Arctic Business Analysis
Bioeconomy

Entrepreneurship and Innovation
Creative and Cultural Industries
PPPs and Business Cooperation
Bioeconomy
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Photo: Olivier Martel Savoie
1 Introduction

The Arctic region is increasingly attracting economic and political interest. New business opportunities are on the rise and Arctic stakeholders are playing a key role in facilitating and creating favourable conditions for boosting Arctic economic activity. There is currently a wide spectrum of business activities, of which oil and gas, mining, and shipping are well known. Nonetheless, the Arctic region holds great economic potential to be realised in other areas such as the (blue) bioeconomy, tourism, innovation and entrepreneurship, and indigenous cultural businesses through business activities and policies designed to address specific opportunities and needs of the region.

Business development in the Nordic Arctic must be rooted in its people(s) and have a drive to create innovative development, in which the Arctic’s unique resources and human capital become competitive on a global scale. Urbanisation has especially highlighted the necessity of Arctic business development. Rural Arctic communities are under pressure, as younger generations want services, opportunities, and education offered in greater metropolitan areas. Arctic business development is therefore an existential issue because creating economic hubs of a sufficient size and critical mass would offer younger generations the quality of life they desire. In response, new technologies are revising the concept of “remote” and are rendering previously inaccessible projects economically feasible. Moreover, new technologies in transport, communication, raw material processing etc. are disrupting traditional business models and forcing business to innovate and to reinvent themselves.

The Nordic Arctic countries (through the Nordic Council of Ministers) and other Arctic states (through the Arctic Council and the Arctic Economic Council) have shown clear intentions of promoting the agenda.
of sustainable economic development in the Arctic as the logical next step in the work in and for the Arctic. Sustainable development focuses on a balance between economic, social, and ecological dimensions, and aims to ensure that the needs of the present generation are met without compromising future generations' ability to meet their own needs.1 As such, promoting sustainable economic development in the Nordic Arctic requires an understanding of the region’s business environment and policy incentives, as well as the identification of opportunities for unlocking the Nordic Arctic economic potential, and the development of practical enablers to achieve this end – to the benefit of the entire Arctic. With this perspective in mind, the Nordic Council of Ministers, in collaboration with the Arctic Economic Council, has commissioned the consortium of Voluntas Advisory and the Confederation of Danish Industry (DI) to conduct this Arctic Business Analysis.

The Arctic Business Analysis covers the areas of Entrepreneurship and Innovation, Public-Private Partnerships (PPPs) and Business Co-operation, Bioeconomy, and Creative and Cultural Industries. Each area is covered in a separate publication. This report presents the findings for PPPs and Business Co-operation. The executive summary presents the findings across the four areas of the Arctic Business Analysis.

Nordic Council of Ministers

The Arctic Business Analysis revolves around opportunities to promote sustainable economic development within the Nordic co-operation, specifically the Nordic Council of Ministers (NCM), as well as other Nordic Arctic stakeholders. It is therefore important to understand NCM’s Arctic priorities and its organisational structure.

NCM is the official body for Nordic intergovernmental co-operation. The overall responsibility for this co-operation officially lies with the Nordic Prime Ministers. In practice, the Ministers for Nordic Co-operation, on behalf of the Prime Ministers, assume responsibility for the co-ordination of inter-governmental co-operation. Besides the Ministers for Nordic Co-operation, NCM consists of 10 ministerial councils (MRs) that cover different sectors and are supported by 16 committees of senior officials (EK). The work in the Minister Councils are handled within the Nordic Council of Ministers’ Secretariat with a Secretary General responsible for the day-to-day operations of the intergovernmental co-operation and its 12 Nordic institutions and 3 Baltic offices.

NCM has since 1996 had an Arctic co-operation programme. A new Arctic co-operation programme, “Nordic Partnerships for the Arctic” for 2018–2021 will enter into force by 1 January 2018. The overall aim is to promote sustainable development in the Arctic with regards to the four themes of 1) peoples; 2) planet; 3) prosperity; and 4) partner-
In 2016 the Nordic Co-operation Minister (MR-SAM) decided to increase efforts supporting economic development in the Arctic. It was acknowledged that there needs to be more knowledge on the types of actions the Nordic countries and the Nordic Co-operation within the auspices of the Nordic Council of Ministers (NCM) could take. This led to the making of the “Arctic Business Analysis”.

The overarching aim of the Arctic Business Analysis is 1) to provide a better understanding of the Nordic Arctic business environment as part of promoting a greater focus on enablers and drivers of sustainable economic activities in the Nordic Arctic and 2) to generate practical recommendations on how the Nordic Co-operation can promote economic activities in the Nordic Arctic through the establishment of a data foundation upon which to draw fact-based conclusions. The findings of the analysis will feed into NCM’s Arctic Co-operation Programme in which sustainable economic development is a key theme. Specifically, the analysis will contribute to NCM’s focus on economic development and investments in the Arctic – a political priority for the Nordic Co-operation.

In addition to outlining enablers and best practices that can promote sustainable economic activities on behalf of the Arctic population, the analysis is also aimed at contributing to NCM’s work with the United Nations Sustainable Development Goals (SDGs). Overall, the analysis will contribute to sustained, inclusive, and sustainable economic growth (SDG 8) in the Nordic Arctic, and an inclusive and sustainable industrialisation and promotion of innovation (SDG 9). Moreover, it will analyse sustainable economic activities related to bioeconomy, creative and cultural industries, and business co-operation, which would promote affordable and clean energy (SDG 7), sustainable cities and communities (SDG 11), and life below water and on land (SDG 14 & 15) among others.
All Nordic Arctic countries are paying more attention to the facilita-
tion and strengthening of entrepreneurship and innovation. Denmark,
Iceland, Sweden, Norway, and Finland perform very well, whilst limit-
ed data makes it difficult to assess Greenland and the Faroe Islands.
Nonetheless, there are a number of potential developments which can
help improve entrepreneurship and innovation environments across
the Nordic Arctic regions. Firstly, entrepreneurial awareness and abil-
ity should be developed. This can be facilitated through an increased
focus on integrating entrepreneurship education in national strategies,
and also implementing such education through local initiatives and local
operators. Secondly, collaboration between actors and regions in the
Arctic should be ensured. Through such collaboration, the Arctic can im-
prove its ability to diversify and fully utilise each other’s entrepreneurial
and innovative competitive advantages. Finally, the cultural bias that
paints the region as an area with low economic and business develop-
ment potential challenges Arctic development. This can adversely af-
flect the region’s ability to attract investments and capital. Overcoming
this challenge through collaboration and branding the Arctic as a single
market would therefore be a key driver for future entrepreneurial and
economic growth in the region.

In the Nordic Arctic, Public Private Partnerships (PPPs) have not
been used often as an infrastructure financing model. The region’s lim-
ited experience with PPPs and the fact that standard PPP models in
the market do not necessarily fit Arctic characteristics hamper the in-
creased use of PPPs in the Nordic Arctic. Therefore, the public sector in
the Nordic Arctic needs to collect data on PPP best practices and advice
from PPP units in international organisations. Furthermore, there is
potential to increase the competences of PPPs in the Nordic Arctic as a
model to finance large-scale infrastructure projects. Initiatives should
be taken to create an overview of Arctic infrastructure needs, expe-
Business co-operation in the form of clusters in the Arctic are generally few, undeveloped, and still need to secure financing long-term, though local variations exists. Norway is a leading figure in supporting national cluster development through initiatives like Innovation Norway. Public support and increased cross-border co-operation are some of the drivers that will benefit cluster development in the Nordic Arctic. Public funding should ensure that business clusters can be created and developed while also ensuring a secure exit strategy so the clusters become financially sustainable. Furthermore, clusters can support their members and develop a greater market reach by co-operating across borders, as well as branding the region as a place for doing business.

Bioeconomy integrates a number of solutions for a sustainable future, both environmentally, socially, and economically. Bioeconomy is already an important economic segment in the Nordic Arctic, constituting 10% of the overall Nordic economy and moving towards 20% in some countries. Increasing the innovative use of biomass resources from land and sea presents a key opportunity to simultaneously ensure environmental sustainability and economic growth. Bioeconomy development should focus on increasing the value of products derived from biomass, and increasing the uses of sidestreams created by bioeconomy activities. These include practices such as the use of fish side streams for pharmaceutical products, wood residues in textile production or fish feed, etc. If bioeconomy in the Arctic is to be harvested, synergies between companies and industries must be built in both public and private sectors as well as across sectors and borders to facilitate the right public support and incentives to drive bioeconomy innovation, commercialisation and growth. Furthermore, the future bioeconomy requires substantial creative capabilities. Rebranding bioeconomy accordingly has the potential to attract a younger generation to an industry perceived as very traditional. As many bioeconomy activities are located in rural areas, developing bioeconomy also counters urbanisation, and promotes rural development and employment in the Nordic Arctic.

The Nordic Arctic creative and cultural industries of film, tourism, and indigenous cultural businesses are becoming increasingly important platforms through which the Nordic Arctic countries can create value and growth – economically, socially, and culturally. Despite significant variations in size and development, Nordic Arctic film industries are gaining considerable traction across the entire Nordic Arctic region. Policy support such as public funding and production rebates have been instrumental to the success of film industries, but ensuring long-term development requires knowledge sharing and collaboration in developing film production skills e.g. through official training across the Nordic Arctic. Nordic Arctic tourism has grown steadily in the last decade. Public support, public-private collaborations, and transnational collaborations have been key in developing Arctic tourism. Transnational collaboration shows great potential, as Arctic regions, especially those in Finland, Norway, and Sweden, are generally perceived as one destination by the tourism market. Growth in Sami and Inuit indigenous businesses offer an opportunity for economic growth whilst integrating Arctic indigenous peoples into the regional and international economy. Business opportunities include indigenous tourism, film, and other cultural activities. However, it is important to ensure that Nordic Arctic Indigenous peoples’ culture, life, and creative work are promoted and not misrepresented when developing these areas.
In a broad interpretation, bioeconomy includes those parts of the economy based on renewable biological resources from land and sea to produce chemicals, health products, food, energy and many other products and materials. To face the increasing demand and challenges posed by a growing population, the development of bioeconomy coincides with the utilisation of biomass to its maximum potential in a sustainable manner. Utilisation must be sustainable in terms of volume and value. Every possible part of a biological resource should be used intelligently via innovative and efficient technologies, business models, and methods to create sustainable value where there was none before. In turn, this would simultaneously contribute to environmental sustainability, economic growth, and societal benefits including raising employment, rural community engagement, and public health.

The Nordic Arctic countries are at the forefront of global bioeconomy development. Bioeconomy makes up 10% of the overall Nordic economy and is moving towards 20% in some countries. Four key pillars of the Nordic bioeconomy have been identified: Collaborate, Circulate, Upgrade, and Replace. “Collaborate” concerns companies in different sectors co-creating industrial synergies; regional authorities collaborating with industry to provide the right infrastructure and political incentives; and producers and official agencies engaging with civil society to ensure participation and ownership. “Circulate” relates to the creation of a circular approach for the use of biomass stocks that allows resources to be renewed to ensure symbiotic, sustainable solutions. “Upgrade” deals with unlocking the full potential of residues and waste as well as creating new, high value products from previously unexploited biological raw materials. Sustainable development of bioeconomy has the potential to replace unsustainable, often fossil based materials with bio-based...
Fisheries have long provided significant economic benefits in the Nordic Arctic. In 2014, exports of fish accounted for approximately 86.7% of total exports in Greenland, 95% in the Faroe Islands, and approximately 26% in Iceland. In accordance with its economic importance, the fishery industry is also an important provider of employment in the Nordic Arctic region. For example, the fishery industry makes up around 9% of Greenland’s employment.

Corresponding to the industry’s economic importance, Nordic Arctic governments are supportive of their fisheries. More direct forms of support include market privileges and subsidies. For example, the Faroe Islands provide such support to fisheries through subsidies in the amount of EUR 775 thousand per year. In contrast, Iceland provides MAPPING OF ECONOMIC ACTIVITIES AND POLICIES

BLUE BIOECONOMY

SUMMARY: The blue bioeconomy is the part of bioeconomy that is based on the sustainable and intelligent use of renewable aquatic natural resources. In this study, the blue bioeconomy focuses on fisheries, aquaculture, and the utilisation of other aquatic biomass such as algae. Nordic Arctic fisheries and aquaculture are global innovation leaders and are some of the most sustainable of their kind. Fisheries have long been an important industry in the Nordic Arctic region and are currently undergoing significant change. To further increase the sustainability and economic viability of limited fish stocks, recent developments focus on creating higher-value products from marine biomass. Fisheries and fish processors are increasingly utilising what was previously considered waste and increasing the value per unit of biomass. In turn, aquaculture is rapidly gaining economic prominence. Nordic Arctic governments are dedicating more focused support through funding and legislation related to research to spur growth within the industry. If aquaculture is developed sustainably and coupled with increased utilisation of fish side-streams, the growth of this industry is a valuable opportunity for sustainable bioeconomic development. Furthermore, seaweed is an underutilised resource with great potential for consumer use in food, pharma, cosmetics, bioenergy etc. With these developments in mind, this section will outline primary trends in economic activity, policy incentives and innovations of the blue bioeconomy.
Aquaculture is one of the fastest growing industries within the food-production sector, already supplying around 50% of today's fish used for food consumption purposes. With a global growth rate of around 8.8%, the share of aquaculture products used for food will reach above 60% in 2020. In the Nordic Arctic region, aquaculture is becoming an important compliment to traditional fishing activities. In light of climate change and the limited food production capacity of traditional fisheries, creating a sustainable and productive aquaculture sector enables the creation of more food from aquatic environments in combination with increased biomass utilisation of side-streams created from fisheries. A key benefit of aquaculture compared to fisheries is a fixed production location which allows for disease control and a proximity to processing facilities which makes it easier to upgrade side streams as transportation time and costs are lower. Nordic Arctic governments are dedicating increased support to unlock the industry’s potential. This support is primarily illustrated through legislative strategies such as "Aquaculture Acts" in Norway and Iceland, the "Helsinki Declaration on Competitive and Sustainable Aquaculture in the Baltic" that is relevant for the entire Nordic Arctic region, and Sweden’s "National Growth Objective for Aquaculture Industry". At a more practical level, the increased economic importance and potential growth in aquaculture activities have facilitated the establishment of dedicated research facilities. Government funded institutions, such as Matis in Iceland, NOFIMA in Norway, and the Aquaculture Research Station of the Faroe Islands, either indirectly or directly help foster innovation and development within their respective aquaculture industries.
Developments

The fishery industry is undergoing significant change. The primary focus of today’s Nordic Arctic fisheries is on creating higher-value products from limited fish stocks in the ocean. Currently, marine biomass is primarily used for the production of fish oil and food, both of which are relatively low value-added products. To create higher-value products, fishery and aquaculture industries now try to utilise what was previously thrown away as waste, such as heads, fins, bones, guts, and tails, for the production of pet food and human consumption. This increases the value per unit of biomass. Yet, even in the best cases, companies only utilise around 75–80% of a fish, leaving room for improvement. An example of this focus includes NOFIMA in Norway. Here, companies can test and optimise their processes to extract all desired components from marine-based biomass and receive help to bring these optimisations to fruition on a larger scale to produce more advanced products. Other examples include Polar Seafood, a seafood exporter in Greenland that changed its business model from only selling filets of halibut to selling all different parts of the fish, which has allowed the company to increase the utilisation of fish from 50% to 90%. Notable product innovations include Royal Greenland’s production of flour from waste shells at their prawn factory.

Overall, the fishery industry in the Nordic Arctic region is moving beyond traditional core activities, such as locally practised fishing and fish processing, to a large-scale industry that incorporates technology, logistics, and marketing. The importance of such innovations and research is exemplified by Iceland, where cod landings have fallen by 60% over the past 25 years, but the export value of cod products have tripled in the same period. The production of fish through the land-based aquaculture technology, recirculating aquaculture systems (RAS), has also developed considerably through initiatives such as the Nordic Network on Recirculating Aquaculture Systems. This may provide potential to increase the production of fish in the Nordic Arctic.

Seaweed is generally a highly underutilised resource in the Nordic Arctic region, but with great potential. Marine seaweed contains a palette of unique compounds that have many uses in consumer products. Nordic Arctic countries are in a unique position to create significant value from the region’s abundant seaweed resources, in part due to the region’s strong competence within aquaculture, offshore construc-
The Nordic Arctic Business Environment: Bioeconomy

and scalability of seaweed. A possible solution to this issue has been presented by the company Ocean Rainforest in the Faroe Islands, which intends to bring the harvesting of seaweed into the open ocean, significantly increasing the viable area for seaweed cultivation. Another key challenge to the increased use of seaweed is a lack of knowledge and expertise. Firstly, there is a need to identify the types of seaweed that are most suitable for cultivation in the Nordic Arctic and are still economically viable. Thereafter, functional cultivation techniques must be developed. Finally, the most prominent challenge to the implementation of large scale seaweed cultivation is demonstrating its profitability to potential investors, since previous analyses have shown that direct profits are relatively low. Important to the future growth of the industry is the need for developing cost-effective, pre-processing technology, but also investment support and political action on spatial planning and licensing.

Note: Based on a qualitative assessment of data on the level of support and economic activity for each country.

Seaweed has been valued at EUR 13 billion as a global commodity and as a result, many countries outside of the Nordic Arctic have recognized the great potential of seaweed-based products. For example, the seaweed species known as bladderwrack contains extremely bioactive antioxidants with multiple uses. Products developed from this and other types of seaweed include food ingredients, feed for fish farming, health supplements (e.g. vitamins), cosmetics, pharmaceuticals, and bioenergy, especially 3rd generation biofuel production (this could also help increase overall use of biofuel in the Nordic Arctic). Despite this positive potential, the Nordic Arctic regions have been slow to create value and value-added products based on seaweed, particularly on an industrial scale.

There are multiple barriers to the development of a profitable seaweed industry in the Nordic Arctic. One barrier is that many of the fjords suitable for the production of seaweed are already utilised by aquaculture companies for fish farming. This may limit the production...
The bioeconomic segment of land-based materials (mainly forestry) in the Nordic Arctic is largely limited to Finland, Sweden, and Norway. Iceland, Greenland, and the Faroe Islands have very limited forests and, therefore, have no or very limited forestry industries. In Iceland, there is however a grant programme originally administered by the Icelandic Forest Service that intends to promote afforestation, but the industry is still small. In the northern regions of Finland and Sweden, the forest industry has been an economic cornerstone for a long time as a significant supplier of employment opportunities (e.g. forestry supplies around 11% of male employment in the Kainuu region in Northern Finland) and gross value-added. Furthermore, the forest-based bioeconomy constitutes around EUR 43 billion (16%) a year in the Finnish econ-

SUMMARY: Land-based materials refers to the segment of bioeconomy relating to the sustainable use of land-based biomass materials to produce such things as energy, building materials and textiles. In this report, the land-based bioeconomy will mostly refer to forestry, as this industry accounts for the lion’s share of land-based materials that can be produced from bioeconomy. Although the increased use of digital mediums points to a phasing out of wood-based materials, recent innovation has expanded the palette of possible uses for wood, reinvigorating the forestry industry in the process. Everything made using fossil fuel-based materials today can potentially be made using wood-based materials. Alternative wood uses include lignin-based carbon fibre in areas such as wind turbines, aircraft and vehicle chassis, windows, textiles made from wood fibre, pharmaceuticals made from cellulose powder, fish feed made from wood residue, and nanocellulose. However, innovative uses of wood still only represent a rather small part of the value derived from wood, whereas more traditional products such as paper and paperboard, pulp, softwood, and sawn wood still make up the majority of value of forestry activities. A more traditional but increasingly important use of wood-based materials is bioenergy. Bioenergy serves as an important renewable energy source in Finland and Sweden. Bioenergy is currently Sweden’s leading energy source excluding fuels used for transport. In Finland, bioenergy supplies around a quarter of total energy consumption. With these developments in mind, this section will outline primary trends in economic activity, policy incentives, and innovations relevant to the land-based materials segment of bioeconomy.
The advent of innovative uses of forestry products increases potential scalable business opportunities within the Nordic Arctic bioeconomy, whilst contributing to employment and environmental sustainability.

### Developments

The advent of innovative uses of forestry products increases potential scalable business opportunities within the Nordic Arctic bioeconomy, whilst contributing to employment and environmental sustainability. The idea is that everything made using fossil fuel-based materials today can be made using wood-based materials. Such uses include: lignin-based carbon fibre in areas such as wind turbines, aircraft and vehicle chassis, windows, packaging materials, textiles made from wood fibre, pharmaceuticals made from cellulose powder, fish feed made from wood residue, nanocellulose, etc.\(^1\) Borregaard Bioenergie in Norway and UPM in Finland are prominent examples of companies attempting to diversify products made from wood.\(^2\) UPM has been able to use residues from paper and pulp production to produce biofuels. This innovation simultaneously replaces fossil fuels, whilst upgrading the value of side streams from pulp and paper. Other uses of forestry-related material include cosmetics. An example includes the company called Forest of Lapland Ltd, which utilises the side streams of the sawmill industry, as well as Arctic organic-ic ingredients, plants, and berries for the production of cosmetics. The Finnish start-up Paptic has also developed a material that can be used to replace plastics from sustainable wood fibre. Uses include packaging, carrying bags etc.

Building with wood has also received increased attention, as it is significantly more environmentally friendly than using concrete. Finland is at the forefront of building with wood, where some 40% of new buildings are made from wood. However, at the European level, wood represents only about 4% of construction, serving as an area with great potential for growth.\(^3\) In Norway, the project named Trefokus is trying to increase the use of wood in construction by establishing a network through which stakeholders in the building sector can connect and collaborate.

Production of textiles from wood is an area of great potential. Although the textile industry is partly bio-based, a great deal of fossil-based synthetic materials is used in textile manufacturing. With a

<table>
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<th>Country</th>
<th>% of Population employed in forestry % of total labour force</th>
<th>Forest Industry exports % of total exports</th>
<th>Exports of secondary wood products % of total exports</th>
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<tr>
<td>SWE</td>
<td>1.7%</td>
<td>10.5%</td>
<td>0.8%</td>
</tr>
<tr>
<td>NOR</td>
<td>0.48%</td>
<td>NA</td>
<td>0.17%</td>
</tr>
<tr>
<td>FIN</td>
<td>2.4%</td>
<td>23%</td>
<td>0.4%</td>
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<td>ISL</td>
<td>NA</td>
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<tr>
<td>FRO</td>
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<tr>
<td>GRL</td>
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The foundation of land-based food is the agriculture industry. Agriculture in the Nordic Arctic region is generally constrained due to the harsh weather and sparse geographical conditions. Therefore, in the Nordic countries, agricultural activities are mainly located in southern regions. In the Faroe Islands, Iceland, and Greenland, agriculture heavily concerns the production of livestock. In Greenland, farming is mainly limited to the southern region and 80% of farming activities relate to the farming of sheep. The Greenlandic government supports such sheep farming through a direct subsidy of around EUR 1.3 million per year. Iceland is self-sufficient with all animal-based foodstuffs. Sheep and cattle comprise the largest segment of livestock, with more than 450,000 sheep, while the production of milk is the most valuable from an economic standpoint. Herding of reindeer also makes up a significant part of the Arctic agriculture industry; however, this will be expanded upon in Indigenous cultural business in the Cultural Industries section. Climate

**SUMMARY:** There are large numbers of underutilised resources in bioeconomy that offer opportunities for innovation, especially with regards to food. It is therefore important that food and meals remain part of the bioeconomy debate and a contributor to its progress, rather than focusing the debate only on biorefineries, technologies, economic benefit etc. Essential to the development of a sustainable New Nordic Food (NNF) chain is involvement from a broad range of actors, including cultural and creative industries, as well as cross-sectional co-operation. Promoting the production and consumption of NNF contributes to developing innovative agricultural activities, such as the use of new crop variants more adaptable to the harsh climate, and niche business activities. Since the establishment of the New Nordic Food movement in 2004, the promotion of the use of sustainable, healthy, and traditional foods that can be grown in and across the Nordic Arctic has been widely successful. The New Nordic Food (NNF) movement relates to bioeconomy through the aim of making the movement into a lifestyle that is beneficial for nature, people, and the Nordic society as a whole. As a result, a considerable part of the founding document of the NNF movement, the NNF Manifesto, has to do with the development of sound production processes and new applications of traditional Nordic food products and to facilitate collaboration across the entire food chain for the purpose of economic and environmental sustainability. This adheres to SDG 12 of promoting sustainable food production and consumption, while simultaneously providing valuable employment opportunities in Nordic Arctic region such as in food and eco-tourism.
change is also affecting agricultural production in the Arctic, as higher temperatures have made crop production more reliable with greater yields. Such an example includes the increased production of wheat and barley production in Þorvaldseyri.23

Closely related to the agriculture industry is the NNF movement. This movement stresses the importance of using locally grown food while it is in season, and emphasises organically grown and non-genetically modified foods.24 Two programmes have been instrumental to the success of the NNF Movement. These are the New Nordic Food I (NNF I) and New Nordic Food II (NNF II) programmes. Sponsored by the Nordic Council of Ministers, these programmes have covered a wide range of food activities, engaging thousands of people across the Nordic Arctic and beyond. NNF I started in 2007 with a budget of 23 million DKK. NNF II ran from 2010 to 2014 with the aim of bringing Nordic cuisine ideology into Nordic homes and institutions, as well as innovative product development and local food production. The NNF movement’s focus on Nordic Arctic food has led to a number of success stories of increased use of Nordic ingredients in a sustainable manner.

Developments

Promoting the production and consumption of Nordic Arctic food contributes to developing agricultural activities and opportunities in Nordic Arctic regions. Firstly, such opportunities include the commoditisation of research related to crop variants that are more adaptable to the harsh climate of the Nordic Arctic and the development of greenhouses that can produce local fruits and vegetables. Considering the effects of climate change, there is significant potential for an extended growing season and the production of a larger variety of crops.25 Secondly, promoting and developing the production of Nordic Arctic food and agricultural activities are crucial from a food security perspective. Factors including high global food commodity prices, trade barriers, and remote location make adequate distribution of food difficult in the Nordic Arctic.

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<th>SWE</th>
<th>NOR</th>
<th>FIN</th>
<th>ISL</th>
<th>FRO</th>
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<tr>
<td>% employed in agriculture (as % of total labour force)</td>
<td>1.9%</td>
<td>1.9%</td>
<td>3.8%</td>
<td>4.1%</td>
<td>0.3%</td>
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<td>Agriculture value added (% of GDP)</td>
<td>1.3%</td>
<td>2.5%</td>
<td>2.5%</td>
<td>6.2%</td>
<td>NA</td>
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* Data from National Bureau of Statistics
* Provisional Figures
← Faroe Islands.
Photo: Scanpix
Many of the agricultural opportunities in the Nordic Arctic can be achieved through niche businesses. One notable example comes from Iceland, where Matis helped facilitate the production of innovative food products. This was achieved through supporting co-operation between farmers and food processing companies by introducing those with the necessary materials and machinery to people or organisations with innovative food ideas. A similar example can be found in the Faroe Islands where the Faroese government has partnered with the Outer Islands Association to create two funds to help foster innovation and develop infrastructure related to agriculture in rural areas. The Outer Islands Association has also entered a co-operation with the Faroese research park iNova to create educational opportunities for small scale agricultural producers.22 Another notable initiative includes the project named, “The Arctic as a Food producing Region”, which is a collaboration between Norway, Canada, Iceland, Denmark, and the Faroe Islands. The aim is to assess the potential for increased food production and added-value of food from the Arctic.22 The point of departure of this initiative is the view that consumers prefer healthy food that tastes good, has been produced sustainably, and tells a unique story. Arctic food fulfills all these properties. The project focuses on primary industries, including agriculture, aquaculture, fisheries, herding, and gathering, to develop a range of realistic development potentials.

One of the primary developments that will benefit both the Nordic Arctic bioeconomy and New Nordic Food is to scale New Nordic Food from a niche industry to a critical mass. Firstly, Nordic food looks to create additional value through refinement as history shows that processed foods enjoy greater commercial success. Raw materials used for the development of these foods should be locally produced or grown to produce local food. Secondly, close collaboration throughout the entire food value chain will ensure closer interaction between primary producers, food manufacturers, retail, and consumers. This will enable valuable knowledge and innovative production processes to be leveraged. Further synergies can be created through co-operation between large and small food producers. In relation to the abovementioned example of Matis, small producers have potential to contribute to large producers through their innovative energy and flexibility, whilst larger producers can give smaller actors access to expertise and distribution chains. Finally, the Nordic Arctic public sectors must use their purchasing power to support local and sustainable food production by buying and utilising Nordic Arctic food products through public food supply in hospitals, elderly homes, schools etc.

An example of how NNF can be developed into a social and economic business concept for the many is the way Hurtigruten in Norway has implemented the concept in its tourism business. Seeing the major opportunity in New Nordic Food, Hurtigruten created a strategy around NNF and has focused on providing local Norwegian culinary experiences to their passengers. Today 80% of all food and drink served by Hurtigruten is Norwegian. The rise in demand for locally-sourced ingredients has created considerable opportunities for local actors. This includes the egg producer Andvik Hoenseri & Hytteutleie located only 2 km away from one of Hurtigruten’s passages. Andvik Hoenseri & Hytteutleie delivers 3 million eggs to Hurtigruten every year. Furthermore, chickens that no longer lay eggs, which were previously just wasted, are now sold to Hurtigruten for consumption. Other ingredients include salmon, cod, reindeer, cheese, and many more. To reap the benefits of the sustainable concept, Hurtigruten makes sure to highlight it in its marketing and to include visitors in the story that comes with the food. Hurtigruten thereby serves as a shining example of successful collaboration and synergies across industries. In this case, the culinary, rural agriculture, and tourism industries benefited economically in a sustainable manner.

Agriculture Support and Performance

Note: Based on a qualitative assessment of data on the level of support and economic activity for each country.
Bioeconomy in the Nordic Arctic is undergoing significant change. International competition and technological developments decrease the need for traditional labour and instead demand a more diverse set of skills and innovative approaches to develop this part of the economy. It is therefore important to highlight some of the key scalable drivers and enablers of innovative bioeconomy processes, products, and business opportunities that can benefit the Nordic Arctic region and potentially the pan-Arctic business environment.

Innovative initiatives carried out by the private sector have been central to the development of the Nordic Arctic bioeconomy. Larger companies in the primary industries, including fisheries, aquaculture, forestry, and agriculture are investing heavily in innovation in bioeconomy. This includes their own innovations as well as those of newer start-ups. Numerous, previously mentioned and other, examples exist, across every facet of bioeconomy.

Collaboration between the public sector, business, and academia, often in the form of the triple helix model, has been fundamental to successful bioeconomy development. SME’s, universities, and research centres often carry out research that can be commercialised in collaboration with private and public actors, and often come up with new ideas for products and processes that can quickly be implemented but lack the resources to scale up. As the bioeconomy is becoming more technology and human capital driven, further development and testing of innovations require sophisticated technologies and specialised skills that individual companies may not possess. Co-operation between businesses and academia with strong support and effective coordination from public actors can leverage such ideas and drive economic growth and business development. Furthermore, there are also opportunities for co-operation between public, private, and academic actors to occur across the Nordic Arctic region. There are areas of
Bioeconomy has the potential to maintain and create valuable jobs in regions where other employment opportunities are limited.
Using Arctic plants to combat health issues and diseases, while trying to develop a new sustainable industry around herbal extracts and natural active substances in Lapland.

Forest of Lapland Ltd. is a producer of standardised herbal extracts and natural active substances for pharmaceutical, health, food, and cosmetic industries. Extracts may be used e.g. to substitute antibiotics, as they are antibacterial, rich in antioxidants and rich in flavonoids. The company uses and has developed Pressured Hot Water Extraction (PHWE) technology, which is carried out without chemicals. They use compounds from berries, herbs, and wood, specifically the knots and the layer just beneath the bark, which are considered waste by the forestry industry. They get their raw materials from the forests just around them, and from a sawmill 200 meters away. As there is no supply chain, it is important to be close to the raw materials.

For now, its main products relate to cosmetics but the company plans to enter other areas related to health and medical products, and it currently has filed a patent application for a treatment of allergic reactions. However, regulatory approvals for these types of products take time, which in turn slows down the business development process.

**Success factors**

Forest of Lapland is still a young company, and its current success relates closely to its location. First, the Arctic climate with the Gulf Stream and the many hours of sun during the summer allow Arctic plants to produce more antioxidants, flavonoids, and antibacterial compounds than southern plants. Second, Lapland has vast amounts of raw materials (i.e. forests), and even certified organic picking areas. Finally, the Nordic Arctic region offers a great marketing platform, as it is perceived as a healthy place with clean air.

More, Forest of Lapland has developed a process that enables them to extract the specific compounds. It conducts its own research but also collaborates closely with the University of Tampere on impact on health, extraction technology, and the discovery of new raw materials.

**Drivers and challenges**

The key drivers for Forest of Lapland is the increased demand for natural health products and natural substitutes for chemicals, as well as large amounts of international academic research exploring the health benefits of natural compounds.

The biggest challenge for the company is financing. It currently has a soft loan from Tekes, the Finnish Funding Agency for Innovation, and without this loan, it would not have been possible to start the company. Getting external financing is difficult, especially in an industry that has not fully materialised. A major challenge is that the business area is so new that the supply chain is not yet in place. There is no technical infrastructure (e.g. for specific analyses), no wholesalers, limited Arctic specific research related to the field etc. Furthermore, it is challenging to find employees to positions such as finance and operations, as people with these professions are often located in the south. To enable the company to grow, it is important that it is able to establish contact with larger businesses that, through collaboration, can support the final product development, and take lead on distribution, marketing and sales.
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THE ROLE OF SUSTAINABLE REGULATIONS IN THE FISH FARMING INDUSTRY

Organisation: Faroese Fish Farming Industry
Sector: Blue bioeconomy
Region: Faroe Islands
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Demonstrates how a regulatory framework has driven the development of a sustainable and profitable aquaculture industry in the Faroe Islands.

In the 1980s, the Faroese aquaculture industry was made up of many small producers who used the fjords to produce fish in an industry that was not strictly regulated in terms of sustainability. This eventually led to the spread of diseases, and around the turn of the century the production of salmon collapsed. As a reaction to these developments, new regulations were introduced, and today the aquaculture industry is flourishing and accounts for almost 50% of the total export value of goods from the Faroe Islands.

Success factors

The new stricter veterinary system that has been introduced in the industry since the crisis is an important foundation of the success of the Faroese aquaculture industry in later years. Some important elements of the Faroese veterinary system are:

- "All in, all out": only one generation for each location. When the fish are harvested, the area must lie fallow for a certain period of time.
- One farmer per area: each fjord can only have one producer to ensure that activities in the fjord are managed and controlled by a centralised unit i.e. the company with the aim of strengthening disease control.
- Closed well boats: rules stipulating closed well boats to ensure that no infections spread in the water, and no waiting cages to limit stress.
- New sea lice regulation: New sea lice regulation introduced in 2016 stipulates mandatory counting of sea lice at certain intervals. If thresholds are continuously exceeded, it may result in early harvesting of fish and/or reduced number of fish in the next release of juveniles in the area.

Finally, a tax incentive that allowed certain taxes to be paid later were also introduced to make it more attractive to invest in the industry.

Drivers and challenges

The new regulatory framework was a key driver of the successful turnaround in the aquaculture industry. The initiative came from the fish farmers who demanded a framework that could ensure a financial and environmental sustainable foundation. Collaboration between actors was seen as key to the regulatory success as it ensured input and commitment to the new rules, and expert consultancies played an important role in terms of sharing best practices. Finally, the regulatory framework is also driven by a set of long-term guiding principles that enables rules to be updated and adapted to new realities, while still ensuring a long-term sustainable foundation.

A key challenge for the industry is a recent revision of a tax on fish farmers. Before 2016 the tax consisted of a 0.5% tax on turnover and 4.5% tax on profits. However, since 2016 the tax consists only of a 4.5% tax on turnover. This means extra costs for fish farming companies regardless of their profits, and may affect the ability to make investments in the future. Though acknowledging the tax, the industry believes it should be based on profits to ensure a sustainable growth, especially in times with low or negative earnings.

Finally, sea lice challenge the global salmon farming industry. Various sustainable methods are being tested and used e.g. keeping the juvenile salmon “on land” for longer time to ensure larger and more resilient fish, but further research and collaborations need to take place.
The Nordic Arctic Business Environment: Bioeconomy

The success of Biotech North comes from its modern labs, business incubator, knowledge sharing activities, and the Arctic’s marine resources. The Arctic marine resources play a vital role in creating a competitive advantage compared to other non-Arctic areas. For example, certain enzymes work best in cold temperatures, and can therefore be used to make different processes more effective and save energy. Another example is algae that are able to grow in cold water, which can be used to capture CO2 emissions and fish feed.

Drivers and challenges

The central driver of Biotech North is the ability to uncover transferable knowledge from which other companies can benefit. They do this by facilitating and meeting the need to collaborate within the cluster and promoting the cluster internationally. Due to the cluster’s relatively small size, it is able to stay agile and access knowledge more easily. This creates more dynamic collaborations where knowledge and needs are more clearly communicated. The dynamic collaboration is facilitated through different activities such as focus groups related to specific themes e.g. sales and marketing, where members are actively engaged and work together. Another example is the establishment of panels that peer review applications for funding and provide feedback for each other. All these initiatives stimulate a closer collaboration and knowledge exchange, whilst acknowledging the limited time members have.

A major challenge for the cluster is its Arctic reach. It is currently focused on the Tromsø region and mostly engages with actors from the southern part of Norway, as this is where knowledge is more institutionalised. However, due to its Arctic biotech scope, the cluster is searching for ways to increase collaboration with other Arctic stakeholders who are not necessarily as institutionalised as those in the south. For instance, there is an opportunity of getting access to byproducts from fishermen who either throw away byproducts or use it for lower value-added products/processes, often because they are not aware of its value or how to take advantage of the opportunity.

Finally, attracting talent is also a challenge for the biotech companies in the cluster. Although the oil industry has created a more diversified economy in the north, there is a need to make biotech more attractive as a career path, and furthermore make the Arctic regions attractive to live in e.g. offering cultural activities or sports activities.
Arctic Business Analysis: Bioeconomy

The Nordic Arctic Business Environment: Bioeconomy

As the Chairmann of Genis, Robert Gudfinnson, argues, “People often fail to recognize that money does not always go where profit is maximized. Money goes where it feels good and safe – at a reasonable return”. Hence, investors need to feel secure and have faith in the development of the Arctic areas. If not, they will not make any investments in the areas.

Part of driving a positive image of Arctic towns or areas is finding the answers to questions like, “Who are we?” and “How can we be different?” and then brand the area accordingly. Furthermore, change is often driven by locals who take the lead and are passionate about a cause. It is therefore key to find the right individuals, and support them in utilising different opportunities, rather than initiating public projects to drive business development.

Drivers and challenges

There are many opportunities in Arctic bioeconomy but a key challenge for bio-tech companies, like Genis, is a lack of skilled people to utilise opportunities. In Siglufjordur this has been addressed by looking at the features young, educated people are looking for in life and accommodating this through investments in infrastructure and initiatives that improve quality of life. This could be improving schools and kindergartens, offering outdoor activities, and creating a vibrant social life in the town. Moreover, Siglufjordur has also focused on fixing the roads, cleaning the city, and painting the houses, all to make the city look attractive and to drive a positive picture of the town and its future.

Creating a positive image of the Arctic areas is key to promoting business development. As the Chairmann of Genis, Robert Gudfinnson, argues, “People often fail to recognize that money does not always go where profit is maximized. Money goes where it feels good and safe – at a reasonable return”. Hence, investors need to feel secure and have faith in the development of the Arctic areas. If not, they will not make any investments in the areas.

Developing a successful biotech company in a small Arctic town, while attracting human capital through initiatives that aim to increase quality of life and create a positive image of the town.

Genis is a biotechnology company located in Siglufjordur in Northern Iceland. It was founded in 2005 as a spinoff of the applied research carried out by IceTech in the 1990s. It focuses on the discovery, development and commercialization of crustacean derived supplements and medical devices. Currently, it has two products on the market: Benecta, which is a natural food supplement that can help alleviate symptoms associated with getting older e.g. stiffness and aches, and BoneReg-Inject which induces scar-less healing in bone defects. It has 31 employees and 50% of these have a university degree e.g. bio-engineers and bio-chemists.

To begin with the company was located in Reykjavik and focused on research to drive product development. However, in 2014 the company moved to Siglufjordur to take advantage of the potential that the small northern town had to offer. Genis has since then attracted good and well-educated employees and are part of the turnaround that Siglufjordur is experiencing.

Success factors

Genis’ success is based on its mission and its location. Its mission is to leverage world-class scientific research with the aim of providing life-changing benefits for individuals. Partners, employees and customers find this very meaningful and it creates an excitement about the company and its products, which is beneficial for Genis’ development. Furthermore, Genis is successful because Siglufjordur provides the right infrastructure and quality of life that attract educated talent to the town.

**CASE**

**GENIS AND SİGLUFJORDUR – INCREASING QUALITY OF LIFE TO ATTRACT HUMAN CAPITAL**

**Company:** Genis  
**Sector:** Blue bioeconomy  
**Region:** Iceland

**Contact:** Robert Gudfinnson  
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Genis and Siglufjordur – Increasing Quality of Life to Attract Human Capital

Developing a successful biotech company in a small Arctic town, while attracting human capital through initiatives that aim to increase quality of life and create a positive image of the town.
Close public-private collaboration through an independent research company with a demand and value creation focus drive the improvement of food utilisation, based on public strategy and stakeholder participation.

Matis is a government-owned, non-profit, independent research company founded in 2007. It provides partners with support for value creation, food safety and public health, and is built on a strong foundation of science, knowhow, infrastructure, and collaboration to maximize impact of investment in research and innovation. In 2016, its turnover was made up of only 25% government funding (service contract), a decrease from 42% when it was founded in 2007. Otherwise, its turnover came from international research funds (30%), Icelandic research funds (15%), Icelandic companies (14%), public bodies (9%), and international companies (7%).

**Drivers and challenges**

A key driver of Matis’ success is the integrated co-operation with domestic and foreign companies, and educational and research institutions for leadership roles in projects. Co-operation concerns external ideas as well as Matis’ own research. Matis offers companies access to its laboratories and provides services such as safety testing, genetic analysis, and product development. This especially helps companies who cannot afford their own research facilities, or entrepreneurs who need to test ideas.

Another important driver of Matis’ success is the company’s strong focus on demand and value creation. Matis’ projects are driven by demand to ensure that it caters to clients’ needs — whether it is global demand to improve the utilisation of fish or a company’s demand for the development of new drugs, fresh food products, or dog feed. Furthermore, Matis’ focus on value creation ensures that its clients gain from collaborating with Matis. As such, Matis focuses on reducing clients’ costs or increasing their profits, and constantly emphasising sustainability as an explicit company focus.

Matis also finds expectation management challenging especially in relation to research and innovation. Trust can be a barrier to introducing opportunities to a new audience, and the focus should be on function and applicability of solutions rather than decorative formalities. Building a track record of excellent science with peer reviewed publication is important, however, application of knowledge is more important in creating value, as the valuables are the economic force of our societies. Alignment of interest starts with the fact that safety and integrity are prerequisites of sustainable value creation in the bioeconomy. Training talents capable of applying new knowledge across the region is important. Safeguarding and improving the quality of products of the bioeconomy is a common goal as it is mutual interest to enlarge markets for commercial products and thus contribute to quality of life and public health.

**Success factors**

Iceland has experienced important improvements in the raw value chain, as the value of exported fresh fish has increased significantly due to improved packaging, handling, and chilling methods. Matis has played a key role in this development by translating research into practical knowledge and products. For example, Matis developed a new Styrofoam box that enabled a prolonged “shelf life” by 2–3 days in collaboration with Sæplast Promens (packaging company) and seafood producers.

**CASE**

**COLLABORATION EFFORTS TO INCREASE VALUE OF NATURAL RESOURCES**

**Organisation:** Matis  
**Sector:** Blue bioeconomy  
**Region:** Iceland

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Close public-private collaboration through an independent research company with a demand and value creation focus drive the improvement of food utilisation, based on public strategy and stakeholder participation.
The recommendations and tools presented below concern opportunities to promote sustainable economic development within the Nordic Co-operation, specifically the Nordic Council of Ministers (NCM), as well as other Nordic Arctic stakeholders.

Support to open access research facilities

**RECOMMENDATION:** Continued support and funding of existing open access research facilities and institutions to promote the creation of new, higher-value products from biomass sources.

→ **Why:** Today marine biomass is primarily used for the production of low value-added products, such as fish oil and food. To create higher-value products, bioeconomy tries to utilise all parts of biomass resources, including what was previously thrown away as waste, e.g. fish heads, fins, bones, guts, and tails. This increases the value per unit of biomass. Considering the increasing demands of a growing population, the development of new and innovative ways to utilise renewable biological material is a vital way of facing challenges of sustainability whilst contributing to employment and rural community engagement.

→ **What:** The development of higher-valued products can be facilitated through support for research facilities whose knowledge can provide valuable insights for companies. Such research facilities can also provide an open platform upon which companies and stakeholders can test innovations and take R&D activities to new heights.

→ **Who:** The Nordic Council of Ministers for Fisheries and Aquaculture, Agriculture, Food and Forestry (MR-FJLS) has the ability and the expertise to advocate for the continued funding of such research facilities and institutions. MR-FJLS is already focused on addressing the demand for these research facilities through...
The Nordic Arctic Business Environment: Bioeconomy

Strengthened public-private collaboration

RECOMMENDATION: Co-operation between academia, public institutions, and businesses should be strengthened to promote the commercialisation of innovative products and processes in the Nordic Arctic bioeconomy.

→ Why: Bioeconomy in the Arctic is being driven more by technology and human capital, as it aims to innovate and increase the competitive advantage of the region. Research as well as development and testing of innovations require sophisticated technologies and specialised skills that individual companies may not possess or cannot afford. Furthermore, research institutions and universities generate knowledge useful for new products and processes that carry great potential. However, a lack of resources or know-how prevents them from commercialising and scaling up. Finally, the drive for innovations in the bioeconomy often comes with great risks of failure. Companies may not be willing to take on this risk without public support, for example, in terms of innovation grants.

→ What: Co-operation between businesses and academia with strong support and effective coordination from public actors can leverage ideas and drive economic growth and business development in the Nordic Arctic.

→ Who: Not all Nordic Arctic areas have easy access to research institutes or academic institutions. The Nordic Council of Ministers for Fisheries and Aquaculture, Agriculture, Food and Forestry (MR-FJLS) and the Nordic Council of Ministers for Education and Research (MR-U) in co-operation with the Nordic institutions

EXAMPLE: There are already a number of such triple-helix examples. Most notable is Bio-tech North, a triple helix cluster within the biotechnology and biomarine sectors located in Tromsø in Northern Norway. This industry cluster combines the unique marine resources of the Arctic with modern labs, highly advanced equipment, local infrastructure and a well-organized business incubator to make it possible for start-up companies to successfully scale and leverage their innovations and ideas.

→ Photo: Fabrizio Conti
Nordic Innovation and Nordforsk could potentially help promote access to knowledge derived from research institutions by private actors located in regions without a triple helix structure. This could potentially be through advocating for increased digitalisation or offering services to rural areas even across borders, for example, through systems like innovation vouchers that give access to triple helix services in other countries. In this way, Norwegian companies would be able to access specialised services in Iceland. The Arctic Economic Council can potentially also help facilitate knowledge and data exchange between industry and academia at the greater Arctic regions, not only restricted to the Nordic Arctic region.

→ Next steps: To facilitate continued support and development of triple helix structures, Nordic and Arctic stakeholders could potentially promote a mapping of triple helix structures and facilitate sharing of best practices across borders and between bioeconomy sectors. This could be done by connecting structures in an Arctic network or by hosting events with the aim of connecting actors.

Promote bioeconomy sector to attract human capital

RECOMMENDATION: Make the bioeconomy sector more attractive for human capital through the promotion and branding of bioeconomy education and improved quality of life in rural areas.

→ Why: An important driver of bioeconomy in the Nordic Arctic is the continued innovative and creative approach to developing the industry. The industry needs to promote interest in bioeconomy education, and attract human capital to Arctic areas, which are often rural and not so economically diverse.

→ What: Promoting bioeconomy education could potentially be done through increased awareness of bioeconomy potential and a focused effort to change the perception of bioeconomy from a traditional industry related to catching fish or logging wood to the innovative and creative industry that it really is in the Nordic Arctic. Furthermore, to attract human capital to the bioeconomy regions in the Nordic Arctic, an increased focus on framework conditions, relating to the collective quality of life that families can enjoy, needs to be promoted. Efforts can support the creation of different facilities such as kindergartens, schools, restaurants, and the possibility of different activities e.g. mountain biking. Even simple efforts such as painting houses and keeping streets clean can change the perception of rural communities to make them more attractive for both companies and employees. Today younger generations generally seek education away from rural areas and often do not return for reasons such as limited job opportunities and isolation. A concrete idea could be to establish centres of excellence in secondary sectors connected to innovation in research and further processing of raw materials from the primary sector. An interdisciplinary “Centre of Excellence” would co-operate with experts in other Nordic Arctic countries as well as other countries engaged in Arctic research. Not only would this create additional innovative products and value in the economy, but also it would alter the trend of young people,
especially women, moving from rural areas to larger towns, cities, and countries.

→ **Who:** Projects related to attracting human capital to the bioeconomy industry and rural areas often rely on efforts by Nordic Arctic universities, research institutions, companies, and local communities, who should pay particular attention to the innovative and creative dimensions of bioeconomy as well as the quality of life that rural areas can potentially offer. However, promoting awareness of what the bioeconomy entails and what kind of career possibilities it can offer, can potentially take place on a Nordic-level through initiatives such as Nordbio. Nordbio was a Nordic bioeconomy initiative that focused on close multidisciplinary collaboration and had an objective of bringing together science, technology, education, and culture at various school levels, in institutions, and the economy. Nordbio demonstrates that bioeconomy could be promoted in an innovative and creative way through its Biophilia project, which uses creativity as an educational and scientific tool.

→ **Next steps:** As part of promoting a modern view of bioeconomy, education institutes and companies should pay particular attention to branding bioeconomy as an innovative and creative industry. Closer work with creative industries could potentially take place to increase awareness of the creative opportunities this sector offers. To initiate this, institutions need to develop a strategic narrative that tells the story of bioeconomy’s purpose, uniqueness, and vision. This should be implemented in all bioeconomy activities as well as communicated internally and externally. MR-FJLS could support this process through knowledge sharing and guidance.

### Tools

**Challenge:** A challenge to the increased cultivation of seaweed is that many of the fjords suitable for the production of seaweed are already utilised by aquaculture companies for fish farming.

→ **Tool:** Aim to bring the harvesting of seaweed into the open ocean. The company Ocean Rainforest is currently testing this in the Faroe Islands.

**Challenge:** Increasing the use of wood as a sustainable building material, as currently wood only represents 4% of construction in Europe.

→ **Tool:** Facilitate the development of a network through which stakeholders in the building sector can co-operate with the forestry sector. The key is to use a broad approach in which interaction between local communities, municipal planning processes, public procurement, building projects, education, and competen-
Desk research, case studies, and interviews have uncovered a variety of recommendations and practical tools to promote sustainable economic development for each focal area in the Arctic. These are presented in the individual reports, this one focusing on bioeconomy. However, the study also reveals a cross-cutting issue related to Arctic-specific data related to business development. Hence, presented below is a cross-cutting recommendation on data collection and dissemination.

**A need for Arctic-specific data**

**RECOMMENDATION:** Promote and support a regular collection and dissemination of Arctic specific data related to business and societal development within the Nordic region by supporting national and Nordic statistical offices in data collection and dissemination or Arctic specific data gathering projects.

→ **Why:** The Nordic Arctic region offers great potential for business development but has limited Nordic Arctic-specific data to uncover the conditions in which companies operate, social and business opportunities and challenges, resources, future investment
OBJECTIVES & DEFINITIONS

The overall goal of this study is to provide a better understanding of the Nordic Arctic business environment with a focus on sustainable economic activities; and to generate practical recommendations to the Nordic co-operation and other Arctic actors on increasing economic activity in the Nordic Arctic. To this end, the research scope includes four focal areas selected by the steering group as areas of particular interest for sustainable business development in the Nordic Arctic. The Nordic Arctic and the four focal areas are defined below.

The Nordic Arctic is defined as the states of Iceland, Norway, Finland, Sweden and the countries Faroe Islands and Greenland (part of The Kingdom of Denmark).

The study will include an overall analysis of the areas mentioned, but for Sweden, Norway, and Finland emphasis will be placed on the northern regions of these countries.

Entrepreneurship and innovation

Entrepreneurship is when actions take place on the basis of opportunities and good ideas, and are translated into economic, social and cultural value for others. Along similar lines, innovation is the process of promoting changes in technologies, products, or administrative practices. It is important, however, that the understanding of entrepreneurship, innovation, and an entrepreneurial mind-set is embedded within regional and cultural contexts.

Public-private partnerships (PPPs) and business co-operation

PPPs are an interaction between public and private institutions for the delivery of pre-defined services. The aim is to provide public service delivery from a mutually beneficial partnership, though the partnership remains founded in public oversight.

EXAMPLE

Arctic-specific data gathering e.g. includes the Arctic Business Forum Yearbook developed by Lapland Chamber of Commerce, the Economy of the North (ECONOR) publication by statistics Norway, and the Business Index North project implemented mainly by High North Center at Nord University Business School in Norway in Bodø. The Yearbook presents an overview of certain European High North investments and business developments, and discusses actions to be taken to overcome barriers of business and trade. It also presents data on specific investment opportunities and projects. The Business Index North initiative is a project that runs from November 2015 to December 2018, and is developed through a strategic partnership between academic and research organizations, authorities, and commercial partners from Norway, Russia, Finland, and Sweden. It presents knowledge and statistics on the northern areas of Norway, Sweden and Finland but will gradually expand its analysis to cover the northern regions of Russia, USA, Canada, Denmark (Greenland), and Iceland. ECONOR presents an overview of the circumpolar Arctic economy, including traditional production activities of indigenous peoples, and has been published three times since 2006.
Mapping & Cross-Analysis

The mapping sought to identify policies and recent economic activity within the focal areas through extensive desk research. The key insights from the mapping were consolidated in a cross-analysis framework that assessed and correlated the level of policy support with the level of economic activity. The combination of factors indicated opportunities concerning policy and economic activity and gaps for sectors in each focal area. This generated hypotheses on enabling and constraining factors, as well as developed an overview of business development potential in the Nordic Arctic. Considering the challenge in quantifying and measuring the topics of this study, a score-based method was developed based on a qualitative assessment of the policies promoting economic activity and available data on actual economic activity in the Nordic Arctic. The multiple scoring method relied on a pre-defined assessment scale and estimations from various project collaborators.

Case Studies

Enabling and constraining factors identified in the cross-analysis were further examined through case studies of selected businesses, organisations, and projects identified during the desk research and the cross-analysis. Case studies were selected based on their ability to enrich the analysis of gaps and enablers, and ability to scale potential learnings to other businesses, industries, and potentially other Arctic areas.

Findings & Recommendations

Findings and hypotheses from the mapping, cross-analysis, and case studies were assessed and reviewed by several stakeholders in the Nordic Arctic region for evaluation, further development, and final assessment. Finally, knowledge and conclusions were synthesised to develop recommendations on ways in which the Nordic Co-operation, specifically Nordic Council of Ministers (NCM), and other Arctic actors can support specific initiatives in the future to facilitate economic growth, investment, and business development in the Nordic Arctic region.