainability and its meanings were also discussed (see Annex in [supplementary material](#) for interview guide).

The method used for the policy paper and interview analysis was qualitative thematic analysis (TA). Thematic analysis is an apt qualitative method that can be used when working in research teams and analyzing large qualitative data sets (Nowel et al., 2017), and can produce trustworthy and insightful findings (Braun & Clarke, 2006). Our data corpus was large, comprising hundreds of pages, and the research team collecting and analyzing the data, agreed that TA was a suitable method to meet this challenge. As forecasting was our research approach, we identified and thematized megatrends and trends. After reading the contents of the data in light of the different themes, however, we applied an inductive approach in the TA, whereby the analysis proceeded in terms of the data. An exercise of rewriting a report where the data originally were organized to detect global drivers for each specific industry (Suopajarvi et al., 2022), resulted in a new avenue of research, organizing this article according to industry-overarching, common global drivers relevant for all four industries: aquaculture, forestry, mining, and tourism.

In the next results section, we present an outline of the most important global drivers discussed by informants and contained in policy and strategic papers, and how the same drivers affect key industries in the European Arctic. Uncited information in the results section derives from the informants interviewed. For references to policy papers and industry-related papers, we refer to the list of all papers in the Annex II (see the [supplementary material](#)). The presentation of each driver will start with a short presentation defining and contextualizing the driver for the European Arctic, written by the authors and with reference to relevant research literature. This is followed by a discussion of cross-industry drivers for further development of Arctic industries, placing the findings in the context of the Covid wildcard and volatile geopolitical situation.

### 3. Results

Our work highlights eight cross-industry overarching global drivers affecting natural resource-based industries in the European Arctic: Increasing foreign ownership and investments, continuing growth, focus on consumer preferences, importance of Indigenous Peoples and Local Communities' acceptance, sustainability in all its forms, challenges of climate change, technological advances, and a wildcard – the Covid pandemic.

#### 3.1. Increasing foreign ownership and investments

Foreign direct investment plays a major role in industrial development, and according to the OECD – Organization for Economic Co-operation and Development, is cross-border investment whereby an investor in one country establishes a lasting interest and has a significant degree of influence over an enterprise in another country (OECD iLibrary). Foreign ownership refers to the ownership of a portion of a country's assets by individuals who are not citizens of that country or by companies whose headquarters are not in that country (Cambridge Business English Dictionary, 2011). The European Arctic is rich in natural resources, but short of big, locally owned companies and locally anchored investors. Therefore, several national Arctic strategies and industry-specific policy papers invite foreign investors to take part in the development of industries. Our informants forward the message of increasing foreign and multi-national companies dominating key industries in the Arctic, contributing much-needed capital.

#### *Aquaculture*

Initially, aquaculture companies were mostly small, local, and family-owned. The current trend is for the consolidation of aquaculture production in Northern Europe, resulting in fewer, very large companies. National industry-specific strategies describe this situation. In Norway, the 10 largest companies account for 65% of production, and are all majority owned by national shareholders. On the Faroe Islands and in Iceland, three and two companies, respectively, account for all production. Two of the three companies in the Faroe Islands are dominated by foreign, mainly Norwegian interests, and in Iceland the salmon industry was rebuilt in the 2010s, with Norwegian investments. On the other hand, some informants mentioned the capacity of these global companies to have strong internal research environments to improve production, profitability, fish health, and digitalization. While industrial expansion brings expectations of population growth and increased job opportunities in the coastal communities where aquaculture is operated, some informants feared that this shift from family-owned businesses to big global companies, which focus more on economic sustainability than on social or cultural sustainability, might threaten the viability and resilience of coastal communities. They feared that less of the profit created would benefit the local communities where these companies operate, but also causing concerns such as loss of local control and local benefits.

#### *Forestry*

When it comes to ownership of forestry, we need to distinguish between owners of forestry land for cutting, and the forest (processing) industry. The national Forest strategy of Finland says that forestry land in Finnish Lapland is mainly state-owned (Metsähallitus), but there are also owners that are private and are communities. The Finnish forest industry is dominated by three private companies, which are partly or fully owned by Finnish actors. Informants worried about the plans in the early 2020s for large Chinese 'Foreign Direct Investment' (FDI) in the Finnish forest industry, but this was not realized due to lack of support from the Chinese State.

State-owned forest (Sveaskog) dominates in Norrbotten, Sweden, while the share of state-owned forest in Västerbotten is smaller and, consequently, more forest is in private hands. The Swedish National Forest Strategy shows that Sweden's forest industry is either partly or fully owned by Swedish actors, dominated by three big companies. The industry includes numerous pulp and paper manufacturers owned by corporate groups, and sawmills owned by groups/companies. With the

most productive forest stock in Europe, informants fear that foreign interests might see opportunities for easier access to forest resources in Sweden and Finland.

### ***Mining***

Development of existing and new mines requires huge investments, and the national mining strategies reveal that only Sweden still has most of their existing mines in national hands. FDI is more prevalent in Finland and Norway, particularly in the mineral segment. Local communities in Norway and Sweden have experienced bankruptcy of foreign-owned mining projects, leaving communities in despair, while foreign-owned companies in Finland have been more of a success story. Some informants say they trust national companies over multinationals to leave more of the profit and ripple effects in the local communities. Northern Sweden, Finland, and Norway are currently experiencing massive mining exploration, dominated by Canadian and Australian companies. Nevertheless, informants are particularly concerned about increasing Chinese FDI in mineral resources in the European Arctic and fear Chinese control and monopoly of rare earth minerals.

### ***Tourism***

The tourism sector is increasingly dominated by larger businesses with headquarters outside the Arctic tourist destinations. Collaboration between aviation and larger hotel companies might according to informants, outcompete local businesses.

Compared to other industries, tourism is to a larger degree intertwined with most sectors in society, making it difficult to assess the level of foreign investment. In Iceland, foreign direct investment in different sectors, including tourism, has been an important part of the strategy to revive the Icelandic economy following the financial collapse in 2008. Most hotels in Iceland are domestically owned, except for some global companies. In the Faroe Islands, hotels are mainly owned by Faroese companies. Hotels in Northern Norway include large, Norwegian-owned companies, smaller family-owned businesses, and large foreign companies. In Finnish Lapland, hotels are largely owned by Finnish and Lapland-based companies, with some exceptions, mainly Chinese-owned hotels. Informants acknowledge the need for investments from national and international companies, as tourism infrastructure is capital-intensive.

Another area where foreign investment and ownership is impacting the region is the rise in cruise tourism, which has expanded very rapidly in the region. Especially Iceland, Norway, and Greenland are experiencing rapid growth. Ownership of cruise ship companies is very international, with headquarters in places such as France, the Netherlands, Norway, the UK, and the U.S.A., and ships are often registered in yet other locations, to avoid tax obligations.

## ***3.2. Continuing growth in European Arctic industries***

Continuing growth is a trend expected in all four industries. Global population growth and rising living standards are driving economic activity in many parts of the world. This includes the demand for increased food production, more construction and technological development, more energy production, and furthermore, more people with the financial means to travel long distances to experience other cultures and landscapes.

### ***Aquaculture***

Aquaculture, especially salmon farming, is an extremely profitable industry, and the informants claimed that aquaculture production would continue to grow, but mostly in northern waters. Several main growth trends were mentioned in the interviews linked to this discussion: Traditional open-sea-cage production is still growing, new offshore farming technologies are being developed and applied, and closed inshore facilities and land-based farming are expanding. Informants stressed that it would be harder to access new areas in the coastal zone, and that the industry would experience a scarcity of suitable areas in the future.

### **Forestry**

Limited resources challenge the growing interest in climate-friendly products worldwide and drive the increased demand for forest-based materials. Growth of online shopping worldwide boosts the demand for packaging materials made from wood. Considering overall sustainability, the EU's forest ecosystems can only meet a fraction of the increased global demand for forest-based raw materials. Although forest production can to some extent be increased through more intensive management, informants claim the value-creating potential instead lies in more advanced utilization of the timber, i.e. the innovative refinement of forest raw materials, including residues and side streams used for climate-smart alternatives.

### **Mining**

Informants highlighted the ongoing mining boom in the European Arctic. This is closely related to a massive interest in mineral exploration, mainly by foreign companies. The national mineral strategies support the need to map and explore the resources. According to our informants, the mining boom experienced over the last two decades will continue, as the area holds vast raw material deposits not yet fully exploited.

Increased focus on seabed mining is an answer to rising global demand for new mineral resources and opposition to new land-based mining activities. This is particularly relevant for Norway, which has an extended continental shelf rich in minerals, with the potential for the extraction of highly demanded rare earth minerals. Informants question the positive attitude of the Norwegian government, rushing to develop seabed mining, albeit with much international resistance.

### **Tourism**

Tourism is growing both globally and in the European Arctic. For instance, between 2010 and 2018 the number of tourists in Iceland increased by 400%. The increase in cruise tourism and increased numbers of tourists from Asia should also be mentioned in this context. This growth is a concern, as informants consider mass tourism to be undesirable, since remoteness, quietness, and wildness are major assets of Arctic tourism and crowding would be likely to negatively impact the visitor experience. Moreover, Arctic tourism largely relies on well-preserved natural environments that could be damaged by large numbers of visitors.

## **3.3. Focus on consumer preferences**

Consumers and companies down the value chain are increasingly able to influence the market for products and services simply by using their purchasing power.

### **Aquaculture**

Changes in consumer behavior were highlighted by Norwegian, Faroese, and Icelandic strategic aquaculture policy papers and stressed further by the informants. The strategic policy papers estimate that aquaculture production will increase, due to a growing demand for seafood globally, and the demand for healthy and sustainable food. Informants stated that customers are becoming more environmentally aware and are demanding high-quality products. As people start to eat less meat, they favor cultivated fish, especially due to the production's smaller carbon footprint. An example raised in the interviews illustrated how one of the world's biggest meat companies, based in Brazil, has invested in the second largest aquaculture company in Australia. As consumer behavior changes, moving away from meat to cultivated fish, this opens up a new market that larger companies want to tap into. On the other hand, informants raised changes in people's eating habits and lifestyles, such as the growing number of middle-class customers who tend to prefer vegetarian food, generating uncertainty regarding the consumption of fish products.



### **Forestry**

High consumer demand for timber due to the shift away from fossil fuels and towards a more bio-based economy has resulted in increased production in northern Finland and Sweden. This includes the intensified use of timber in the production of food, medicine, concrete, electronics, batteries, and textiles. Moreover, informants named the trend that consumers are becoming increasingly aware of and concerned about sustainable production and consumption issues, and manufacturing industries now ask for certified goods and products from certified forest land and forestry operations.

### **Mining**

Customers are concerned about the sustainability of the products they buy and want to know where they come from and under what circumstances they were produced. According to national mineral strategies, the Northern Europe mining industry operates within stable national frameworks, with high ethical and environmental standards. One interviewee summed up the general idea: It is better to extract the mineral under the strict environmental standards of Northern European countries, when the alternative is unregulated mining conditions in Congo, where child labor is used.

Other informants question such statements as rhetoric, as sustainability must be observed in all its forms. Promises of new jobs and ripple effects in the local community are not enough, if the area becomes polluted, reducing the quality of life of those living on and using the land, and negatively affecting other livelihoods. Informants mention examples of customers pulling out of mining projects due to weak social sustainability, and industry representatives fear that the EU Taxonomy on mining can stop further investments, due to low sustainability scores.

### **Tourism**

Population dynamics, and demographic change, is one of the main driving forces behind this development in the tourism industry; as more people are able to travel, tourists are becoming increasingly diverse. This process involves regional changes in socio-economic status; in the period up to the COVID-19 outbreak, Asia (China in particular) was, for instance, a major new market for Arctic tourism, and well-off elderly people are also mentioned as a new target group. Urbanization processes taking place on a global scale contribute to making Arctic destinations, branded as peaceful, isolated, sparsely populated, and surrounded by wilderness, highly attractive to well-off urban consumers who want a break from city life. Practically, all interviewees estimated that future investments would specifically target high-quality, customized services for quality-demanding tourists.

## **3.4. Importance of acceptance among indigenous peoples and local communities**

The Arctic is often considered to be untouched wilderness with few people. This is not the case for the European Arctic, as the area is well developed with infrastructure, vibrant cities and villages, well-functioning public services, and high material standards of living. Also, northern Sweden, Norway, and Finland are the homelands of the indigenous Sámi people, just as Greenland is for the Inuit. Sámi reindeer husbandry and Inuit hunting and fishing are important livelihoods to preserve culture and language. Social license to operate (SLO) is a prominent theme in the research literature (Moffat & Zhang, 2014; Prno, 2013) on the relationship between major industries and local people who are affected. As host communities are important stakeholders and rights holders, SLO refers to the local community's acceptance or approval of a project or a company's ongoing presence, beyond formal regulatory permit processes.

### **Aquaculture**

Informants feared that challenges related to negative environmental impacts from aquaculture, such as fish health, escapees, and sea lice, would affect local communities' attitudes, and could limit the industry's ability to grow. They stressed that increased production must meet environmental standards and offer ripple effects to affected local communities, as social acceptance is needed for

the industry to thrive. Policy documents pointed to the need for adaptive management of potential conflicts with offshore fisheries, the oil and gas industry, offshore wind farms, and marine traffic, if the industry moves offshore.

### **Forestry**

The relevance of indigenous issues has become more prominent as Sámi indigenous people are questioning mainstream forestry. Informants confirm this. As reindeer husbandry take place on about half of the forest land in Sweden, disputes between Sámi reindeer herder communities and the forestry industry are expected to intensify in the future. The clear-cutting of forests was said to deprive the reindeer of their most important fodder, lichens, that grow on the forest floor and on large trees. In Finland, 90% of the Sámi homeland in the northern parts of Finnish Lapland is state-owned land controlled by Metsähallitus (the state-owned forest enterprise). Decisions regarding timber felling by Metsähallitus require the participation of reindeer herding cooperatives. From the perspective of Sámi informants, the concept of 'sustainable forestry' and the labelling of forestry as 'green' are opposed for as long as forestry is conducted at the expense of indigenous culture and reindeer husbandry.

Concerns were also raised by informants related to the reduced acceptability of a large-scale forestry industry if the trend of employing workers from the Baltics and other Eastern European countries continues. This practice would not sustain local Arctic communities.

### **Mining**

In the interviews, the subject of SLO was often mentioned as one of the biggest challenges to further growth of the industry in Northern Europe. The fact that most of these northern areas are inhabited by the Sámi adds an additional layer to SLO efforts, as indigenous peoples have extended rights, regulated by national and international law, to practice their livelihoods on their traditional land. Parts of the mining industry lack good tools and practices for consultation with indigenous people and for implementing the principle of free, prior, and informed consent. Informants mention that indigenous people, on the other hand, lack trust in southern/global industrial actors, based on previous experience of decision-making in extractive industries, and often view new initiatives as 'green colonialism', questioning the role of mining in the green shift.

### **Tourism**

Local acceptance of tourism activity and development is needed to achieve a common understanding of what sustainable tourism means in the specific local context. The tourism industry is increasingly centralized and managed by big companies with headquarters outside the destinations, and smaller local businesses may find it increasingly difficult to compete. Informants report that excessive tourism is already a problem in some locations, especially in coastal destinations visited by big cruise ships, and tourism can also trigger land-use conflicts with other actors and their livelihoods. In the Faroe Islands, for instance, as a reaction to what is perceived as excessive tourism, local landowners and communities have restricted access to nature, thereby creating problems for the tourism industry. To maintain SLO, and acceptance among locals and other stakeholders, local community involvement is necessary, and informants mention that the tourism industry should also at least avoid negative impacts on, for example, the availability of suitable housing, fair prices, and access to services.

## **3.5. Sustainability in all its forms**

Sustainability is a megatrend that is a prerequisite for successful business development here in the early 2020s and especially in the future, due to pressure from consumers, financiers, and policy-makers. Sustainability is usually divided into three pillars, i.e. economic, environmental, and socio-cultural sustainability, but even when applying this division, sustainability remains both context-specific and ontologically open (Purvis et al., 2019). This is even more true of indicators developed for

sustainability, the most important being the United Nations sustainable development indicators. The political dimension of sustainability is evident in the EU's contested taxonomy that enables investors to reorient investments towards more sustainable technologies and businesses. These measures will be instrumental in making Europe climate-neutral by 2050 (European Commission, 2021).

### ***Aquaculture***

The salmonid aquaculture industry in Northern Europe is experiencing significant challenges relating to environmental impacts, fish health, escape from pens, and sea lice. One informant noted that aquaculture companies are among the top-rated food producers, according to ESG (Environmental, Social, Governance) perspectives, in the Collier FAIRR Protein Producer Index, while others question the environmental effects of the industry in fjords with waste and fodder affecting other marine species. Informants say that increased production can only take place with strict environmental goals and with the needs of local communities in focus. The Faroese informants stress that the industry is very powerful and takes rapid decisions on increasing production that affects the local communities.

Informants also highlight governmental regulations as important, such as the Norwegian traffic light system whereby increased production quantities are only allowed in regions with minimal sea lice problems. Such policies will direct growth towards areas at lower risk of affecting wild salmon stocks.

### ***Forestry***

Sustainable development is the key to all economic use of forests and is embedded in forestry legislation. Sustainable development principles are incorporated in the concept of Sustainable Forest Management, which has been adopted in national legislation, as well as in forest certification schemes, strategies, and policies at the company and organizational levels. However, interpretations of the concept seem to differ, and also the extent to which forestry really has fulfilled the sustainability principles and goals. Some informants perceive the forest industry as developers of sustainable economic well-being for local communities, while others question its environmental sustainability, or highlight protecting forestry from harvesting, as necessary. Informants confirm that the political rhetoric expressed in official documents on sustainability issues is also affected by changing trends and behavior among customers and financiers.

### ***Mining***

We are witnessing a general drive to decarbonize the European economy. Energy production must be more sustainable, more efficient, and be accompanied by better storage capacity to reach the goals of a green energy transition. Resource mapping of the European Arctic reveals that the area contains important metals and minerals needed for the 'green shift'. In addition to these critical raw materials being of great economic importance, these materials also face large supply risks.

Sustainability in mining is controversial. Proponents of the mining industry see minerals as the solution for a decarbonized energy system and a prerequisite for a sustainable energy transition – with the green shift as a megatrend for the industry. Electrification is one of the main trends, both for the mining industry itself by using less fossil fuel, and for other industries where electrification entails a need for more minerals for use in batteries. Moreover, the industry tends to focus on the local employment benefits, local ripple effects for subcontractors, increased community capacity, and national tax revenues. Some informants outside the industry consider mining inherently unsustainable, as it extracts unrenowable resources, and because of its large, negative, and irreversible environmental impacts and landscape changes. Involving host communities has become an integral aspect of the industry's practices, but this Social License to Operate (SLO) is not always accepted as genuine.

## **Tourism**

Since the main asset of Arctic tourism is perceived to be its pristine nature, quietness, and authentic traditional livelihoods, all the stakeholders that were interviewed agreed that it was necessary to avoid mass tourism, as it poses a major threat to environmental and cultural conservation and to the opportunity for visitors to experience the expected peace, isolation, and nature/wilderness. The possible strategies mentioned to achieve such balance are to increase the value of the tourism services provided, rather than increasing the number of tourists; and to implement international certifications and labels of tourism products, living up to the sustainability standards set by the Global Sustainable Tourism Council (GSTC).

Moreover, Arctic tourism predominantly caters for distinct consumer segments distinguished by their elevated income, advanced education, and passion for nature. As a result, the envisioned 'ideal' visitor, as emphasized by most interviewees, exhibits environmental and cultural awareness, expecting the industry to uphold accountability in its pursuit of sustainability. However, this heightened consumer awareness also renders the tourism sector susceptible to various forms of boycott. For instance, individuals may opt to refrain from air travel, upon which numerous Arctic destinations rely, or express opposition to local practices like whaling.

### **3.6. Challenges of climate change**

Climate change is a complex phenomenon that appears above all to threaten northern nature and thus also northern communities; paradoxically, it may also strengthen some industries, as described in our interviews. The European Arctic is experiencing the impacts of climate change before other parts of Europe, and it is estimated that the Arctic is warming up four times faster than other parts of the globe (Rantanen et al., 2022). This is a warning of what can be expected in the future, and this concern was often repeated in the interviews.

## **Aquaculture**

The policy documents and informants stated that carbon emissions, rising Arctic Sea temperatures, and ocean acidification were wildcards that could affect the premises for aquaculture production practices. However, there is a strong belief among informants that those challenges will be met by knowledge.

According to interviewees, climate change could benefit the industry by opening up new transportation routes to Asian markets, while higher ocean temperatures might make certain areas unsuitable for aquaculture, while other areas, such as Northern Norway and Iceland, might become more attractive. The need for climate-change mitigation could, according to the informants, lead to the integration of different forms of aquaculture production. Shellfish and seaweed aquaculture could well become part of salmon aquaculture production. This means that simultaneously cultivating different species at the same location could benefit the industry, as sea conditions change. Shellfish, such as mussels, could filter waste from salmon cultivation, and this waste could also nourish seaweed. Aquaculture that seeks to be circular in its production processes, producing as integrated multi-trophic aquaculture (e.g. fish, mussels, and seaweed), rather than at just a single trophic level (e.g. salmon), can be regarded as more sustainable.

## **Forestry**

Climate change challenges existing forest management practices. Informants mention a lack of frozen ground needed for certain harvesting operations, increased risks from extreme weather events, and pests. Adaptation measures include more robust tree species and developing technologies for detecting pest and insect outbreaks. Forests and forestry also play an important role in climate-change mitigation. The Swedish Arctic Strategy (2020) highlights the role of forestry, with good growth in binding large quantities of carbon dioxide.

### ***Mining***

Climate change, and the green shift towards more renewables, has resulted in intensified mining activities in the European Arctic, for instance, related to the need to develop car batteries, wind turbines, and solar panels for which minerals are pivotal ingredients.

### ***Tourism***

As the climate is changing more rapidly in the Arctic, northern ecosystems and traditional livelihoods are already facing severe challenges. Winter tourism is already threatened in many parts of Scandinavia, as snow seasons are shorter and snow conditions more uncertain. Unpredictable weather conditions make outdoor tourism activities more difficult to plan, and also more generally constitute serious safety issues. Interviewees also mentioned the opportunity to reframe weather change and unpredictability as 'authentic experiences' in tourism marketing. 'Last-chance tourism', where travelers want to see endangered species and ecosystems, can also be seen as one example of such alternative framings. Other opportunities include a longer summer tourism season and easier access to previously isolated areas. Interviewees also mention indirect impacts on the tourism industry and businesses from climate change, the main point raised being the possibility of stricter environmental regulations, for instance taxes or restrictions on air travel.

## **3.7. Technological advances**

New technology is an important driver for innovation in all industries, and for attracting investors and meeting sustainability goals.

### ***Aquaculture***

Informants highlight the greater automatization and use of big data in salmonid production in pens in order to optimize fish health and control of fodder and the slaughtering process.

Other technological advances are land-based fish farming. Faroese informants claim they are world-leading specialists in smolt farming, in RAS, recirculating aquaculture systems. This is to reduce the time the salmon are kept in pens in the fjords, where the lice are a big problem. As it stands now, land-based smolt farming is very expensive and requires a lot of energy and water. Informants also fear that more of the production taking place on land will move the production closer to the market, and the natural conditions in the Arctic environment will then no longer be an advantage. Offshore aquaculture is also mentioned as something that will expand in the future, with technological progress.

### ***Forestry***

Purchasing wood from forest owners, including the cost of harvesting and transport, is one of the most significant costs for forestry. In Sweden and Finland, costs of harvesting operations have not increased significantly over the last decade, and prices have remained relatively constant. However, interviewees claim that to maintain or increase forest industry competitiveness, cost reductions in the supply chain are crucial as labor and fuel costs, for example, are increasing. New technologies for energy-efficient and less labor-intensive operations are therefore being sought. Such technologies include hybrid drive lines, electrified drive lines, semi-automation and automation of control, and tele-operation. The full automation of forestry machines will require completely different designs. This in turn may lead to both lighter vehicles causing less harm to the forest floor and more cost- and time-efficient systems than those currently in use. Informants expect that digitalization will support sustainable forest management practices, and that forest harvesting, for example, will become more efficient and have less impact on the soil and forest stands.

### ***Mining***

Automation in the mining industry has many positive effects, as the mine can be run more cost-efficiently, and reduce its energy usage, lower its carbon emissions, and replace dangerous manual work with mechanized processes. Technological improvements can also reduce operational risks in the harsh Arctic climate. On the negative side, informants fear that this development will reduce the need for manpower, as fewer people will be needed in the mines, again changing the employment structure from dominant blue-collar work to white-collar work.

### ***Tourism***

Digitalization of direct marketing was mentioned by many interviewees as being of great importance for the growth of the sector, and as a generally positive factor that increases accessibility, opens up market destinations to an unlimited number of potential customers, and creates opportunities for small businesses to create independent niche markets. Digitalization also allows for extended stays because travelers have the possibility to work remotely. Tourists have access to more information, options, and power to choose services and experiences in accordance with their own expectations and tastes. Although the interviewees do not mention the risks and possible negative feedback that increased reliance on digitalization could create, some of these risks are described in the literature, however. For example, third parties can manipulate or disable marketing websites, and consumers may be exposed to fraud. Digital and sharing economy platforms are not easily regulated and may facilitate fraud and tax evasion. Tourism products are under increasing pressure from online reviews, which can determine the success or failure of businesses.

## ***3.8. Wildcard: covid pandemic***

The COVID-19 pandemic was a wildcard discussed among the informants.

### ***Aquaculture***

The informants all agreed that the pandemic affected the aquaculture industry, as restaurant and food-service markets closed temporarily, although the industry adapted well, producing more for retail markets, while the production volume was upheld.

### ***Forestry***

The pandemic affected forestry only slightly. According to interviewees, the demand for forest products has increased rather than decreased – for example, demand for packaging products has increased and a construction boom has increased demand for roundwood. Forestry informants reported that the production chains, including timber procurement, operated almost normally throughout the pandemic.

### ***Mining***

Informants from the mining sector commented that mining operations in the European Arctic were only slightly affected by Covid-19. Existing mines kept producing as normal, and some even produced more, as market demand and prices increased during the pandemic. However, exploration activity and some mines under planning or in the start-up process experienced delays due to travel restrictions affecting movements of key personnel, machinery, and technology.

### ***Tourism***

The vulnerability of the tourism industry to the COVID-19 pandemic was an important theme for the interviewees, as tourism was the industry most severely affected by the pandemic. The almost complete travel standstill and the continuous changes in regulations and restrictions severely challenged the industry, and according to the interviewees, especially small family-run businesses experienced huge impacts. A major negative consequence was workforce scarcity, since the industry

often relies on seasonal workers from elsewhere. The cruise sector was severely affected, which also had consequences for local businesses, souvenir shops and restaurants, and so on. The interviewees also mentioned positive effects of the pandemic. For instance, domestic tourism increased, which from a sustainability perspective is positive, since it reduces long-distance (air) travel. As nature-based tourism implies outdoor activities, the safety measures were simpler than in crowded destinations, which could be seen as a competitive advantage.

#### 4. Discussion of cross-industry drivers for further development of Arctic industries

The results from this study, summarized in Table 2, have detected eight common cross-industrial global drivers for the European Arctic industrial development. This implies that the global drivers are vital and brought forward by key respondents from all four industries and other informants interested in European Arctic development. The broad agreement across industry indicates the importance and relevance of these drivers. The cross-industry global drivers were derived from the collective work of the researchers, cross-reading and discussing hundreds of pages with interview material and document analysis. This method of thematic analysis opened for combining researchers' industry-specific knowledge with European Arctic context-specific expertise. The following discussion will highlight the industrial variety of each of the detected global drivers, and how the discourses documented in the interviews can inform cross-industry learning for future industrial development.

**Increased foreign ownership and foreign direct investments** continues, but with different intensity and geographical dominance in each industry. Norway plays a major role in aquaculture, while foreign ownership is less prevalent in forestry, and planned Chinese investments in Finnish forestry was not realized. Mining is on the other hand dominated by several foreign companies from Canada, Australia and other Nordic countries. Foreign investors are most active in Finland, least in Sweden, and with Norway in a intermediary position. Chinese investment is so far present only in Northern Norway. Foreign ownership in nature-based tourism is mainly visible in the cruise industry, mostly active in Arctic Norway, Iceland and Faroe Islands. Informants are mainly positive to foreign investors, and the need for investor friendly national industry policies, but not at the expense of Chinese control. Some of the expressed skepticism towards Chinese investments in the 2021 interviews, can certainly be extended to Russia, as the war in Ukraine stopped Russian investors access the European Arctic market.

The narrative of **Continued growth** is still dominating in aquaculture due to nearly unlimited demand for seafood globally, in forestry caused by demand of forest-based materials in construction and packing, in mining owing to rich deposits of much sought after minerals for the green transition, and in tourism due to high-quality nature-based products economically accessible for more people. Thus, the public debate increasingly questioning the unlimited growth calling for strict national regulations keeping the growth within sustainable targets. Increased value creation of processing more of the products, or developing new refinements in the Arctic region, leaving more of the ripple effects in the local communities, are opportunities still not fully utilized.

**Consumer preferences** favors seafood over meat production, wood-based bioeconomic products over fossil fuels and other building materials. Buyers of mining products want to know where they come from and how they are produced, and high paying tourists demand high-quality products in mainly pristine nature in the Arctic without over-tourism. European Arctic products have long gain trust from global consumers due to the favorable natural environment and relatively transparent production and working conditions. Increased focus on quality certification and traceability enhances Arctic industries, thus, consumer preferences may quickly change and force the industries to act accordingly. This gives a clear signal to the industries to inform customers and work with their 'Arctic brand'.

**Local communities' acceptance** for industrial growth is vital in Arctic communities, and all industries strive to obtain a Social License to Operate – SLO. The importance of **Indigenous Peoples' acceptance** is highly relevant in Greenland, Norway, Sweden and Finland, and is presently one of the main challenges for further industrial growth as Indigenous livelihoods are negatively affected by changes in land- and sea use. Much of the SLO and Consultation work take place during

**Table 2.** Impacts of the global drivers on the four European Arctic industries analyzed in this study.

	Aquaculture	Forestry	Mining	Tourism
<i>Increasing foreign ownership and FDI</i>	The ongoing development from small, local, family-owned companies to fewer, larger, multinational companies could improve production, profitability, fish health, and innovation/digitalization. Risks include loss of local benefits.	Forestry land is domestically owned, while the forest processing industry is partly or fully owned by domestic actors. Chinese investors planned to invest in the sector in 2020, but later withdrew due to lack of support from the Chinese State.	Foreign direct investments are prevalent in Finland and Norway, while most of Swedish mines are nationally owned. Informants are concerned about Chinese ownership and monopoly of rare earth minerals.	The sector is increasingly dominated by larger businesses outside the Arctic. Ownership in the cruise industry is very international.
<i>Continuing growth</i>	Growth in the aquaculture industry is expected due to high demand for seafood globally, along with limited access to coastal space. Much of the growth may come from alternative forms of production, with potential positive and negative environmental and social impacts.	Growth is expected due to high demand for forest-based materials. Potential for value-creation lies in refinement of forest raw materials, and less through more intensive forest management.	The ongoing mining boom in the European Arctic will continue, due to remaining raw material deposits that can be exploited and a high interest in mineral exploration by foreign companies. Seabed mining will receive increased attention.	Tourism is growing in the European Arctic. In this context, the increase in cruise tourism, the high number of visitors from Asia, and concerns about mass tourism, were raised.
<i>Focus on consumer preferences</i>	Changing consumer preferences away from meat and towards more healthy, environmentally friendly options could impact the industry positively through high demand for cultivated fish. On the other hand, if vegetarian food becomes more popular, this could reduce demands.	The shift towards a bioeconomy and away from fossil fuels results in the development of wood-based products and thus increases consumer demand for timber. Sustainability concerns increase the demand for certified products.	Customers want to know where the mining products come from, and how they are produced. There are recent examples of customers pulling out of mining projects due to weak social sustainability.	Rising socioeconomic status enables more people globally to travel. Arctic tourism is a major market for visitors from all over the world – including Asia. Future investments in tourism will likely focus specifically on high-quality, customized services for high-paying visitors.
<i>Importance of Indigenous Peoples' and Local Communities' acceptance</i>	A negative environmental impact and minor ripple effects challenge the industry's growth potential in local communities. Moving activities offshore may result in conflicts with industries here such as shipping, fisheries, oil and gas, and offshore wind power. Community involvement and adaptive management are needed for social acceptance of the industry.	Disputes between forestry and Indigenous Sámi reindeer herders are expected to grow, particularly in Sweden. Sámi informants question the concept of green forestry. The acceptability of large-scale forestry may deteriorate if the trend of importing workers from Eastern Europe continues.	SLO is challenged, particularly for new mines and in important reindeer herding areas and can restrict the industry's ability to grow. Good tools for consulting with Indigenous peoples and acquiring free, prior, and informed consent are still lacking.	Lack of local acceptance is causing problems for the tourism industry due to, for instance, excessive tourism. Local people have sometimes restricted access to nature, and growth in tourism can affect housing prices and access to services.

(Continued)



Table 2. (Continued).

	Aquaculture	Forestry	Mining	Tourism
<i>Sustainability in all its forms</i>	Even with a low carbon footprint, local environmental sustainability is a challenge for the industry. Reducing environmental impact, including green energy transition, is a key focus of the industry. Government regulations can help direct the industry in a more sustainable direction, with more positive effects on local communities.	Principles of sustainable forest management are included in forestry legislation, certification, strategies, and policies at multiple levels. How sustainability is understood differs, however. Some claim that forestry and environmental sustainability are incompatible.	Sustainability concerns require the industry to fulfill all aspects of sustainability during the whole process. Decarbonizing the European economy increased demand for minerals. Proponents of the mining industry see minerals as the solution and prerequisite for a sustainable energy transition. Others claim that harvesting un-renewables can never be sustainable.	Focus on avoiding mass tourism. Sustainability drives a greater need to focus on increasing the value of tourism products and services, rather than increasing the number of visitors. Consumer preferences for sustainability makes the industry vulnerable to boycotts/bad reviews.
<i>Challenges of climate-change</i>	Climate-change could impact aquaculture in negative and positive ways, such as making certain areas unsuitable for production, while opening up other areas for production and transportation. High reliance on technology to solve challenges.	Climate change could produce challenges such as a lack of frozen forest floor, pest and insect outbreaks, extreme events, and damaged trees and equipment, but also positive increased growth.	Climate change has resulted in intensified mining activities related to the green energy transition with much sought after minerals.	Climate change can cause challenges related to unpredictable weather, lack of snow, making planning challenging, potentially creating safety issues and impacting visitor experience. Positive impacts include a longer summer season and easier access to previously inaccessible areas.
<i>Technological advances</i>	Technological development, automatization, big data and recirculation systems are seen as a key component of climate-change mitigation, adaptation, and environmental sustainability challenges. More onshore aquaculture can be one solution, but also cause other challenges.	New technologies for energy-efficient, less labor-intensive and more cost-efficient forestry are being developed to maintain and increase the competitiveness of the forest industry.	Automating the mining industry has the benefits of reducing costs, energy usage and carbon emissions, while improving safety. On the other hand, a concern regarding to reduced employment.	Digitalization has increased marketing opportunities, improved access to information for tourists and enabled people extended stays. due to the possibility of remote working. Challenges include cyber security, fraudulent companies, tax evasion, and the pressure from online reviews.
<i>Covid pandemic as a wild card</i>	The pandemic impacted the aquaculture industry through the closing of restaurant and food-service markets. Production volume was maintained by producing more for retail markets.	Forestry was only slightly impacted by the pandemic. Production chains operated almost normally throughout the pandemic.	Mining industry was only slightly affected by the pandemic. Exploration and some mines being planned experienced delays, while existing mines produced as normal.	The tourism sector was severely affected by the pandemic, as travel largely came to a halt.

the planning process of new or extended aquaculture and mining activity but must be maintained during the whole production period. This is not only a controversy between Indigenous Peoples and industries as it also involves national governments obliged to secure indigenous interests in industrial developments. Indigenous Peoples' consent is not only a question of meeting international and national law requirements, as the market also follows the industry's compliance with code of conduct and can withdraw from disputed projects. Forestry, particularly in Sweden, has several controversies with indigenous reindeer herders that needs special attention. The nature-based tourism is often more tangled with local businesses, but initiatives from the outside also struggle with local acceptance as it can negatively affect use of land/sea, housing prices etc.

No industry can be developed without focusing on **sustainability in all its forms**, and the EU policy of taxonomy accelerates the implementation of sustainability in Arctic industries. The fast economic growth of resource extraction, and particularly to speed up the green transition, can increase employment, but is questioned by increasing numbers of opponents. Environmental concerns are always high on the agenda as the Arctic nature is fragile, but the social sustainability is gaining more prominence. The terms used to speed up industrialization growth, like green industry transition, are increasingly questioned as losing its meaning.

**Climate change** challenges production of Arctic resource-based industries, particularly aquaculture with diseases and need to move production further north due to warmer waters. Forestry also struggles with diseases due to warmer climate, but on the positive side a warmer climate results in a longer growing season. Arctic winter tourism can deteriorate with unstable winters and snow conditions, but Arctic chilly summers can provide climate refugees from central Europe with some rest from the heat. Mining is less directly affected by climate change, but often mentioned as an input to green energy transition to meet the climate change. The dual role of industry development to mitigate climate change has gained even more momentum since the interviews were conducted, bringing the loss of Arctic nature to the table.

**Technological advances** drive the development of aquaculture to new places like onshore or in open sea, and with more automatization of production. New forestry machines can produce more cost-efficient, less-labor intensive and more environmentally friendly forestry, while Arctic mining industry now focuses on electrification and less diesel use. Digitalization of nature-based tourism gives small local-based tourist providers advances over global chains and allows marketing of products to the whole world. Making use of technological advances is nothing unique for the European Arctic industries, but the peculiar Arctic conditions allow for testing out production under extreme conditions and can be transferred to other geographies.

**Covid pandemic as a wild card** affected nature-based tourism most as all international travels were suspended for almost two years. Arctic aquaculture, mining and forestry survived the pandemic without major interruptions, and most even increased production during this period. Nevertheless, the informants communicate that the covid pandemic gave them a wake-up call for better future preparations.

The hypothesis of expected industrial variation between the four industries for each global driver, holds true, and indicates that global drivers have different practical effects that require special attention. Industries are often studied separately in the scholarly literature, and national political industry-specific strategies often lack the Arctic contextual frame. This study has opened for an industry-overarching approach to the thematic of global drivers. Policymakers must consider that Arctic industries are all affected by some common global drivers, but need to learn more about the specific effects they have in Arctic industries.

This analysis is placed in a European Arctic geographical setting, with vast and much sought after natural resources of high industrial and recreational value. The drive for extraction, harvesting, and utilization of the natural resources in this specific Arctic area originates from other global megatrends such as population growth, urbanization, and increased living standards. The detected eight global drivers are to a certain extent intertwined, and we have clustered them in three main groups for a clear interlinkage message of future Arctic industrial development.

- (1) **Unlimited growth with mainly foreign money.** Continued growth is expected across all the four industries, and this growth is mainly possible through foreign direct investment and foreign/global ownership of key companies. There is high demand for Arctic resources – i.e. seafood, forest-based material, minerals, and high quality, nature-based tourism, but large-scale development linking the resources to the market is challenging without external/global capital.
- (2) **More power to consumers, local people, and indigenous livelihoods.** Growth in Arctic industries is no longer possible without transparency on production methods, quality and certifications, and mapping environmental and social effects on those affected by the development. Local people, stakeholders, and particularly indigenous livelihoods are expected to have a say, and their rights must be respected by the industrial companies through continuous work to gain and maintain a social license to operate – SLO, and by national governments through consultations. Companies failing to comply with these obligations risk production delays and market boycotts. There seems to be room for cross-industry knowledge exchange and collaboration on this matter.
- (3) **All about technology meeting climate change and sustainability goals.** New technology is expected to meet many of the challenges of climate change by reducing the environmental impact of industrial activities, and electrification of production methods away from fossil fuels to renewable energy. The circular economy is one answer to climate-change adaptation and mitigation. Technology also creates economic opportunities and vulnerabilities related to access to distant markets, increased efficiency and easier working conditions in an Arctic climate. Sustainability goals such as food security and nutrition and the need for more bio-based raw materials are driving several Arctic industries.

The study has confirmed that globalization is a very complex process, and the wildcard of the COVID-19 pandemic was something quite unexpected that happened at the time of the interviews conducted in 2021. Looking back on that volatile period, it seems that we must prepare for more climate-related wildcards, for instance extreme weather events caused by for instance El Nino, floods and volcanic eruptions, affecting food and other industrial production, as well as transport. The effects of some of these wildcards demonstrate the vulnerability of natural resource-based industries. Wildcards will be more dominant in the future than we have been accustomed to in recent decades. They are difficult to predict, and it can be of great value to think through different scenarios of how such wildcards can play out and how businesses and local communities can prepare.

Another observation is the limited concern about geopolitics in the interviews and industry policy documents studied. The informants fear increased Chinese control of Arctic natural resources, but were not particularly worried about Russia, nor did they foresee the later invasion of Ukraine as something that would change global markets and food supply considerably. The escalation of Israel's invasion of Gaza to a Middle East conflict, with blocked transport routes and a new refugee crisis, is a new development with as yet unforeseen consequences. Stakeholders and strategic papers are not very aware of or prepared for a more volatile world. Geopolitics and the changing situation during the past years show how this is a major driver of change, but we are yet to see how geopolitics will affect the eight detected overarching drivers for industrial development in the European Arctic.

## 5. Conclusion

This study has shown that the European Arctic is certainly no remote frontier or hinterland in industrial development. The industries are important in the regional and national economy, but also for the global markets. Their products are unique and under severe demand. The industries are also pivotal for realizing important EU-goals for reducing carbon footprint, climate change, promote industrial transition, and increase self-sufficiency in raw materials, food-supply etc.

However, the industries operate in an Arctic context with fragmented and decentralized power relations and navigate under considerable uncertainties. They need to relate to multiple global institutions, international organizations, national policy laws, regulations, and frameworks, as well as steering between multiple discourses of industrial Arctic development. The novelty of this article is the cross-industry approach combining analyses of four different industries and searching for common global drivers affecting key Arctic industries. Relying mainly on interviews with national and EU-level specialists in the industries and their Arctic activities, the study contributes new voices that complement the different industry-specific and Arctic-strategy papers. The interviewees' knowledge makes it possible to place industrial development in the Arctic in the context of other important global drivers; industry-specific and industry overarching drivers.

This article has provided the scholarly literature with new knowledge by introducing a cross-industry approach in an Arctic context. The novelty lies in the effort to first, identify some common global drivers for all four studied industries in the Arctic Europe, and secondly to study their impacts on the same key Arctic industries.

Our first research question is answered by identifying eight cross-industry global drivers; Increasing foreign ownership and investments, continuing growth, focus on consumer preferences, importance of Indigenous Peoples and Local Communities' acceptance, sustainability in all its forms, challenges of climate change, technological advances, and a wildcard – the Covid pandemic. The second research question on the impact these eight drivers have on the four studied industries, is answered in the results section and summed up in [Table 2](#). This study reveals that natural resource-based industries in the European Arctic operate in an increasingly competitive and globalized Arctic and must be studied in the explicit Arctic context as certain challenges are specific to the geographical defined area. Discovering eight common global drivers has disclosed the complexity and specificity in the analysis, as well as detected the intertwined connections between several of these drivers. To interlink the global drivers relevant for key industries in this Arctic Europe, we came up with three main messages for future industrial development: Trust in unlimited growth with mainly foreign money, the need to consider increased power to consumers, local people, and indigenous livelihoods, and finally, the believe that technology will meet the challenges of climate change and to reach the sustainability goals. The study was conducted in 2021 when the COVID-19 appeared as a wild-card. It is evident that geopolitics plays an increasing role in the need for change, but we are yet to see how geopolitics will affect the eight detected overarching drivers for industrial development in the European Arctic.

This knowledge of key drivers and their industrial impacts provides industries, companies, communities, and decision-makers at multiple levels with information on how to plan, manage, and collaborate for the future.

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