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EXECUTIVE SUMMARY

The focus of this report is on the impacts of new and existing industries on the social, economic and cultural structure of the local communities affected by the economic activities that are taking place in the European Arctic. Economic activities that are analysed are forestry, mining, fish farming, tourism and indigenous communities' activities. This is done on a local level, through the analysis of the local hubs, that are identified in the project itself.

We conducted an exploratory and descriptive research method to understand the context and impacts of the existing and new economic activities on local communities in the European Arctic. We relied on local and regional statistics; grey literature such as companies and institutional reports; scientific literature, existing policies, local expertise of our partners and personal knowledge for indigenous activities as some are members of indigenous communities. Key characteristics per hub were developed to provide an overview of the individual hubs.

The first thing that can be observed is that selected hubs are very diverse. Even though they are facing similar challenges, in this mosaic, it is hard to compare hubs. It is rather possible to identify commonalities and then analyse each one within its own context to understand specific challenges and develop unique opportunities. This report is an initial step in this process and provides background socio-economic data at a regional and hub level, which will, together with other data that will be collected in the frame of WP3, be used for assessment of socioeconomic and cultural impacts in hubs.

Analysed industries produce both positive and negative effects on a local level. Mining, fish farming and tourism, for example, contribute to mitigating the outmigration from rural and sparsely populated areas by providing job opportunities, increasing tax income for the municipality, expanding local business and creating new infrastructures and services. At the same time, they have a high impact on resources. Mining heavily modifies landscapes and is a source of noise, air, land and water pollution; fish farming produces large volumes of waste that affects the marine ecosystem and, especially in the case of land-based plants, requires large amount of land, energy and freshwater; tourism, if not restricted, can become mass tourism and lead to huge fluxes of people in localities where the local population is small, creating crowds, difficulties in waste management, environmental degradation, higher prices for accommodation and mostly seasonal jobs. Industrial forestry is at risk of being unsustainable when it comes to biodiversity conservation and carbon sequestration. In addition to affecting ecosystem services that local people rely on for resources, livelihoods (reindeer herding) and recreational activities. All these issues and others are described in this report, through industry/activity specific chapters. The environmental impacts are partly addressed in the analysis too, since many of the social, cultural and economic features of Arctic communities are directly related to their environmental basis. However, more detailed analysis of the environmental impacts is the task of the work package two of the ArcticHubs project.

What becomes obvious is that stakeholder participation is the key to avoid or, at least, to reduce impacts. Power imbalances should be thoughtfully considered when designing and implementing activities. Improvement of existing policies and assuring cross sectoral communication and activities is also crucial. Current developments are predominantly focused on economic growth, and biophysical, or planetary boundary perspectives are insufficiently addressed in existing strategies. Alternatives to existing activities and focus on more balanced development, in line with indigenous community's needs, deserves more attention. Possible new development should consider the 'postgrowth'

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paradigms, such as degrowth and doughnut economics, as well as postcolonial and decolonial justice approaches.

Limitations of this report are related to the data availability and difference in the quantity and quality of available data between hubs. Hub-level data are often not-existing or are of limited quality (collected in different time periods and for different purposes), therefore it is very hard to use them for comparison purposes. However, a tentative comparison was carried out, to underline relevant similarities and differences and to grasp the main features of general Arctic socio-economic phenomena related to the selected activities.

HIGHLIGHTS

- Study combines analysis of 4 industries and indigenous activities.
- The impacts of new and existing industries on the social, economic and cultural structure of the local communities in the Arctic region are analysed.
- Effective participation is the key to avoid or, at least, to reduce negative impacts of various industry activities.
- Improvement of existing policies and assuring cross sectoral communication and activities is needed.
- Alternatives to existing activities and focus on more balanced development, in line with indigenous community's needs, deserves more attention.

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1. INTRODUCTION

The Arctic is often pictured as a pristine, wilderness-dominated land, where the extreme weather and climate conditions make the human presence very sparce in number and limited in impacts (Saarinen and Varnajot 2019). In reality, the Arctic is a place of growing activity in many different sectors. Industries which rely on the extraction, modification or, in general, use of arctic natural resources are particularly crucial, since the vulnerability of Arctic ecosystems calls for a great caution in their exploitation. Social and cultural impacts are as important as the environmental ones, since the Arctic is inhabited by local and indigenous communities with unique livelihoods vulnerable to heavy environment alterations (Glomsrød et al. 2021).

The main industries selected for the ArcticHubs project are mining, fish farming, forestry and tourism. These industries have strong local environmental and social impacts, but most of them are operated by international companies that are intensifying their activity, driven by the increasing global demand for resources and arctic experiences (Bennett et al. 2021; Similä and Jokinen 2018; Keskitalo 2017). This calls for sustainable planning of their development through a glocal approach. The process of glocalization can be understood as a process that combines local adaptation and interpretation of global forces (Roudometof 2016).

The fifth, central, focus of ArcticHubs is indigenous communities, cultures and livelihood. The arctic is home to the only indigenous people living in Europe: Sami people in Sweden, Finland and Norway and Inuit people in Greenland (Eriksson 2023). Indigenous people are keeping alive traditional livelihoods like hunting, fishing and reindeer herding, which act as a material basis for the very survival of their language, culture and social spheres. These livelihoods rely on a strong connection with the environment, its resources and ecosystem services, and are facing great challenges because of the cumulative effects of the industrial sectors expanding on their lands, in addition to climate change (Ford et al. 2021; Glomsrød et al. 2021). Indigenous people can be considered particularly exposed to the cumulative pressures from different resource-intense industries, although this issue does not affect them exclusively. As a matter of fact, industries can compete with each other for resources, for example, nature-based tourism (the dominant kind of tourism in the Arctic) and mining (Similä and Jokinen 2018; Saarinen and Varnajot 2019). However, conflict is not the only possible interaction: synergies could be created as well, to combine industrial production, environmental conservation and new opportunities and services for local residents, being them indigenous or non-indigenous.

The focus of this report is on the impacts that new and existing industries have on the social, economic and cultural structure of the local communities affected by the activities. Mining, fish farming and tourism, for example, could contribute to mitigate the outmigration from rural and sparsely populated areas by providing job opportunities, increasing tax income for the municipality, expanding local business and creating new infrastructures and services. At the same time, they have a high impact on the resources (Viinamäki 2016; Hassen 2016). Mining heavily modifies landscapes and is a source of noise, air, land and water pollution; fish farming produces large volumes of waste that affects the marine ecosystem and, especially in the case of land-based plants, requires large amount of land, energy and freshwater (Bennett et al. 2021; Iversen et al. 2020b); tourism, if not restricted, can become mass tourism and lead to huge fluxes of people in localities where the local population is small, creating crowds, difficulties in waste management, environmental degradation, higher prices for accommodation and mostly seasonal jobs (Varnajot 2020). Industrial forestry is at risk of being unsustainable when it comes to biodiversity conservation and carbon sequestration. In addition to

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affecting ecosystem services that local people rely on for resources, livelihoods (reindeer herding) and recreational activities (Kivinen et al. 2010; Lidestav and Westin 2023). All these issues and others will be described in this report, through industry-specific chapters using data at national, regional and hub level and with comprehensive interpretations of the industries' impact on local societies, economies and cultures. The environmental impacts are part of the analysis too, since many of the social, cultural and economic features of Arctic communities are directly related to their environmental basis.

Consistently with the importance of these complex interaction, most of the selected localities are hubs for two or three industries and indigenous livelihoods and culture, as the following map (fig.1) shows.

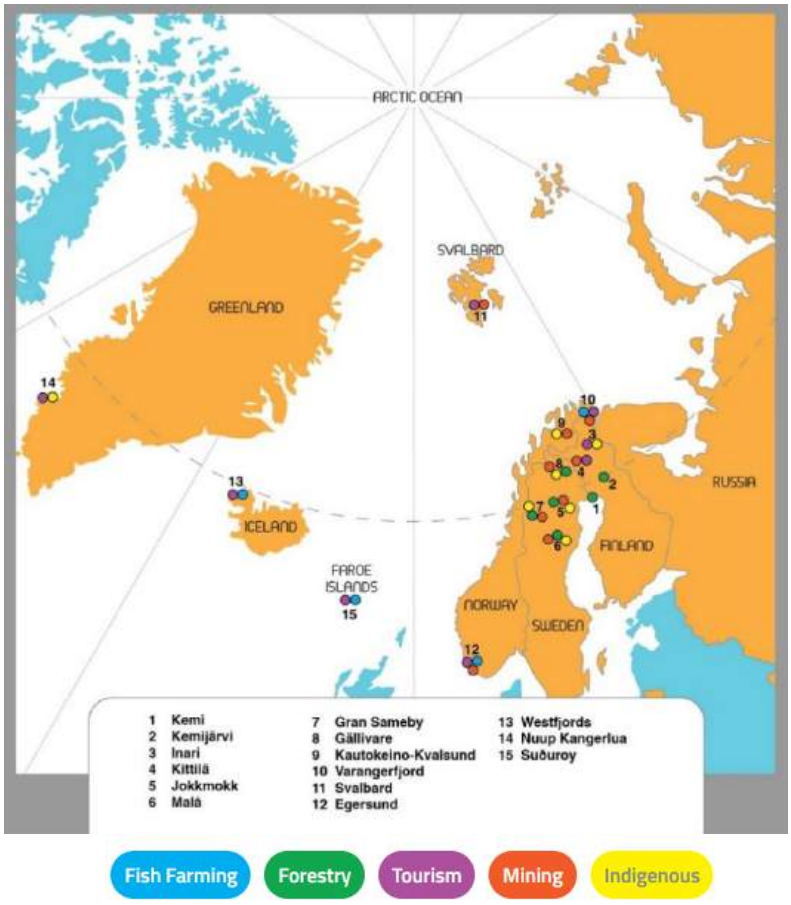

Figure 1. Overview of the hubs in Arctichubs project

This report is the Deliverable 3.2 (D3.2), output of Work Package 3 - Assessment of socioeconomic and cultural impacts. The overall objective of WP3 is to gain an understanding of effects of new and existing economic activities on local communities including indigenous societies and cultures across the Arctic and how social structures, histories and stakeholder/citizens' perceptions matter to decision-making processes, including learning from outside examples (alpine regions). In particular, this report relates to the Task 3.1 "Identification of socio-economic impacts of new and existing economic activities", with

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the objective to identify socioeconomic impacts of new and existing economic activities, i.e. a systematic review and classification of socio-economic impacts affecting the vitality of present and future economic activities in Arctic regions. Consequently, D3.2 is a "Report about context and effects of existing and new economic activities on local societies and cultures, which provides a systematic overview of effects of economic activities in the Arctic regions as basis for further examination of impacts and local perceptions on these developments".

1.1. Structure of the report

At the beginning of this report a brief introduction and description of the methods used are presented. Furthermore, results for each selected industry/activity (forestry, fishing, mining, tourism, indigenous culture) with data on socio-economics for the regional and hub level are presented. Each chapter ends with a discussion and a conclusion, where a tentative comparison is carried out to underline relevant similarities and differences between the hubs, summarizing the main features of general phenomena related to the selected industries/activities. At the end of the report the general discussion and conclusions are provided and there we hypothesise trade-offs between existing and new economic activities and how this could influence hubs.

2. METHODS

Exploratory research method

Following the DOA, this task studied the context and impact of existing and upcoming economic activities in the hubs with regards to five topical foci (fish farming, forestry, mining, indigenous culture, tourism) across the Arctic region through a comprehensive document/literature analysis and a review of regional and if existing local data.

In line with the above, we conducted an exploratory and descriptive research method to understand the context and effects of the existing and new economic activities on local societies and cultures in the Arctic region. While there are studies about the effects of economic activities in the Arctic region (see (Glomsrød et al. 2021; Nordic Council of Ministers 2014), little is known about the local contexts of the hubs that warrants further attention. Additionally, each hub analysed in this project and economic activities have immense differences that understanding them simultaneously in one study requires a flexible approach. In line with this, we followed Stebbins's (2001) exploratory research method which defined exploratory research as an "undertaking designed to maximize the discovery of generalizations leading to description and understanding of an area of social or psychological life" (ibid, 2001, p.3). These generalizations are varied and they are composed of descriptive facts, structural arrangements, social processes and systems. Accordingly, it requires flexibility in looking for data and open mindedness about where to find them. However, one doesn't know in advance whether something novel will result from the process (Stebbins 2001; Given 2008; Swedberg 2020).

In the case of the Arctichubs project, this report serves as a preliminary study about the socio-economic impacts of industries in each hub, as a base for further in-depth study of perceptions and social license to operate in the Arctic region in WP3 and other WPs. Through the result of this study, we aim to understand the context of each hub and learn the operating socio-economic mechanisms that underlies the operation and expansion of new and traditional economic activities in the Arctic.

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Data Collection

For this study, we relied on the data collection from task 3.1. baseline analyses of different industrial hubs operating in the Arctic regions using existing documents, literature and recent regional data and if existing, local data based on a comprehensive screening. We summarized our data collection in figure 2. We employed an exploratory bottom-up approach to data collection, where our project partners who are experts in their own fields and hubs provided insights of which information is available and relevant to our study. However, due to the complexity and massive amount of data, we tried to structure the data collection with a simple guide, see table 1. It should however be noted that the guide served only as a reference, and project partners did add and remove data and information, when appropriate.

Data collection was done by our partners. It was focused on the local level data, however, during the course of our data collection, we found that local hub data was difficult if not impossible to obtain, therefore we made use of regional level data if no local data can be obtained. By region we mean the country's administrative divisions e.g., Norrbotten county of Sweden. Industry data were collected from company reports and websites, however this proved to be challenging, as well as tourism operators - as a small firm, doesn't have corporate social responsibility or sustainability reports. On the one hand, as mining and forest companies are international companies, their company reports are provided for the whole company, not per region or country where they operate. Production data is also different from each industry and impossible to compare. For the indigenous people's activities, such as reindeer husbandry, there are no available statistics and we have to rely on qualitative data from articles, reports and local expertise of our partners, as well as their personal knowledge (as some are members of indigenous communities). Country

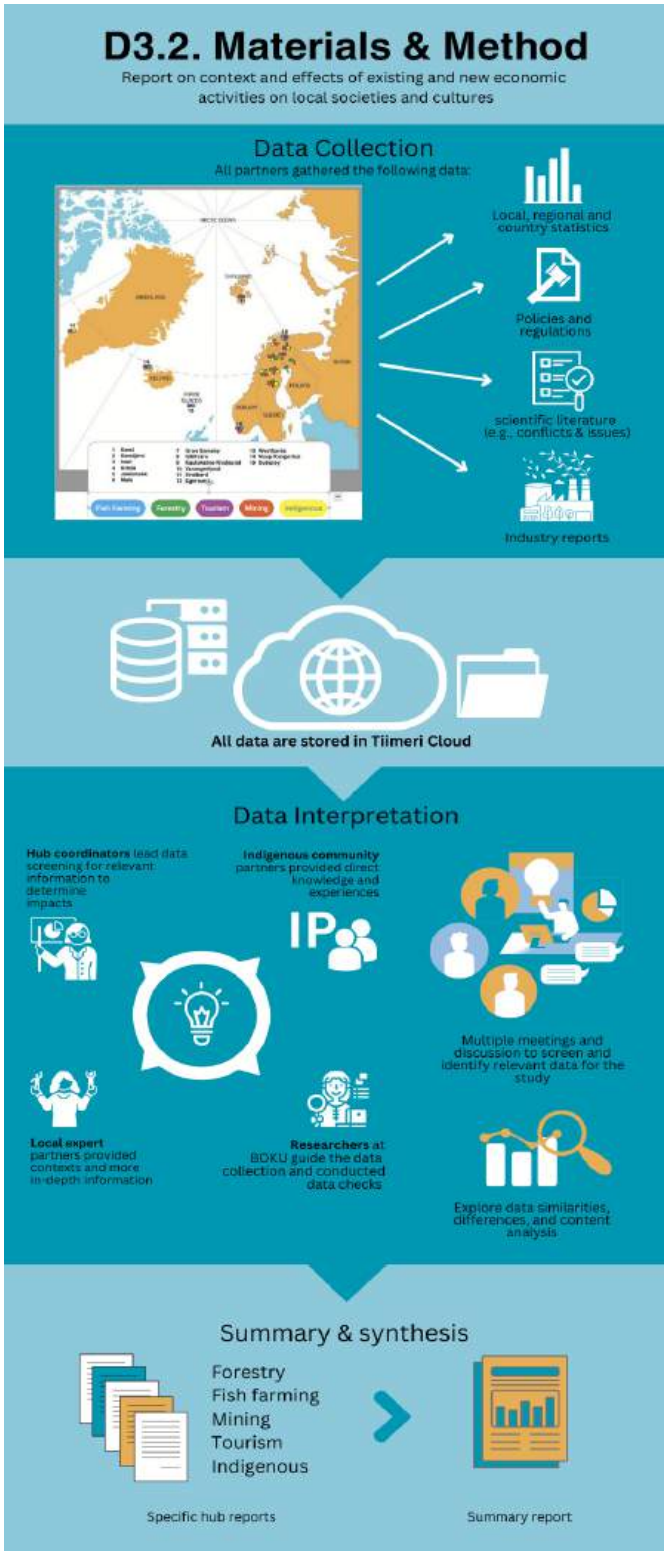

Figure 2. Summary of D3.2 data collection and synthesis

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level data was used only if there are no other available data, so as to have an overview of the socio-economic status of the country. Existing policies and regulations that impacts the operation of the industries, local community and indigenous people were also taken in consideration. Lastly, we made clear in the data collection guide to take note of missing data, and which ones are important to look at to determine industry impacts.

Table 1. Simple data collection guide of relevant data per hub and industry

Level	**Data**	**Source**
Local/regional	Population structure, education, economy, society and culture Issues and conflicts	Statistics database, official reports, articles, grey literature
Indigenous activity (reindeer husbandry)	Population, livelihood, language, traditional knowledge, culture, governance Issues and conflicts	Studies, reports and local expertise
Industry (firms or organization)	Production, trade, employment, revenue and other industry relevant data to determine contribution to the community, region or state Issues and conflicts	CSR reports, sustainability reports, company websites, articles,
Country	Demography, economy, society and culture Policies, regulations	Official country reports, Laws and policies

Data collection has been shared among all the consortium partners, relying on their expert knowledge as researchers, practitioners, and members of the communities involved in the hubs. A hub leader for each activity (forestry, fishing, mining, tourism, indigenous culture) has been selected, and they have coordinated collection of the data for this specific hub. Multiple online meetings were conducted to discuss relevant data, sources and scientific literature, including their interpretation, local relevance and validity. Data and sources have been stored in the Tiimeri platform (Luke`s data safe cloud), in order to be constantly available to every partner for control and coordination. Data checks were conducted by BOKU team who produced final outputs for this task

Data interpretation

The result of the data collection was an accumulation of statistics, maps, graphs, tables, studies, stories, histories and local knowledge. In case of the indigenous hubs, we also used direct knowledge and experience of our partners who belong to indigenous communities, and who could explain and provide qualitative information on some aspects which were hard to obtain in statistics and literature.

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Following an exploratory research method, it was crucial that all provided data was screened to make sense of the relations among variables, types, frequencies and magnitudes in structures, processes and consequences (Stebbins 2001; Creswell and Poth 2018). However, to effectively do so, expertise was needed. Therefore, we relied on each hub leader to conduct a preliminary read through of the data to determine which ones are relevant to the study. Based from their expert judgement and selection of relevant data to build a logical chain of evidence to describe the socio-economic effects of industries, a synthesis report was developed. The writing process was shared with all the members of the consortium to add their interpretation and provide in-depth information on the hubs. All the data and reports has been made available for all the other partners through the Tiimeri platform. All the partners have been periodically updated about the progresses through emails and meetings. The task resulted to five detailed hub related reports and one summary report where all the main characteristics reported in the detailed hubs were summarized and synthesized.

Limitations

The methods have, however, two main limitations: scarce data availability and inconsistency of the available data. Indeed, even if the territorial focus of this report is on the local, hub-level data are often not-existing or are of limited quality. To fill the gap as much as possible, national and regional-level data have been included: beside giving some insights about the wider socio-economic context, they can sometimes offer estimations of the phenomena on local dimension. Regarding inconsistency, the main problem has been to find comparable data between hubs, as data defer in terms of the level, periods and scales. Due to both the very different context of each hub and the difference in data collection methodologies, this has rarely been possible. However, in the final section of each industry-specific chapter, a tentative comparison was carried out, to underline relevant similarities and differences and to grasp the main features of general Arctic socio-economic phenomena related to the selected industries. Furthermore, a third issue is related to the quantitative nature of the majority of the collected data: since the complexity of socio-economic and cultural issues, qualitative and primary data are necessary to allow for a comprehensive interpretation of the effects that industries have on the selected localities. This is, nonetheless, beyond the scope of the present report: deeper analysis will be conducted in the next steps of the work package 3, which will look more in-depth in the perceptions of local people and different stakeholders, and later on in the work package 5 that will focus on future prospects and scenarios in hubs and Arctic region at large.

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3. FORESTRY

In this chapter, we focus on the forestry industry in the Arctic, particularly the six forestry hubs from two Arctic countries, Sweden and Finland, and two learning hubs from Austria. This will provide a summary of some of the key characteristics to analyze the socio-economic impacts of forest industry in the Arctic.

The detailed forest industry report is attached as Annex 1 to this report.

3.1. Overview of the forest hubs in the Arctic European countries (regional level)

Socio-economic. The forest hubs are located in the two regions of Sweden namely, Norrbotten County and Västerbotten. The Norrbotten County have 251,000 inhabitants which implies a population density of 2.6 inh/km2. Similar to Västerbotten, with 275,000 inhabitants and population density of 5.0 inh/km2, the population, is concentrated to the coastal municipalities. The administrative centers (Luleå) and university towns (Umeå), has both experienced a population growth and have a comparatively favorable population structure (Statistics Sweden 2023).

Norrbotten County previously had a clearly higher unemployment rate than the average for Sweden. Since 2010, however, unemployment in Norrbotten County has decreased and in 2021 was among the lowest recorded in the country. Today, the employment rate is increasing, but still below the national average. The gross regional product (GDP) per inhabitant in Norrbotten County is the second highest in the country after Stockholm County. The willingness to grow in small businesses in the county is slightly above the national average. The total export value of goods from Norrbotten in 2022 was 47.4 billion SEK, which makes Norrbotten with the highest export value of goods per inhabitant (SEK 190,000.) Also, the value of goods exports has increased from 2016 to 2020 by as much as 50 percent compared with 20 percent for the country as a whole. In comparison, the export value of goods from Västerbotten, 27.4 billion SEK in 2020, implying a value per inhabitant of 100.000 SEK, and the increase by 26%. In terms of unemployment, it is 5.7 percent, which is clearly below the national average (Tillväxtverket 2021b, 2021a).

The forest hubs in Finland are located in Lapland County which has 176,000 inhabitants or a population density of 1.9 inh/km2. The administrative center is Rovaniemi, with a population of 64 000 inhabitants and a university. The population in Rovaniemi has grown, but the number of inhabitants in the Lapland County has decreased over the last three decades (from 1993 to 2021) – from 203 000 to 176 000. (Statistics Finland 2023). Further, unemployment in Lapland County decreased by 24 % in April 2021, and in April 2022 it was 10.5 % of the available labour which is slightly above the national average (9.1 %). Also, the number of open positions has increased to 65 % from April 2021 to April 2022 (Ministry of Economic Affairs and Employment in Finland 2022) .

Forest industry. Forest is an essential landscape element of the regions in Sweden (73% of the land area of Västerbotten and 59% of the land area in Norrbotten), and with a total forest coverage of 18.7 M hectares which also represents a variety of goods and services for local people and industries operating in the European Artic. The so-called productive forest land, i.e. where forestry is considered possible in accordance with Finnish and Swedish forestry legislation, comprises 12 M hectares (64% of the forested area). However, some 1.6 M hectare (13%) are formally protected, and 0.3 M hectare are voluntary set-asides (Swedish Forest Agency 2015). Meanwhile, 10.5 million hectares are currently available for forestry operations (56% of the forest cover area, and 85% of the productive forest land).

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The annual timber growth on the entire productive forestland is estimated around 34 M cu.m., whereof 19 M cu.m. (56%) is currently harvested, see figure 2. However, there are significant differences in harvesting intensity within the region (Swedish Forest Agency 2015; Länsstyrelsen Västerbotten et al. 2020; Länsstyrelsen Norrbotten 2020).

In Finnish Lapland, only 40% of the annual timber growth is harvested, and the cuttings are currently at the same level as previously (Luonnonvarakeskus 2021). In contrast, the harvestings in Västerbotten (Sweden) are rising from an already comparatively high level, meaning that the current situation corresponds to the Forest Impact Assessment 2015 (FAO 2016) scenario Business as Usual + 110% (refer to Annex Forestry report: Table 4). The situation in Norrbotten is somewhat in-between, with about 50% of annual timber growth, which is even less than the assessment for the scenario of "Double nature conservation provisions".

As part of the bioeconomy, about two thirds of the total value added came from the value chain begins from forestry. The timber provides raw material for sawmills and pulp and paper mills. Aside from this, the products and residuals are used as inputs for other industrial production such as fiber board, gas, liquids and source for electricity and heat production. The products that are created from sawmills are important for the wood industry and in the manufacture of furniture, infrastructure and buildings (Swedish Forest Agency 2015; Länsstyrelsen Västerbotten et al. 2020; Luonnonvarakeskus 2021).

Relative to ownership, public ownership dominates in Norrbotten and Lapland while non-industrial private ownership (NIPF) and private companies are the major landowners in Västerbotten. Specifically, there are around 41, 000 NIPF owners in Västerbotten and Norrbotten and about 50, 300 in Lapland (Länsstyrelsen Norrbotten 2020; Länsstyrelsen Västerbotten et al. 2020) (tab.1).

Table 2. Regional overview of forest industry in Lapland, Norrbotten and Västerbotten

	Lapland (FI)******	**Norrbotten (SE)**	**Västerbotten (SE)**
Forest area cover	9.1 M ha, whereof 4.9 M ha productive forest land	5.7 M ha, 59% of land area. Whereof 3.9 productive forest land*	4.0 M ha, 73% whereof 3.2 M ha productive forest land *
Annual growth rate (productive forest land)	1.7 cu.m./ha/year. Total 11.4 M cu.m./year	2.5 cu.m.sk/ha (11 M cu.m.sk)**	3.5 cu.m.sk/ha. Total 12 M cu.m.sk**
Cuttings	4.5 M cu.m./year in year 2020 to be compared with 4.9 M cu.m./year as an average for 1985-2020	5.5 M cu.m.sk/year as an average for 2017-2019 to be compared with 4.7 M cu.m.sk/yr as an average for 2009-2007.***	9.0 M cu.m.sk/yrs as a mean for 2017-2019 which increas of 2.7 M cu.m.sk/yr since 2007-2009. ***
Protected area	1.8 M ha on productive and poorly productive forest land, i.e. 27,6%. Respectively 17.1% of productive forest land protected.	1.1 M ha whereof 0.6 M ha on productive forest land, i.e. 23.2% respectively 16.5%. Additionally, 163.000 ha voluntary set asides***	0.4 M ha whereof 0.2 on productive forest land i.e 10.5% respectively 6.3%. Additionally, 146.000 ha voluntary set asides***
Ownership	Public 70%, NIPF 25%, Private companies 2%, others 4%	Public 54%, NIPF 29%, Private companies 9% , others 8%***	40% NIPF, 31% Public, 23% Private Companies, 5% Others ***
Total industry revenue	1.3 billion EUR. Value added 0.2 billion EUR.	Total net turn over 23.2 billion SEK whereof 4.0 billion from forestry, 6.4 Billion SEK from 6.4 from wood processing (sawmills etc) and 12.8 Billion from pulp and paper industry. Total value	Export value of forestry and wood processing is estimated to 12 billion SEK *****Wood processing industries - Turn over 8.5 billion SEK

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		added 7.8 Billion SEK (~ 5% of the GRP) 2.1 Billion SEK from forestry and 1.5 from wood processing, and 4.2 Billion SEK from pulp and paper industry.**	
Employment	In total 3500, whereof forestry 1800 persons, industry 1000 persons and saw wood industry 700	Forestry; 2717 persons, whereof 78% men. Industry: 2905 persons whereof 84% men **	Forestry 1140 annual work. Industry 2550 whereof 79% men
Number of enterprises	10 wood processing companies whereof 1 pulp- and papermill and 5 major saw wood companies	173 forestry companies ****, 62 wood processing industries whereof 2 papermills	244 forestry companies ****, 230 wood processing companies in total whereof 116 joint-stock-companies (AB), incl 1 papermill *

* Statistics Sweden 2019 Land Use in Sweden 2015, 7th ed.
** Eriksson and Lundmark 2020 Skogsnäringen i Norrbotten fram till och med 2030
*** Skogsstyrelsen 2020 Statistik Databas
**** Statistics Sweden 2022 Regionala branschnyckeltal efter näringsgren
***** Länsstyrelsen Västerbotten et al. 2020
****** Luonnonvarakeskus 2021 Finnish Statistical Yearbook of Forestry 2021

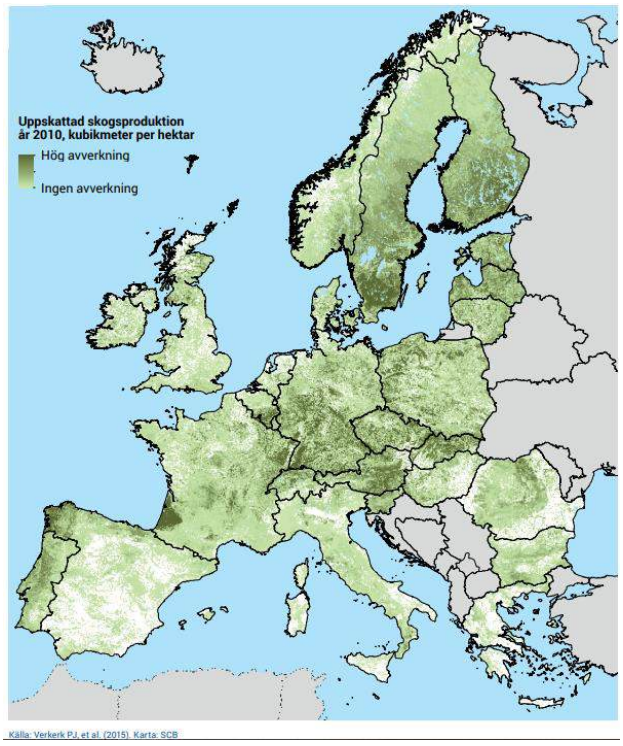

Figure 2. Forest production cu.m./hectare, the darker green the higher production, 2010

For more than a century, forestry and the associated industry plays an important role in Northern Sweden and Northern Finland. It also constitutes an integral part of the national economy. Table 4 summarizes the forest/ forest industry in Lapland, Norrbotten and Västerbotten.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 869580.

Table 3. Forestry/Forest industry in Lapland, Norrbotten and Västerbotten

	Lapland (FI)******	Norrbotten (SE)	Västerbotten (SE)
Forest land used for timber production, hectares	4.0 million hectares	3.1 M hectares	2.8 million hectares*
Income/sales		330 SEK/cu.m.fub (Gross value) **	330 SEK/cu.m.fub (Gross value) **
Production output		5.5 M cu.m.sk	9,0 M cu.m.sk, whereof 63% in final felling and 25% in thinning ***
production input (silviculture)		soil preparation +planting +cleaning 10041 SEK/ha **	soil preparation +planting +cleaning 10041 SEK/ha **
Operating costs		Final felling 110 SEK/cu.m., thinning 203 SEK/cu.m., Road transport 85 SEK/cu.m.**	Final felling 110 SEK/cu.m., thinning 203 SEK/cu.m., Road transport 85 SEK/cu.m.**
Products		saw logs, pulpwood, fuelwood (GROT)	saw logs, pulpwood, fuelwood (GROT)
Production output	4.5 M cu.m., whereof 1,2 M cu.m. of saw logs, 3.1 M cu.m. pulpwood and 0.3 M cu.m. energy wood	3.5 M cu.m. sawlogs *****	3.7 million cu.m. sawlogs, 3.1 million cu.m. pulpwood, 0.5 cu.m. biofuel**
Production input (wood)		4.5 M cu.m.fub	7.4 million cu.m.fub*
Products			1.75 million cu.m. planks and boards *
No of mills	The major production units are 5 sawmills, 1 pulp mill	The major production units are 2 pulp mills and 5 sawmills	The major production units are 8 sawmills, 1 pole factory, 1 pulp mill *
Employment structure (age, sex, etc)		Forestry; 2717 persons, whereof 78% men. Industry: 2905 persons whereof 84% men *****	In total 4900 whereof 1140 in forestry operations, 1200 in forest technology and 2,550 in wood-based manufacturing industry is 2,550. The largest the proportion of these, 1,305 people, work at sawmills and planers. The largest employers in the county is Martinsons with 467 employees and SCA's saw in Rundvik with 120 employees ***
Income, saw mills			3, 000 - 4,000 million SEK*
Income, other processing industry			3,000 million SEK *

* Roslund 2021 Skogsprogrammet Västerbotten.
** Skogsstyrelsen 2020
*** Barsk 2020 . Västerbottens regionala skogsprogram.
**** Brännström 2021 Skogsprogram Västerbotten
***** Eriksson and Lundmark 2020
*** Länsstyrelsen Norrbotten 2020

Since the 1950s, rotation forestry dominated by even-aged coniferous stands has become the dominating practice in Sweden. However, forestry has a profound effect on forest and landscape configuration and conditions and consequently on reindeer husbandry (Swedish Forest Agency 2015).

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Similarly, in Northern Finland, the conflicts between forestry and reindeer husbandry have been prevailing issues for more than a century due to the overlapping land use practices (Luonnonvarakeskus 2021). Commercial forestry affects reindeer husbandry in a number of ways. Negative impacts on the ground lichen resource have been documented over the last 60 years. Largescale logging, intensive reforestation efforts and fire suppression have resulted in a decline in old, open pine-dominated, post-fire successional stands on low productive sites which are important habitats for ground lichens (Sandström et al. 2016; Kivinen et al. 2010). Such stands have instead been replaced by dense, managed forests that favour mosses at the expense of lichens. The introduction of lodgepole pine and fertilization also had a negative effect on ground lichens. Furthermore, damage by soil scarification causes substantial decreases in both the cover and biomass of ground lichens. Clear-cut forestry also has negative consequences for arboreal lichen which are especially important to reindeer during winters with difficult snow conditions (Esseen et al. 1996; Horstkotte et al. 2023).

3.2. Forestry hubs

3.2.1. Kemi, Lapland, Finland

Kemi is a small town that used to have two large pulp mills, and one sawmill until 2021 when Stora Enso company closed their pulp and paper mill. The Stora Enso's Veitsiluoto sawmill continues the production (Kemi 2021). At present Metsä Group pulp- or bioproduct mill is the main operator in the Kemi forestry hub, and when the new pulp mill will be ready to replace the old one in 2023, Kemi will have one of the largest mills in Europe (Metsä Fibre 2020). The current use of approximately 3,1 million cubic meters of wood, will then be add another 4,5 million cubic meters to its wood-use. Upon the expansion of the mill, the total amount of wood-use will be 7,6 million cubic meters per year, mainly pine. Although the closing of pulp- and papermill reduced the annual wood-use in Kemi hub about 2 million cubic meters, the total wood-use will, however, increase about 2,5 million cubic meters as a sum of the abovementioned changes. At the same time, Chinese company Camce is planning to construct a pulp mill in Kemijärvi, about 200 km away from Kemi. These new pulp mills added together with the existing pulp mills and sawmills have raised concerns about sustainability of the wood use in Northern Finland. This will lead to demand of wood from nearby areas, mainly Sweden and Russia, but also import from overseas areas, mainly Southern America (Metsä Fibre 2/11/2021).

The timber procurement area of Metsä Group mill is large, and wood is already delivered there from whole Finnish Lapland (Fig.3). A share of wood comes from Sweden, and a smaller proportion of wood is shipped to Kemi from the Baltic Sea area. It has been estimated that about 1-1,2 million cubic meters of wood would in future be purchased from Sweden. In general, after the changes (+4,5 and – 2 million cubic meters per year) the wood supply in Lapland will be close to the maximum availability after the new mill starts since the latest estimate of annual growth was 12,2 million cubic meters, which is about 4,1 million cubic meters larger than the sum of loggings and natural removal between years 2015-2018 (Metsä 2020).

The Metsä Group Kemi mill's timber procurement area overlaps with Stora Enso Oulu board mill procurement area. Oulu mill was shifted from pulp and paper as a board mill in 2021. It led to increase in capacity of wood-use by 0,5 million cubic meters per year to 2,4 million cubic meters. Furthermore, the company is planning to construct a second unit in Oulu by2025. The effect on the annual wood-use is not yet published, but some estimates indicates that approximately 1 million cubic meters increase in the annual wood-use. Also, the sawmill company Junnikkala has made an investment

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decision to Oulu. Their new sawmill unit would start in 2023, and it would use annually 0,8 million cubic meters of pine and spruce sawlogs. This might affect the timber procurement area of Stora Enso Veitsiluoto sawmill, which has other competing sawlog users e.g. in Tervola (Tervolan Saha ja Höyläämö and Veljekset Vaara). The Metsä Group Kemi mill has been estimated to employ about 2500 workers in the whole value chain and to maintain the present 250 direct jobs within the mill (Tiihonen et al. 2021). Today Kemi hub has significant effects on the whole Lapland's employment, but in the near future it's role will still grow.

Forestry has several competing interests with other land-use forms within the Kemi hub area. The majority of wood procurement area overlaps with reindeer herding area. In Lapland also the role of tourism, hunting and gathering of natural products is more pronounced than in other parts of Finland. Forestry has competing interests with all of those.

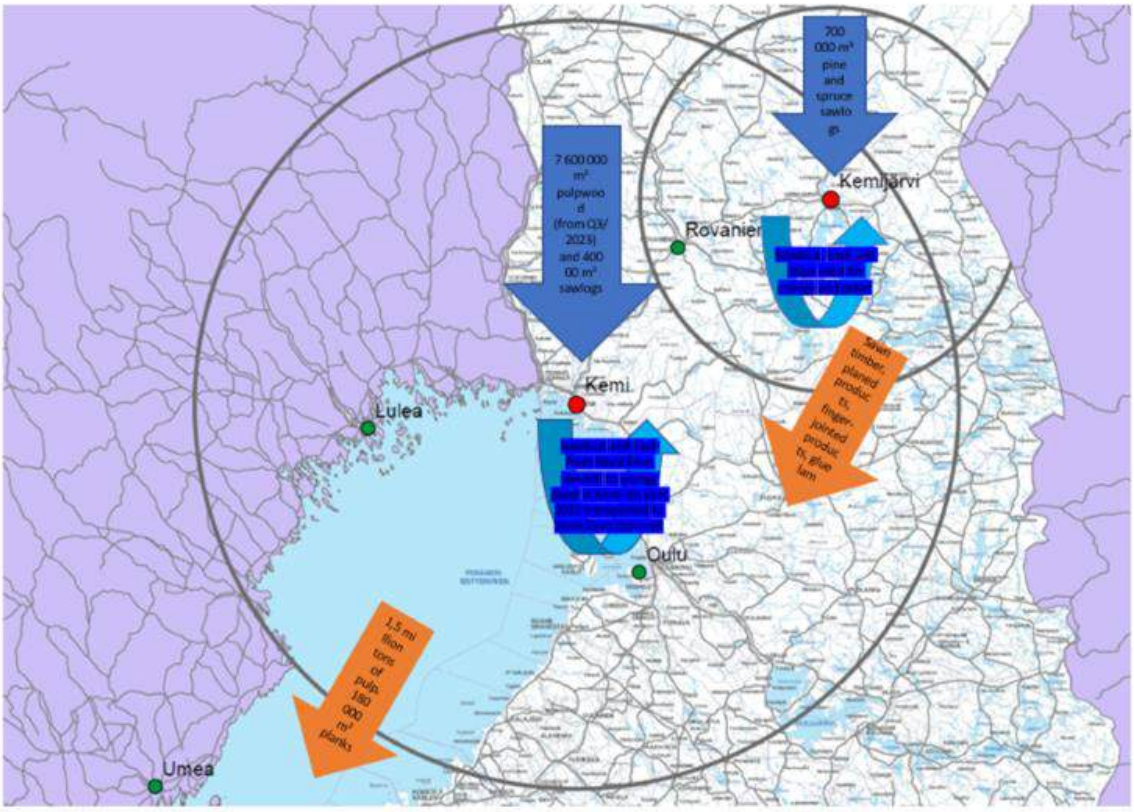

Figure 3. Comprehensive description of the current flow of timber resource flow in the Kemi hub (July 2022, by authors of the forestry report)

3.2.2. Kemijärvi, Lapland, Finland

Kemijärvi is the northernmost town in Lapland that has during the past 15 years faced large socio-economical changes due to globalization (Nyseth and Granås 2007). In 2008, Stora Enso closed a large pulp mill in Kemijärvi and sold the factory to Canada. Currently, Chinese company Camce is planning to construct a pulp mill on the location of Stora Enso pulp mill. Similarly, the pulp mill in Kemi and Kemijärvi has raised concerns about the sustainability of wood use in Lapland.

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In Kemijärvi forestry hub, the main operator is Keitele Group, which started in 2014. The annual wood-use in Keitele Group sawmill is about 700 000 cubic meters of pine and spruce sawlogs and the mill employs about 120 workers. Their products consist of sawn timber, planed products, finger-jointed structural products, gluelam and side products. In addition, the silviculture, logging and timber transport employs people within the procurement area (Keitele Group 2022). Direct statistics for the Kemijärvi hub are not available, but for example in the new Metsä Group sawmill in Rauma, which uses 1.5 million cubic meters of timber, the additional employment has been estimated as 500 persons (Korpelainen 2022). Based on that, the respective additional employment for the 700 000 cubic meters would be 200 – 300 in Kemijärvi.

Forestry has significant competing interests with reindeer herding, tourism, hunting and gathering of natural products also in Kemijärvi forestry hub and its wood procurement area. The amount of used wood is smaller in Kemijärvi hub than in Kemi hub, but the wood procurement area overlaps completely with the reindeer herding area. Also, the role of tourism, hunting and gathering of is even more pronounced in Kemijärvi hub area since it can be characterized as more rural area than Kemi hub area.

3.2.3. Jokkmokk, Norrbotten, Sweden

The small town of Jokkmokk, and the entire municipality, is one of the most prominent places for Sámi culture. Thus, the hub is foremost defined by the indigenous traditional land use, that includes reindeer husbandry, hunting and fishing, which largely take place in the forested landscape of 765,000 hectares. Young Sámi from the whole of Sápmi go to Jokkmokk for education. It also has the principal museum of Sami culture Ájtte, that is an information centre for mountain tourism. Jokkmokk is also the meeting place for several Sámi reindeer herding communities (RHC, sameby in Swedish) and located in the heart of their wintering areas (Sami Parliament 2024).

Forestry has a long history in the area and today some 500 000 hectares are available for harvesting, while the remaining 265 000 are formally protected, i.e. 35% of the forests are formally protected. Yet, forestry is by most reindeer herding communities considered as the most impending threat to reindeer husbandry (Sandström et al. 2016). Improved and innovative forest activities to reduce loss of landscape connectivity as well as ground and pendulous lichen rich forests is much needed (Horstkotte et al. 2023). Such goals can be achieved through improved participatory dialogue between reindeer husbandry and forestry. Today, there are no active mines in the Jokkmokk area. There is however, a long-time, ongoing dialogue and conflict around the establishment of the Kallak mine.

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Figure 4. The Jokkmokk hub area with forest land in dark green, nature reserves light green, national parks light blue and biotope protection yellow. Municipality border in red

Figure 5. The reindeer herding communities residing/operating in the Jokkmokk hub; Sirges, Jåhkågaska, and Tuorpon.

In the Jokkmokk hub (the same as Jokkmokk miúnicipaliy/municipality), there is no wood processing industry, meaning that most of the harvested timber is transported out of the municipality. The annual harvesting on any forest land in Jokkmokk is around 700,000 cu.m.sk, whereof some 42,000 cu.m.sk are used locally for fuelwood, while 658,000 cu.m.sk (548,000 cu.m.fub) is transported out of the hub. To carry out this forestry work 96 persons are employed (82% men) according to Eriksson & Lundmark (2020). In comparison, 92 persons are employed in reindeer husbandry (85% men).

Thus, from a hub perspective, it is the forest land/forest properties that represent the main value locally which in turn can be made up by different assessment criteria and components. Typically, it is the market value that is presented, and the most current statistics on market prices (Lesprom Network 2023) shows that in the north of Sweden, the prices per hectare is increasing more that price per cubic meter. To what extent the market prices also covers the other values that forest owners put on their forestland it's hard to tell. However, research shows that in the timber production values are only a part of the total value assessment that forest owners put on their land and ownership (see e.g., Westin

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et al. 2017; Lidestav and Nordfjell 2005) to most Swedish forest owners, the economic values of the property and the ownership (timber, leasing hunting rights, capital assets) are considered less important than the social values (recreation, health, cultural values, etc.) while environmental values (preserving plants and animals, good water quality, carbon storage falls in-between (Lidestav and Westin 2023).

The forest landscape in Jokkmokk has for several years been the scene for controversies between different land use interests, primarily forestry, reindeer husbandry and conservation. These interests are to a varying extent supported by policies at different levels and strength, and the local advocates for the various interests have also been more or less successful in networking with organizations beyond the municipality.

3.2.4. Malå, Västerbotten, Sweden

Malå forestry hub, represents a complex land-use situation where mining, wind power developments, and infrastructure projects overlap with the land use needs of Sami reindeer husbandry (Johnson 2020). From the forest industry perspective, the hub is defined by the sawmill situated in the town of Malå and its timber procurement area. At present, the timber procurement area comprised the forest land within a radius of 100 km from the core, i.e., the sawmill, meaning that the forestry hub stretches beyond the municipality boarders. In the area Sveaskog AB is the major forest owner (about 60% of the productive forest land) while 37% is owned by non-industrial private forest owners. Since the establishment in 1946, the sawmill has been an important employer in Malå municipality, and as one of the larger and prospering industries in Malå, also an important actor and partner in the local business network. The owners of the sawmill Setra AB, are planning for major investments in this industrial unit, which will imply that the production will double from 170,000 cu.m. sawn goods 340,000 cu.m., which requires that the volume saw logs increases from about 340,000 cu.m.fub (about 410,000 cu.m.sk) to 680,000 cu.m.fub saw logs (820, 000 cu.m.sk) (Länsstyrelsen Västerbotten et al. 2020).

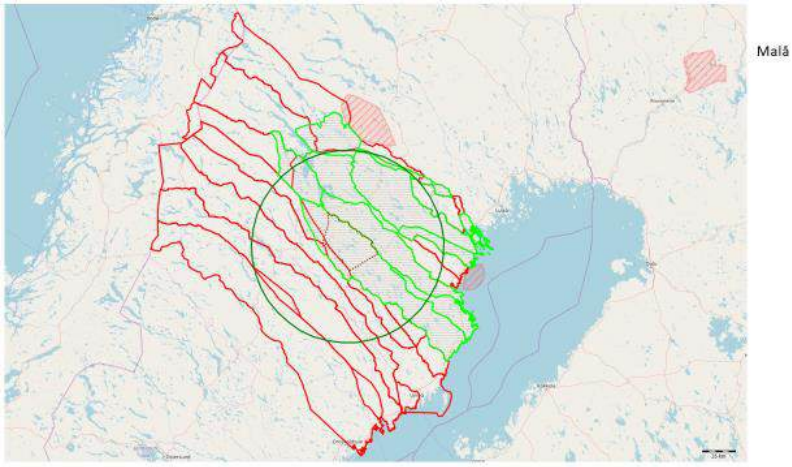

Figure 6. The reindeer herding communities residing/operating in the Malå hub; Ståkke, Östra Kikkejaure, Västra Kikkejaure, Mausjaur, Maskaure, Malå (forest RHCs) and Luokta-Mávas, Semisjaur-Njarg, Svaipa, Gran, Ran, Ubmeje tjeälddie, Vapsten, Vilhelmina norra (mountain RHCs)

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Mining activities in the Kristineberg mine began in the late 1930s, where Boliden AB extracts zinc, copper, gold and silver. The ore is transported by truck from the mine site to the coastal processing plant in Rönnskär (Boliden 2021). Malå RHC use the area all year, but also in direct connection with winter lands of Gran RHC. None of the RHCs are "completely" within the timber procurement area, but all the forest RHCs are for the most part within this, with the exception of Ståkke in the far north. Gran, Ran, Ubmeje and Vapsten RHCs cross the timber procurement area, the other mountain Sami RHCs only overlap with this (Sami Parliament 2024). This complex land-use situation calls for innovative participatory tools to provide an effective and inclusive dialogue in search of solutions.

The forestry value chain in the Malå hub consists of timber production (i.e., silviculture and harvesting operations within the 100 km radius of the Setra Maå sawmill meaning that the procurement area stretches beyond Malå municipality and into the municipalities of Norsjö, Lycksele, Storuman, Sorsele, Arvidsjaur and Arjeplog (Norra Skog 2022). Meanwhile, it can be said that 1/3 of the circle falls into the Västerbotten coastal area (ACK), 1/3 in Västerbotten Lapland (ACL) and 1/3 in Norrbotten Lapland (BDL). Out of the total hub area of 3,14 million hectares, 69% is forest land, whereof 5% is formally protected. The area available for forestry in the hub is around 2 073 000 hectares, while the area of forest land available for forestry in the ACL/ACK/BDL region is about 3 913 000 hectares (FAO 2016). Estimates on the current use of the timber resource that the Malå hub represent 53% of the timber production of the growth and production areas of ACK, ACL and BDL). Furthermore, it is assumed that each of the sub-areas contributes 1/3 each to the timber supply of the sawmill (Länsstyrelsen Norrbotten 2020; Länsstyrelsen Västerbotten et al. 2020).

Based from the Forest Impact Assessment 2015 (FAO 2016) scenario Business As Usual, the potential timber harvest by assortments has been estimated for the Malå hub area at present and for several decades ahead. For the current period (2020-2029) almost 4.7 M cu.m.fub can potentially be harvested whereof 1,400 thousand cu.m.fub as sawlogs of pine, i.e., the principal assortment for the sawmill in Malå. Most of these sawlogs (84%) originates from final felling according to our estimates, compared to 20% for the harvested volumes in total (refer to Annex Forestry report: Table 4).

The timber supply to Setra Malå sawmill involves 340.000 cu.m.fub (410.000 cu.m.sk) pinewood logs that are harvested and transported to the sawmill, while a similar amount of pulpwood logs from pine trees are sold and transported to the pulp mills along the coast (Setra 2021). Other assortments (spruce logs and broadleaf logs that harvested in the same operations as the pine logs are delivered to other industries in the region. There are 80 persons employed in harvesting, silvicultural operations and road transportation (Setra 2022).

At the sawmill 75 people are employed, whereof 74 % men and 26% women (mean age 44 yrs). The turnover in 2021 was 430 million SEK. The logs are processed to 170,000 cu.m. planks and boards whereof 20-25% is planned. 32.200 cu.m. planks and boards, and 9 200 cu.m. further refined products goes to Swedish costomers, whereof 21.000 cu.m. respectively 9.200 cu.m. to customers in Västerbotten. 91.000 cu.m. pulpwood chips, 70.000 cu.m. sawdust and 8.000cu.m. bark (Setra 2022).

The sawdust and bark are then sold to the nearby heat and powerplant owned by Skellefte kraft, who produces 72 000 MWh, wherof 75% delivered to Malå sawmill and 25% to the district heating grid (32.2 km) with 239 connections (Setra 2022).

The wood industry company Setra plans to apply for a new operating license for its production at the unit in Malå. The expanded permit enables a doubled production of wood products as well as an

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expansion of the existing processing operations and production of biofuel products. Meanwhile, doubling the production volume from 210,000 cu.m. to 500,000 cu.m. Setra is also considering increasing the processing operations of wood products and developing biofuel fractions. Thus, the energy supply and storage possibilities also need to be reviewed (Setra 2022).

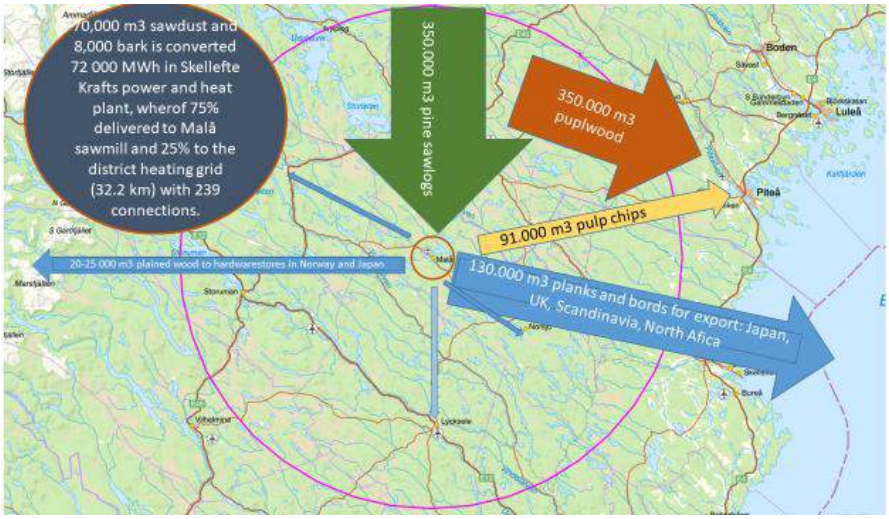

Figure 7. Comprehensive description of the current flow of timber resource flow in the Malå hub (May 2022)

Within the procurement area of the Malå hub, there are 15 RHCs facing similar experiences as Malå and Gran RHCs in terms of balancing competing land use interests with ongoing and expanding forestry interests. Considering the expansion of the Setra sawmill, in combination to other planned and commenced expansions of processing industries in the surrounding region (Holmen sawmills in Bygdsiljum and Kroksjön, and the SCA papermill in Obbola), which indicates increase in harvesting volumes and impacted areas. Further, there is also another sawmill within the Setra mill procurement area, Glommers Timber AB, also specialized on pine timber. At present, they process some 140,000 cu.m. (Setra 2022). Thus, it can be assumed that they represent a competing interest. This will likely impact not only on the competition of timber assortments and the timber price, but also on the conditions for reindeer husbandry. For Malå forest RHC, this expansion and intensification of forestry will have significant impacts.

3.2.5. Gran reindeer herding community, Västerbotten, Sweden

Gran sameby is the name of the reindeer herding community (RHC) in which the territory stretches from the Bothnia Bay all the way into Norway (Figure 8) based on rights laid down in Lappecodicillen in 1751. RHC is a special legal entity specific for the purpose of managing the rights and obligations involved with reindeer husbandry (Sami Parliament 2024). Gran is a mountain reindeer herding community which is characterized by long seasonal migrations. Summers are spent in the high mountains in Norway and Sweden and winters in the forests all the way to the Gulf of Bothnia. The all year around land is located in Vindelfjällens Nature reserve and are thus, protected from exploitation by forestry and mining. However, most of the forest land is also used for commercial forestry. In total, the forest cover of the Gran territory is 256,600 hectares whereof 10% is formally protected (nature reserves etc.). On this land, seven reindeer herding families with approximately 50 members and a maximum of 7000 reindeer in the culled herd makes a living (Länsstylrelsen n.d.).

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Figure 8. Gran Sameby hub with forest land in dark green, nature reserves light green, national parks light blue and biotope protection yellow.

Even though Gran is a mountain RHC, the importance of the forest can be found in the word used for being/working with the reindeer – you are in “renskogen”, which literally translates to ”reindeer forest”. The forest surrounding the high mountains consists mainly of birch, small and very crooked trees. These bent trees are used to build the frame of the traditional kåta (traditional sami dwelling), which are then covered with bark from the birch and peat. Vrilar from birch are used to make cups for drinking and traditionally for bigger bowls for milking the reindeer. The reindeer feed on birch leaves often before there is anything to eat on the ground out west. The “bottle neck” is winter. The grazing possible in the forests cap the size of the herd for Gran. Reindeer do not really put on weight during winter, they are in survival mode. They have to build up their reserves during autumn. A crucial part is that they feed on mushrooms in the forests close to high mountains. Winter is long and cold and most are gestating. But there are roads, railroads, windmills, hunters, dogs, snowmobiles, skiers, in short, lots of other people getting on with their lives and earning their living. Reindeer also migrate between areas in the winter, since they of course step on the snow as they walk and harden it. Areas once used cannot be used again that winter, they will not find peace on trampled snow (Länsstylrelsen n.d.).

Different forestry methods and different phases of forestry strongly affect the behaviour and the well-being of the reindeer. It is important to emphasize that for a reindeer herder, this is almost equivalent to his or her own well-being. Reindeer herding is not a job. It is a culture; it is a way of living and a quite heavy responsibility of the few that stay on. Suffering reindeer means suffering communities, at a core level (OECD 2019; Swedish Forest Agency 2015). Working every day for months on end in a forest that is destroyed from the perspective of a reindeer (perhaps for the rest of that reindeer herder’s lifetime) takes a heavy toll. Much attention has been on old forests and lichens, which have been the backbone of winter grazing for a very long time (Akujärvi et al. 2014; Rikkonen et al. 2023).

Now, in Gran, we face new circumstances especially sudden increase in temperatures and rain in winter and then freezing again. It affects the ground lichens and makes the reindeer sick. Reindeer travel long and fast if there is no grazing and loose what reserves they had. Reindeer herding is not monetarily very prosperous. You need natural grazing. You need usable forest land. According to certain criteria, reindeer herders can apply for funds in case of catastrophically bad grazing in winter. Applying for these funds was not usual 20 years ago, but now, Gran applies almost every year. The

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funds are used for feed, pellets and hay. Feeding reindeer disrupts Sami culture. Feeding is not healthy for the reindeer. Feeding is still so expensive it hollows out what little economy is left. Finding new collaborative ways with forestry is indispensable if Sami culture is to survive and thrive. Fluctuations in the weather and forestry combined is what must be closely studied for reindeer herding in Gran to survive. There is not one save-all measure anymore (Länsstylrelsen n.d.).

3.2.6. Gällivare, Norrbotten, Sweden

The Gällivare hub area (same as the municipality) is dominated by the mining industry. The Malmberget iron mine operated by LKAB is located directly north of Gällivare. Part of the future plans for the Malmberget mine is the establishment of the HYBRIT – fossil free steal production system. On the south side of Gällivare, Boliden Minerals AB operates the Aitik mine and processing plant, established in 1968. Today, the Aitik mine has grown into the largest open pit copper mine in Europe covering an area of approximately 50 km2. The Aitik mine is mainly producing copper, but also gold and silver. The Aitik mine employs 770 people and many more are employed in jobs related to the mine. Aitik is expected to be in operation until 2029 but a number of expansions of existing mine are planned and proposed which is expected to prolong operations (Wagenius 2022; Cambou 2020).

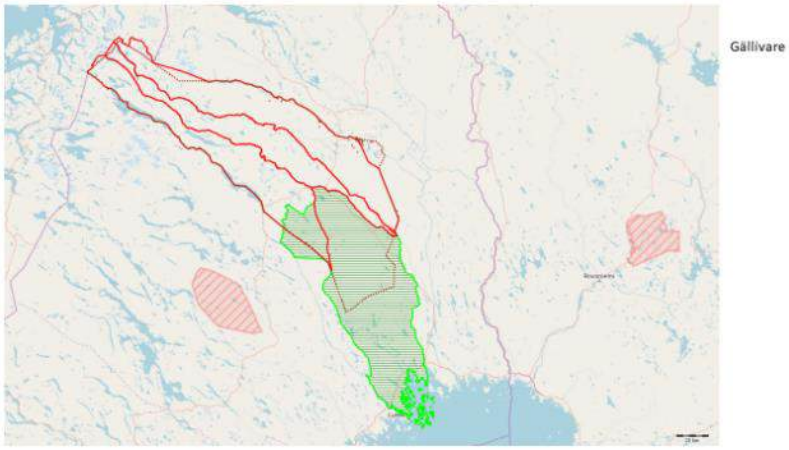

Figure 9. The reindeer herding communities residing/operating in Gällivare hub, Girjas, Baste Cearru and Unna Tjerusj.

Gällivare is also part of the traditional lands of Sami people and the town of Gällivare, serves as meeting point of the four RHCs; Gällivare, Girjas, Baste Čearru, and Unna Tjerusj. Gällivare hub will focus on the forest RHC Gällivare (Sami Parliament 2024). Of the forested land, i.e. 649,300 hectares, some 30% is formally protected, meaning that some 454,000 hectares may be used for commercial forestry. Thus, it is an important timber resource for neighboring areas but at the same time this land is also important grazing land for the reindeer herds (Swedish Forest Agency 2015).

Similar to Jokkmokk, most of the harvested timber is transported out of the municipality, as there is no local wood processing industry. Therefore, it is the forest land/forest properties can be considered to represent the main value.

In terms of employment 174 persons are employed in forestry operations (79% men) and 65 persons in reindeer husbandry (75% men) (Eriksson and Lundmark 2020).

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There are a number of proposed major wind power projects in Gällivare RHC. The advent of the wind power expansions has also meant that the common have access to an expanded road network of a high standard. It will facilitate future timber transports in connection with fellings in the area (Skanska 2017).

In contrast to Jokkmokk, the community in Gällivare is heavily influenced by mining, both historically, presently and in to the future. In relation to mining interest, both forestry and reindeer husbandry interests are less influential. In fact, the mining interest has made the whole town and neighborhood of Malmberget to move and merge into the town of Gällivare. Forest land that is needed for the expansion of mining activities including infrastructure, is bought and transformed (Accastello et al. 2019; Wagenius 2022). For example, is the Gällivare Allmänningsskog sales of Liikavaara 3:2 and 3:3, a deal that involved a payment of 12.3 million SEK which then was distributed to the co-owners of the common (Norra Skog 2022). Thus, the conflicting land use interests between mining and forestry has been settled by an exchange of land for money, and given that the decision by the common is made according to democratically governing principles we may consider that the majority of the co-owners are satisfied with the monetary compensation. For reindeer husbandry, the situation is more difficult, as they do not own the land they use and that is exploited or impacted by the mining industry.

With respect to the overlapping and conflicting interests between reindeer husbandry, forestry and conservation interests are similar to in Jokkmokk.

3.3. Overview of forestry in Lower Austria

Socio-economic. The forest hubs in Austria are located in the provinces of Lower Austria (Forestry hub Mariensee) and Styria (Forestry hub Liezen). With an annual average population of 1 681 748 inhabitants (18,9% of total population), Lower Austria has the second highest number of inhabitants. (Statistik Austria, 2021).

Forest industry. In Austria, both hubs are located in areas that have rather high standing volumes compared to the Austrian average, and both hubs are in areas that are touristically important.

In 2019, the Gross value added at production price (GVA) of the forest sector in Lower Austria decreased compared to the previous years from 236,91 mio € to 257,95 mio € (2018) and 240,45 mio € (2017) (Statistik Austria, 2021).

Production of the forest sector at production price had been 563,14 mio €. The production of the forest sector is fluctuating over the years. Most of the production was “forest goods”, while "raw wood" as second. The increase in production of raw wood for energy use, with a value of 95,4 mio € is its highest value recorded over the years (BFW, 2022).

Even though, the share of spruce forests in Lower Austria is smaller than in the other Austrian provinces, spruce wood still makes up 48,9% of the harvest (BFW, 2019). Climate change threatens the growth of spruce not only due to lack of water supply, but also due to increase in bark-beetle damages.

In Styria, almost 9 940 km^2 or 60,7 % of the province are covered with forest, of which 28,9% or 4 735 km^2 are protected (B. Schwarzl & P. Aubrecht, 2004) and 70,3% of these areas are coniferous forests (BFW, 2009).

In terms of total standing wood volume of these forests, it is 0,303 billion m^3 equivalent to 352 m^3/ha. The annual increment is around 8,21 million m^3, or 9,4 m^3/ha and annual harvest is 7,42 million m^3 or 8,5 m^3/ha. Meanwhile, 90,4% of annual increment are harvested (BFW, 2022).

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In Styria, most of Mayr-Melnhofs forests lie in the districts of Leoben, Bruck-Mürzzuschlag, and Graz-Umgebung (with the management being located in Frohnleiten, marked by a red dot in the map); as the following map shows, these areas are some of the richest in standing volume in Styria (BFW 2015) (fig. 10).

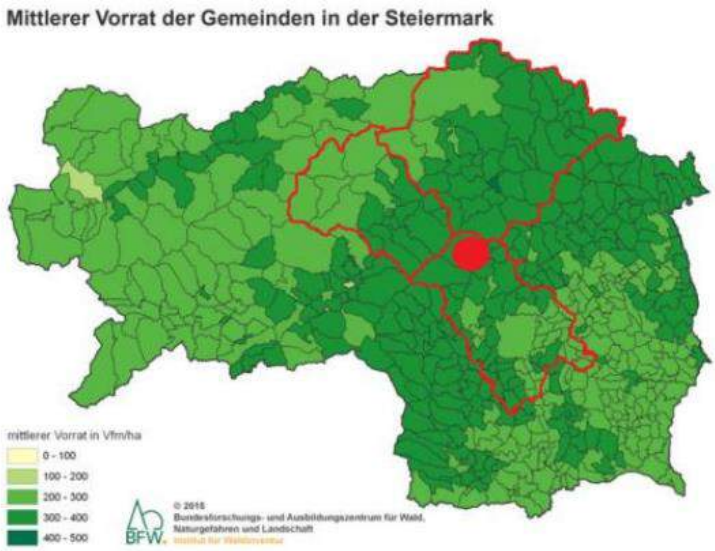

Figure 10. Average standing volume of the communities in Styria, modified from BFW, 2015. The red lines indicate the three districts Leoben (in the West), Bruck-Mürzzuschlag (in the North) and Graz-Umgebung (in the South).

In 2019, GVA of the forest sector in Styria was 224,86 mio €. This value was the lowest the GVA of the forest sector in Styria had been since 2003; only then had it been lower with a value of 215,78 mio €. Production of the forest sector at production price had been 496,17 mio €. Still, this value had been the lowest for almost ten years. Most of the production was "forest goods", raw wood came in second (Statistik Austria, 2021).

3.4. Overview of the forestry hubs in Austria as a Learning Case

3.4.1. Mariensee

The private forest company "Forst Schenker" in Mariensee, Lower Austria covers around 2000 ha, of which 1700 ha are forest, 170 ha are "Alm"/mountain pasture, and 50 ha are meadows. It is divided in two forest districts, Mariensee and Linsberg (fig. 11) (Forst Schenker 2020).

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Figure 11. Forest hub Mariensee – forest district Mariensee (left) and forest district Linsberg (right)

In this area, spruce does historically play an important role – until about 1865, local forgeries and hammer mills needed wood and coal, resulting in large clear-cut areas that were re-afforested with spruce. Nowadays, the forest company relies on a greater diversification of tree species: spruce, larch, silver fir, sycamore, ash, beech are the most important tree species. Further, natural rejuvenation and smaller cuttings are preferred instead of big clear cuts (Forst Schenker 2020).

Aside from forestry products such as sawn timber, industrial wood and fuel wood, the forest company also provides a broad range of products/ services like hunting permits, rent and lease of buildings and other properties, income from district heating, energy from photovoltaic, hydropower, water for artificial snow, drinking water, and services to other forest owners (Das Land Steiermark 2021).

Five wells on the forest company's land provide the local residential area with drinking water. Water is also used to power a small power station, which provides the forest company an additional income independent from wood harvesting.

In addition, tourism plays an important role in the area with its different hiking trails that attract hikers, and in winter, cross-country skiiers visit the "Wechsel-Simmering-Panoramaloipe", which partly runs along the forest roads. The forest company also leases areas for the use as ski slopes for downhill skiing.

The company has a business value of about 70 million € and a yearly harvesting of 12.000 m³ wood with income of around 90 € per cubic metre.

Silvicultural costs amount to slightly more than 70.000 €. The most important operating costs are harvesting costs (about 275.000 €), thinning costs (85.000 €), and costs for forest roads (about 50.000 €) (BFW, 2022).

The forest company is employing 5 employees full-year and additionally 4-6 seasonal workers every year. The employment structure is, typically for forest enterprises, dominated by men (75%), with an average age of 36 years.

There are 7,5 ha of forest which are under nature protection. Important regulations affecting forestry activities in the area are the Austrian forest law ("Forstgesetz 1975"), which for example contains hazard zone plans ("Forstgesetz-Gefahrenzonenplanverordnung"). It enables to identify which areas are susceptible to natural hazards that needs silvicultural measures for protection, and they can greatly

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influence the values of properties. The law also imposes regulations for the conservation of protection forest, like regulations on clearcuts on certain sites. In the forestry hub Mariensee, this concerns mostly the site protection forests, of which there are 165 ha. However, there is also one area of 10 ha with object protection function, in which no regular timber harvesting is done and the forest is only managed to conserve its protective function ("Bannwald").

The hunting law of Lower Austria ("NÖ Jagdgesetz 1974") also have provisions on how to deal with forest damages by wild game (e.g. browsing, bark peeling damages). The owner of properties damaged by wild game can request a reduction of the damaging wild game species with the local hunting authorities. The owner of damaged silvicultural properties can demand financial compensation within four weeks. In reality, this is rarely done and leads to potential conflicts. For the forestry hub Mariensee, this has a little impact, because the hunting is organized by the land owner itself with trusted hunters, so that there are no emerging conflicts.

The forest company is PEFC certified. While this is not seen restricting the management practices because the Austrian forest law is mostly stricter than PEFC regulations. Further, it does not offer much of an advantage anymore because more than 75% of Austrian forests are PEFC certified (PEFC Austria, 2022).

In an interview with the owner of the forest company "Forst Schenker", the most important driving forces for adaptation and change were identified as tourism/recreation and societal change/expectations from society. Other drivers that have called for adaptations of management and measures are climate change, changes in the timber market and the covid pandemic. In tourism and recreation, while there is certainly some conflict potential, there is also a lot of potential for communication and cooperation. The forest company is already working successfully together with an enterprise that provides mountainbiking trails on the forest company's grounds, and hikers' interests are considered like in designing round trails and avoiding blocking forest roads for harvests during tourist seasons. Similarly, societal change with society's growing interest in sustainability, nature protection, and climate change are especially noticeable in forestry and call for a better communication with the general public. Climate change do not have an impact yet on the forestry hub Mariensee too negatively – the colder and rather wet local climate as well as good forest hygiene seem to have avoided larger amounts of damaged wood by bark beetle, for example. Still, the forest company Schenker is taking action to be prepared by diversifying their tree species composition and careful selection of provenances of the seedlings. It does not only bear the risk of increasing damages by forest pests and droughts, but also lead to an increased need for carbon sequestration and sustainable and renewable products, where forestry might even find new chances for positive developments. Timber market becasue large amounts of damaged spruce timber in the past years have made it hard for many forest companies to manage their forests as usual. Covid-pandemic has been a driver for adaptation and change in all aspects of everyday life as well as industries in the past two years, and it has affected forestry as well; however, the forestry hub Mariensee was not impacted too strongly by it, aside from a three-week production stop of the sawmills at the beginning of the pandemic.

3.4.2. Liezen

In Liezen, Franz Mayr Melnhof-Saurau (2021) is a forest enterprise which is the largest private forest enterprise in Austria, owning a total of 32 400 ha of properties, 21 800 ha of which are commercial

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forest. Those forests are situated in altitudes of 430 up to 2200m, 5600 ha are defined as protection forest. About 75% of the enterprises' forests comprise of coniferous trees, 15% are larch, 10% beech forests and other deciduous species like ash, sycamore, cherry, and oak. Timber production is the main service provided with an average yearly harvest of 180 000 m³, but the enterprise also diversifies by renting and leasing properties (about 2000 apartments), having a tree nursery to supply the own needs for seedlings, and selling hunting permits and renting hunting areas. Additionally, services like consulting and forest road construction are offered. The subsidiary MM Ökoressourcen GmbH has specialized on development of renewable resources in the area, and is currently operating four small hydropower plants; more projects are planned. The company also have biomass heating plants supplied with wood from the enterprises' own forests. A farm owned also by Franz Mayr-Melnhof-Saurau is producing rye and cattle on 170 ha; another 1230 ha alpine pastures can be rented by local farmers.

The forest enterprise divides into 11 forest districts with about 2000 – 3000 ha each, as shown on the map (fig. 12) below:

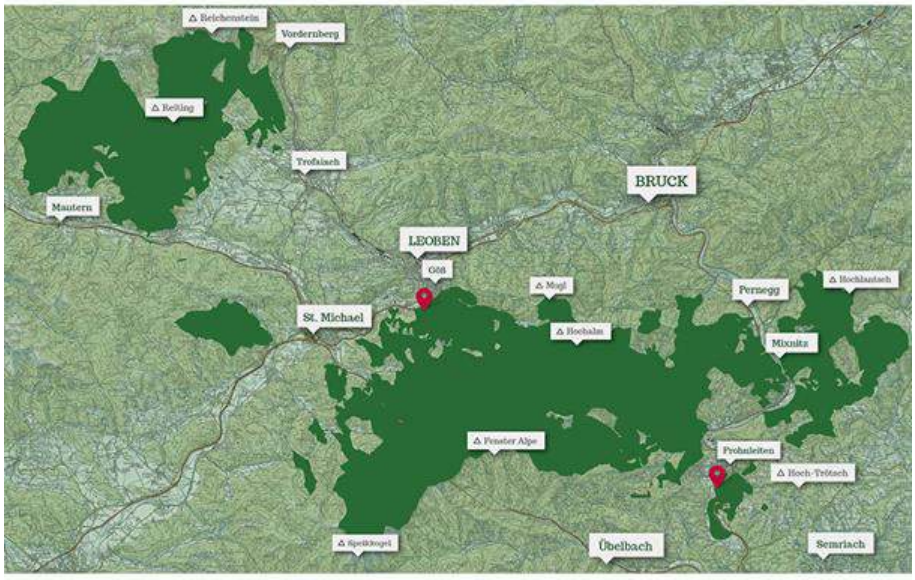

Figure 12. The forest districts of forestry hub Liezen

In Leoben, there is also the sawmill Mayr-Melnhofer Holz, which is producing about 700 000m³ of sawn timber and 95 000 to of pelles yearly and employing about 330 job holders.

3.5. Discussion and conclusions

For a long time, the forest industry has played an important role in Northern Finland and Northern Sweden which constitutes an integral part of the national economy. The wood processing industries process harvested timber to meet the local wood demand. However, there are no wood processing industries in Jokkmokk, and Gällivare so most of the harvested timber is transported out of the municipality. The forest industries also generate employment (tab. 3). Thus, from the local perspective, it is the forest land/forest properties that represent the main value, and the value of these properties

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is made up by different assessment criteria and components of which the most common is the market value. The most current statistics on market prices by Ludvig &Co shows that in the north of Sweden, the prices per hectare is increasing more that price per cubic meter. However, research shows that in the timber production values are only a part of the total value assessment that forest owners put on their land and ownership (see e.g. Lidestav and Nordfjell 2005, Westin et al 2017 to most Swedish forest owners, the economic values of the property and the ownership (timber, leasing hunting rights, capital assets) are considered less important than the social values (recreation, health, cultural values, etc.) while environmental values (preserving plants and animals, good water quality, carbon storage falls in-between (Lidestav and Westin 2023) .

However, there has been sustainability issues on wood use in Northern Finland even though the production of new pulp mills and existing pulp mills were combined, specifically in Kemi and Kemijärvi hubs. This could lead to demand for wood in neighbouring countries such as Sweden and Russia and could also affect the import from overseas in Southern America.

Despite the positive impacts of forestry, commercial forestry especially on mountain reindeer herding communities has a variety of effects on reindeer husbandry. For more than a decade, detrimental effects on the ground lichen resource have been recorded. The key habitat for ground lichens, ancient, open pine-dominated post-fire successional stands on low-productive sites have declined as a result of extensive logging, rigorous replanting efforts, and fire suppression. Instead, dense, controlled forests that promote mosses over lichens have taken the place of such stands. Ground lichens have suffered as a result of fertilization and the invasion of lodgepole pine. Furthermore, the cover and biomass of ground lichens both significantly decline as a result of soil scarification damage. Additionally, clear-cut forestry has detrimental effects on arboreal lichen, which are crucial for reindeer during winter.

In Jokkmokk, forestry is considered a threat to reindeer husbandry as it damages the landscape and lichens to feed the reindeers. It calls for active participatory dialogue between reindeer husbandry and forestry actors. In terms of mining, there is no active mines in the area but there is an ongoing dialogue and conflict around the establishment of the Kallak mine.

The Malå forestry hub, represents a complex land-use situation where mining, wind power developments, and infrastructure projects overlap with the land use needs of Sami reindeer husbandry. The forestry hub has sawmills and timber procurement area. The mining activities are conducted in the Kristineberg mine to extract zinc, copper, gold and silver. This also needs dialogue among stakeholders to resolve the complex land use conflict.

The Gran RHC hub is also affected by different forestry methods and different phases of forestry specifically on the behavior and the well-being of the reindeer. Here it must be pointed out that for a reindeer herder this is almost equivalent to his or her own well-being. Reindeer herding is not a job. It is a culture; it is a way of living and a quite heavy responsibility of the few that stay on. Suffering reindeer means suffering communities, at a core level.

In terms of Gällivare hub area, it is dominated by mining industry which generates employment. The area is also a timber resource and similarly as reindeer grazing area. With respect to the overlapping and conflicting interests between reindeer husbandry, forestry and conservation interests are similar to in Jokkmokk.

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Table 4. Summary of forestry/forest industry key characteristics within the hubs

	Kemi	Kemijärvi	Jokkmokk	Malå	Gran RHC	Gällivare
Main operator	Metsä Group pulp- or bioproduct mill	Keitele Group	Forest owners - large scale owners + 532 small-scale management units whereof 314 are owned by 454 individuals living in Jokkmokk In 15 large private owned properties	Setra Malå sawmill	Reindeer herders	Forest owners – Large scale owners and 1016 small-scale management units whereof 995 are owned by 1321 individuals living in Gällivare.
Employment		120 workers	96 persons are employed (82% men)	90 persons (harvesting operation and silviculture and road transportation 75 persons (sawmill) of which 74 % men and 26% women	7 reindeer herding families with some 50 members and a maximum of 7000 reindeer in the culled herd makes a living	174 persons are employed in forestry operations (79% men)
Wood consumption	3,1 million cubic meters of wood	700 000 cubic meters of pine and spruce sawlogs		42,00 m3sk are used locally as fuelwood		29,000 m3sk are used locally as fuelwood
Products	Sawn timber	Sawn timber, planed products, finger-jointed structural products, glulam and side products	658,000 m3sk logs is transported out of the hub	170,000 m3 planks and boards whereof 20-25% is planned. 91.000 m3 pulpwood chips, 70.000 m3 sawdust, 8.000m3 bark		451,000 m3sk logs are transported out of the hub
Conflicts	Concerns about sustainability of the wood use in Northern Finland Forestry has competing interests with all of those (tourism, hunting and gathering of natural products).	Concerns about sustainability of the wood use in Northern Finland competing interests with reindeer herding, tourism, hunting and gathering of natural products and its wood procurement area	Forestry is by most reindeer herding communities considered as the most impending threat to reindeer husbandry.	Complex land-use situation where mining, wind power developments, and infrastructure projects overlap with the land use needs of Sami reindeer husbandry	Forestry strongly affects the behaviour and the well-being of the reindeer	important timber resource for neighboring areas but at the same time this land is also important grazing land for the reindeer herds a number of expansions of existing mine are planned and proposed which is expected to prolong operations.

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Forestry is also affected by climate change. According to the study of Kyriazopoulos et al. (2017) in the northern and central European regions, as a result of climate change, several moth species are attacking birch woods more frequently. Wind, wildfires, grazing, and loss of biodiversity are the primary effects of both climate change and land use change. Avalanches, root diseases, and outbreaks of the bark beetle are next. According to the authors, responses were typically scarce and limited on case studies on governance and political mechanisms that were specifically designed to restore or adapt treeline ecosystems to change.

Relative to the learning case in Austria, climate change is expected to have heavy impacts on forestry in the region (Mariensee). A decrease in water supply and an increase in bark-beetle risk threaten spruce forests in large parts of the province Styria. To better address the new challenges climate change presents for forestry, the FORSITE-project (Dynamische Waldtypisierung – FORSITE) for Styria was initiated by BOKU University, the federal research centre for forest BFW (Bundesforschungszentrum für Wald), and other project partners. This extensive project offers advice for silvicultural measures to convert vulnerable, spruce rich, not site-adapted forests into stable, adapted forests that can still fulfil their functions in the altered conditions of climate change. This was achieved by gathering data on soil, vegetation, and site conditions all over Styria, feeding the information into a GIS-system, and classifying forest types, for which different silvicultural measures apply. This tool is expected to help forest owners to be prepared better for climate change.

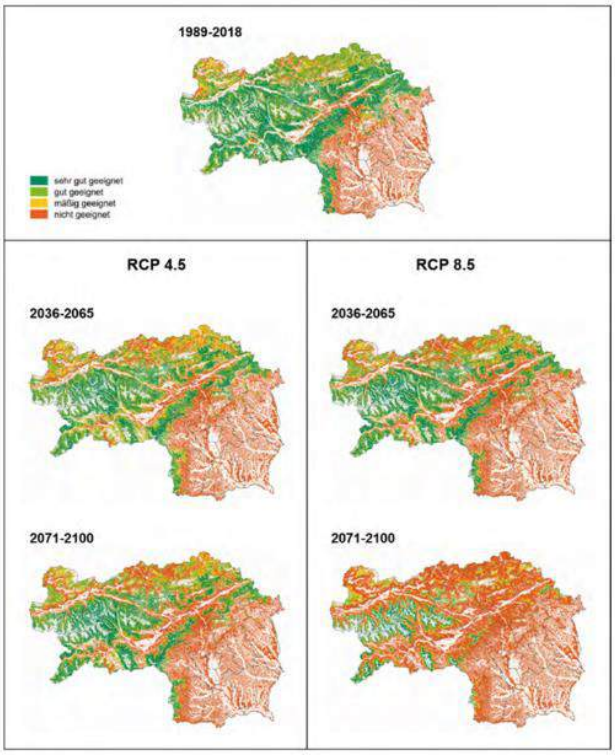

Figure 13. Suitability of spruce in Styria under current climate conditions and for two different climate change scenarios; Source: Amt der Steiermärkischen Landesregierung, 2022

Thus, it is necessary to develop strategies to respond to the impacts of climate change in Northern European countries similarly as how Austria develop their strategies. This will help the forest owners to improve the forest conditions.

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Generally, the forest sector has positive impacts economically but the negative impacts are primarily on competing land use interests. It needs reconciliation between the actors to sustainably manage the forests. In terms of expansion of the wood processing industries, such as the new pulp mill in Kemi and the sawmill in Malå, the actors should consider the advantages and disadvantages of the expansion of industries regarding the timber resource. Further, the social, ecological and economical sustainability should also be taken into account. In development of plans and strategies, it is necessary to understand the different perspectives of forestry in the hubs of the region.

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4. FISH FARMING

In this chapter, we focus on the fish farming industry in the Arctic, particularly the four fish farming hubs - Sudoroy, Westfjords, Egersund and Varangerfjord, from the three Arctic countries: Norway, Iceland and Faroe Islands. This will provide a summary of some of the key characteristics to analyze the socio-economic impacts of fish farming in the Arctic.

The detailed fish farming industry report is attached as Annex 2 to this report.

4.1. Overview of FISH FARMING industry in countries

4.1.1. Faroe Islands

Traditionally, the Faroese economy has been dominated by industrial fisheries, and fish and fish products still make up between 90 and 95 percent of export value and 20% of GDP (GFI 2022). In recent decades, initiatives have been made to promote new industries. New industries are perceived as necessary to modernize, strengthen and diversify the Faroese economy and society, for instance by creating more diverse employment opportunities and so on. In the Faroes the new industries that have emerged and which are increasingly dominating in Faroese society, are aquaculture and tourism. Aquaculture has become a very important element in the Faroese economy during the past decades, and in recent years aquaculture has accounted for around 40% of export value. Despite this, Industrial fisheries still dominate. In comparison, tourism was estimated to be around 2% of GDP before Covid19 (more on Annex).

Fish farming is an industry that has grown very rapidly in the Faroes during the past 20 years. The industry began to establish itself around 1980. And in 1985, there were more than 50 fish farming companies in the Faroes (Hovgaard and Bogadóttir 2020). As can be seen in figure 14, production reached more than 40.000 tons in the early 2000s, but the industry more or less collapsed around 2005 because of disease and poor management. After reaching a low in 2006 production has skyrocketed to 94.823 tons in 2021 corresponding to almost 1,8 tons of salmon annually per capita. However, in recent years production under current conditions seems to have reached limits, and parts of the industry face severe problems especially with sea lice and increasing fish mortality (Statistics Faroe Islands 2021).

In this same time period between 1990 and today, total catch of the industrial Faroese fisheries fleet has also grown, reaching a high of 701,658.2 tons in 2017. Much of this growth in total catch is based on pelagic fish species (mackerel, herring, blue whiting). In 2021, total catch was 540,603.5 tons (fig. 14). In the Faroes, fisheries and aquaculture production are directly connected as large volumes of pelagic fish, especially blue whiting, have gone into the production of fish feed (Statistics Faroe Islands 2021).

The recent success of the pelagic fisheries and aquaculture industries have meant that economic growth rates have been very high, and during the past years population growth in the Faroes has been rapid (fig. 15), but Covid19 and the new political situation with the Russian invasion of Ukraine has exposed the vulnerabilities of the Faroese economy. However, with its isolated position and small size, and the great economic reliance upon only one key resource (fish), the Faroes are part of a peripheral region, and outmigration especially of young and educated people is an issue that has received much attention and concern. As can be seen in the historical population statistics, one trend that has been

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ongoing since the 1950 is the outmigration of women, something which is characteristic of most peripheral areas in the North and the Arctic (Statistics Faroe Islands 2021).

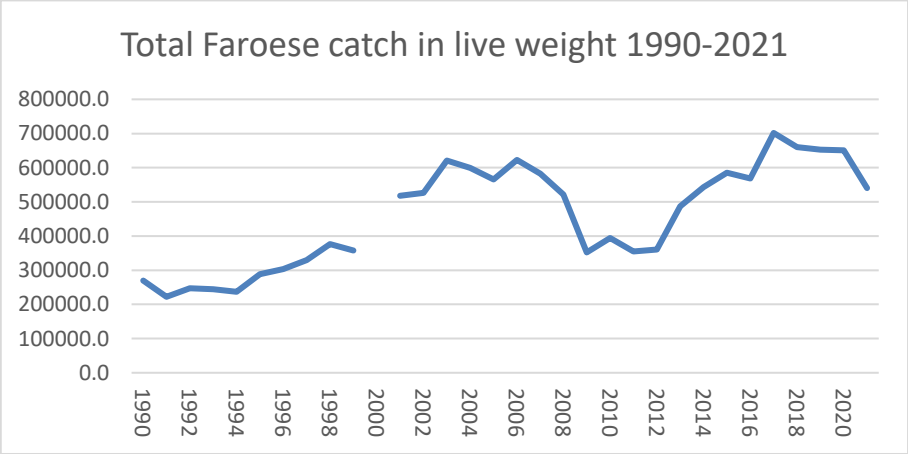

Figure 14. Total catch in the Faroes between 1990-2021. Source: Statistics Faroe Islands

The gender ratio between men and women for the whole country per January 1st, 2022, was 27.799 men and 25.842 women per January 1st in 2022 (Figure 15). This discrepancy is often discussed as a "deficiency" of almost 2.000 women in Faroese society (Statistics Faroe Islands 2023).

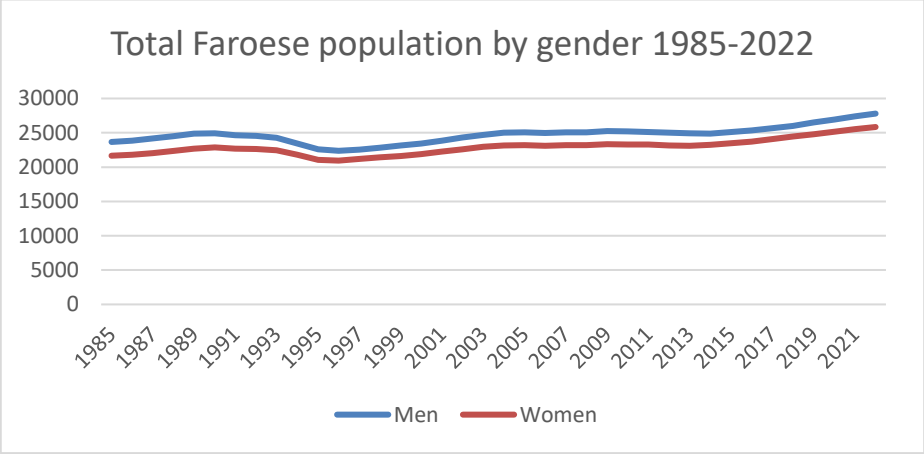

Figure 15. Total Faroese population by gender 1985-2022. Source: Statistics Faroe Islands

4.1.2. Iceland

Culturing of salmon for propagation has a long history in Iceland and salmon ranching started in a state-owned fish farm in the 1960s (Kristinsson 1992; Ásgeir Jónsson 2014). The business model of ranching was to augment natural salmon runs for sport fishing. Today ranching is exclusively for sport fishing, and two of Iceland's main salmon rivers rely entirely on the release of hatchery produced smolts. Farming salmon for food started in Iceland in the 1980s, both with land-based operations and in cages, but experienced catastrophic losses and went bankrupt. The next growth period in salmon

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farming started with cage farming in the east of Iceland in the late 90s. Production gradually rose to about 7000 t in 2006, but disease in a major provider of smolts led to a crash in the industry which had all but disappeared in 2008. In recent years, salmon farming has been growing again driven by foreign investment in cage culture in the Westfjords and in the east.

Figure 16 shows the rapid growth from 5000 t to around 55.000 t in aquaculture production since 2010. As seen the growth has mainly been in cultivation of salmon in sea-cages, but cultivation of Artic Charr has been stable, while cultivation of rainbow trout and other species has declined, which have mostly been cultivated in land-based facilities (Radarinn – The fishing industry´s dashboard).

The aquaculture companies have established themselves in the Westfjords and East Iceland because the fjords in the area are suitable for aquaculture in sea-cages and the Icelandic legislation allows aquaculture in these areas (Ásgeir Jónsson, 2014). In the beginning the companies were founded and owned by Icelanders, but in recent years Norwegian companies have bought the majority of companies´ shares. That has led to a market concentration as few big parent companies, who operate globally and are listed on the Oslo Stock Exchange, own more than one company (Arnarlax, n.d.; Arctic Fish, n.d.; Helgi Bjarnason, 2022).

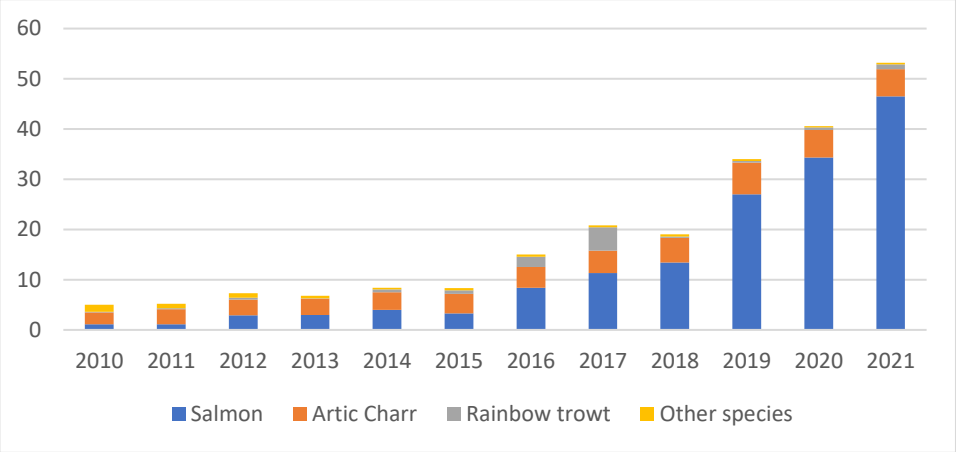

Figure 16. Aquaculture production–thousands of tons. *Source: Radarinn–The fishing industry´s dashboard.*

Even though around 45.000 thousand tons of cultivated salmon is being produced in Iceland in 2021 the companies have plans of an increase up to 70 thousand tons per year (Ásgeir Jónsson, 2014). Such a large-scale industry puts enormous strain on the rural communities of Westfjords and East Iceland, who have for a long time been struggling to maintain the well-being and quality of life of their inhabitants (Ásgeir Jónsson, 2014; Edvardsdóttir, 2016).

Up till now the traditional fisheries companies have focused on traditional fishery, but recently at least two major Icelandic companies, Samherji and Hraðfrystihúsið Gunnvör (HG) are establishing themselves in the aquaculture industry; Samherji focusing on land-based facilities in south and northern part of Iceland to cultivate Artic Charr and salmon and HG has been granted license in cultivating salmon in open-sea cages in the Westfjords (Samherji, e.d; Hraðfrystihúsið Gunnvör, e.d.). The reason for this shift is that it is estimated that in the next 10 years aquaculture´s value of export will be more than of traditional fisheries and then aquaculture production would be a bigger industry than traditional fisheries (Ásgeir Ingvarsson, 2022).

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When looking into conflicts regarding aquaculture at national level, the North Atlantic Salmon Fund (NASF) which is an international volunteer organization founded in Iceland is worth introducing here as the strongest opponent to aquaculture along with the Icelandic Wildlife Fund. These two NGO´s main objective is to protect wild salmon in the North Atlantic Basin and other freshwater fish in lakes and rivers. The Funds are outspoken about its opposition against large-scale aquaculture in open pens on Icelandic shores and uses every opportunity to draw attention to the subsequent danger to the wild salmon and the environment. However, the Funds supports sustainable aquaculture in closed systems and favors land-based facilities (NASF, n.d.; Icelandic Wildlife Fund, n.d.).

4.1.3. Norway

The Norwegian aquaculture industry is very important and is now the largest activity in the Norwegian seafood industry measured in value. The development has been very positive, not least driven by high international sales prices and at times a very positive currency situation, which has helped to create high export values as shown in Figure 17. Production of salmon and trout measured in carcass weight round weight (Wfe) in Norway was 1,474 thousand tonnes worth NOK 68.5 billion in 2020, of which salmon to a value of NOK 65 billion in 2020 (Fiskeridirektoratet 2022).

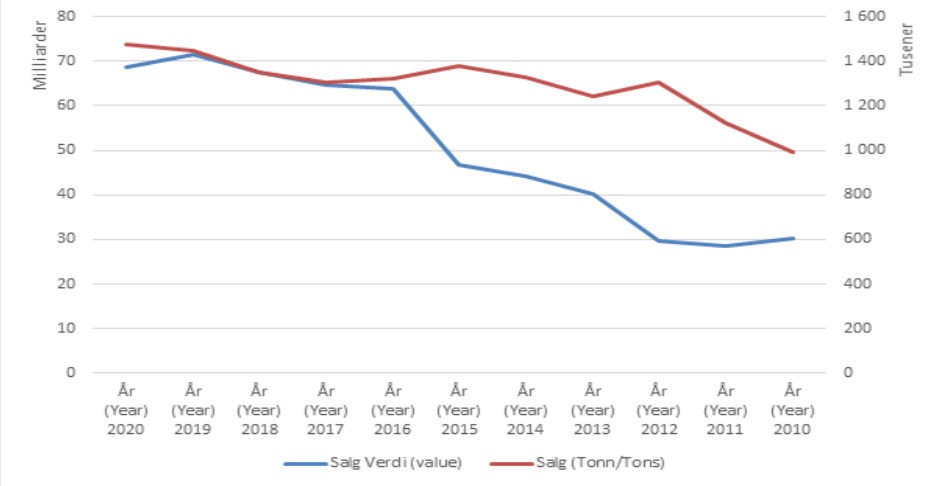

Figure 17. Production of salmon and trout measured in carcass weight round weight (Wfe) in Norway

We see that the value has more than doubled since 2010, with strong growth from 2012 to 2016. At the same time, the amount of salmon and trout produced has not increased more than 48% in 10 years. We see that the quantity sold has levelled off and has had a moderate increase from 2012 of approx. 13%. The reason for the moderate increase in volume in production is primarily that the companies have not solved the lice problem, which entails restrictions in growth based on current practice of the traffic light system. In addition, there is a high mortality rate mainly due to diseases and mechanical treatment of lice (Fiskeridirektoratet 2022).

In Norway 600 salmon/trout farming locations were active in 2020 distributed along the Norwegian coastline. Approximant 5 % was used for rainbow trout and 95 % was used for salmon production. North Norway accounts for 25 % of this production. The production has increased from 1 million metric tons in 2009 to 1,4 million metric tons in 2019 (SSB 2022).

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The seafood industry is Norway's most important rural industry. The industry is represented throughout the country, but it is in the regions of Western and Northern Norway that the industry has the strongest significance for value creation and employment.

Few industries have grown more than the seafood industry in the last 15 years. In 2019, exports exceeded NOK 100 billion. The growth in the seafood industry makes Norway a richer country and is very socio-economically profitable. Value creation per person employed in the seafood industry is almost twice as high as the average for mainland Norwegian industries. The more labor and capital that is provided to the seafood industry, the higher the Norwegian future welfare will therefore be (Fiskeridirektoratet 2022).

Through the purchase of goods and services, the seafood industry lays the foundation for employment and value creation throughout the country and in large parts of Norwegian business and industry. The total employment effects of the seafood industry's activity in 2019 were just over 90,000, while the total value creation was 127 billion according to our calculations. The figures (fig. 18) below show the most important results from this survey (Johnsen et al. 2022)

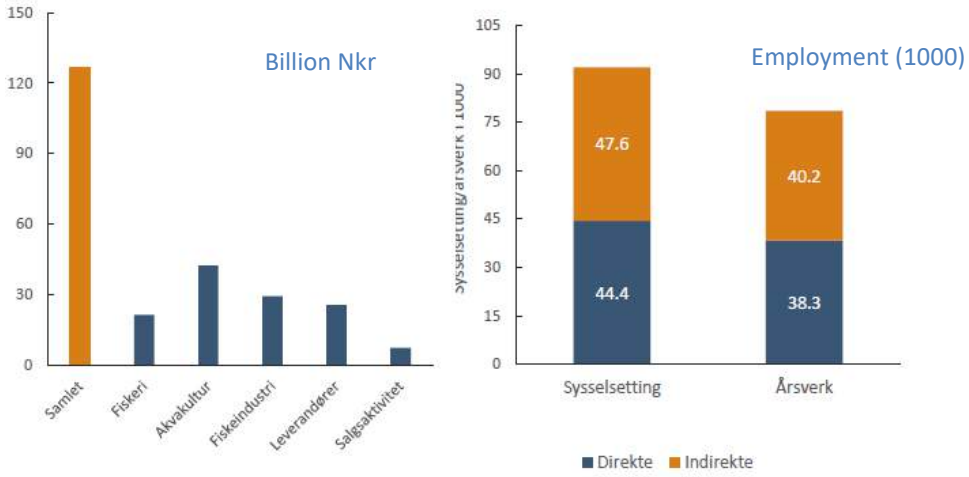

Figure 18 Total value creation effects (left) and total employment effects (right) of the seafood industry in 2019. Effects including the seafood industry's purchases of goods and services. Source: Menon Economics 2020

4.2. Fish farming and aquaculture in the hubs

4.2.1. Suðuroy, Faroe Islands

Description. Suðuroy, is the southernmost island of the Faroes. Population in Suðuroy per January 1st 2022 was 4.684 people which is 8.7% of the total Faroese population (Statistics Faroe Islands 2023). The land area of Suðuroy is 165 square kilometers which is 11.8% of total land area. The island is divided into seven municipalities and 15 settlements (see fig. 19) (ArcticStat 2023).

Suðuroy is today considered a peripheral region of the Faroes, but during the first half of the twentieth century, Suðuroy was the center of the transformation of the Faroes from a relatively self-sufficient peasant society to a modern industrial fisheries nation (Ministry of Fisheries and Natural Resources 2010).

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***Demography and gender balance*.** Suðuroy experienced population decline after the severe economic crisis that hit the Faroes in the early 1990s, and although population has remained relatively stable during the past two decades, with an upwards trend in recent years, the population is aging. Average age for men in 1985 was 35,5 years and 36,3 for women. In 2022 the average age is 42,4 years for men and 43,6 for women while the average age in the Faroes was 39,5 in 2021. When it comes to gender balance, in Suðuroy, the balance is slightly more skewed than in the country as a whole. Per January 1st in 2022 the number of women was 2.211 and the number of men was 2.473. In 1985, the ratio was 3.044 men and 2.838 women (Statistics Faroe Islands 2023).

The past decades have also seen great changes in the traditional fisheries industry, and this again has had a great impact on the local communities in Suðuroy. At the turn of the century, the fisheries industry as well as the aquaculture industry in Suðuroy was still mainly locally owned and controlled, with a large number of fishing vessels and fish processing plants. Today, the fisheries industry has become centralized, and ownership is to a large extent non-local. As the aquaculture and tourism industries are growing rapidly in the Faroes and in the whole Arctic region, the local communities in Suðuroy are struggling to become part of these industries in ways that benefit the local community.

***Fish farming and employment*.** Although fish farming has been practiced in Suðuroy for a long time, it is one of the last places to be exploited in the newest expansion phase, and a large portion of the prospected growth in production announced by the salmon farming company Bakkafrost is to be in Suðuroy (Ministry of Fisheries and Natural Resources 2010).

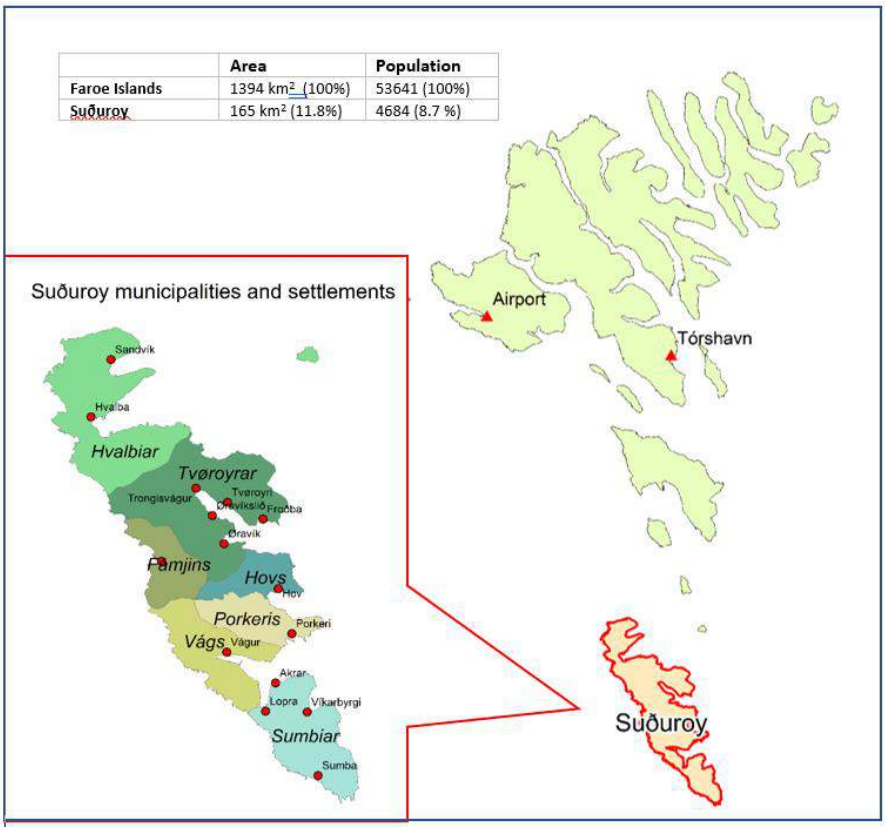

Figure 19. Suðuroy municipalities

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As shown in the national overview, both the fisheries and aquaculture industries have become more resource intensive, both in total volume of biomass and per capita. At the same time, for the Faroes as a whole, the number of employees in the fisheries and fish processing industry has gone down, while the number of employees in the aquaculture industry has increased, see figure 20 below.

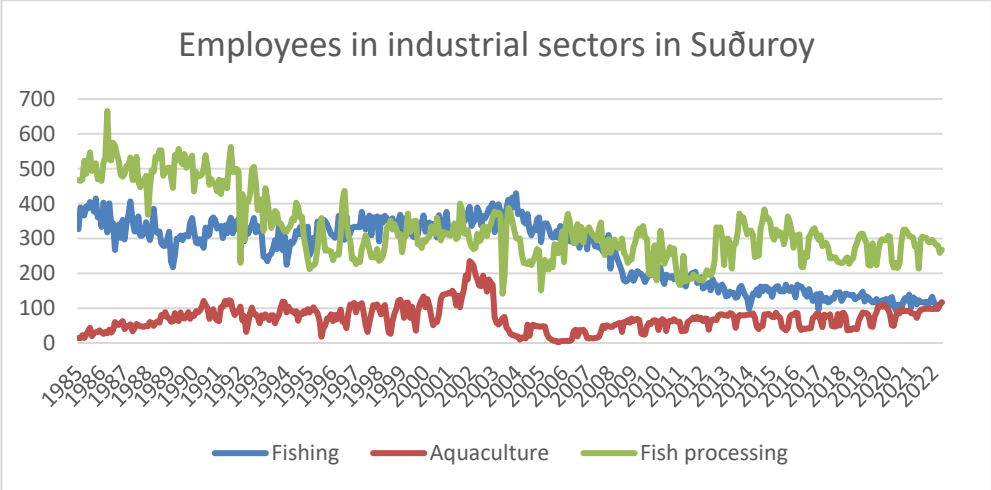

Figure 20. Employees in industrial sectors (fishing, aquaculture, fish processing) in Suðuroy. *Source: Statistics Faroe Islands*

In Suðuroy, the only salmon farming company operating in the island is Bakkafrost. In addition, there is one seaweed farming company in Suðuroy, TARI based in Fámjin. Bakkafrost has announced plans to expand and increase production in Suðuroy to 15.000 tons annually, corresponding to more than 3 tons per Suðuroy inhabitant. In addition to using the fjords in Suðuroy for open-cage salmon farming, another element in this growth strategy is the construction of a new smolt plant in Suðuroy. The expected employment in Suðuroy from this expansion was reported to be around 100 in total, 10 of which to operate the Ónavík plant (Moore 2018). It is unclear whether this employment is all-year or only seasonal.

In summary, the growth in the salmon farming industry has been very large in the past decade in the Faroes, and practically all areas suitable for aquaculture in the coastal zone have been exploited. This means that further expansion at least when it comes to salmon farming must rely on either offshore aquaculture or land-based aquaculture. One of the changes in the aquaculture industry visible in the Faroes is that the development of the aquaculture industry has become more centralized. Also, as can be seen in the statistics, the consequences, benefits and risks associated with the industry, vary between the different regions and local areas of the Faroes. Salmon farming in the Faroes has been very successful and profitable in the past two decades, but the growth of the industry is not unproblematic.

4.2.2. Westfjords, Iceland

Description. The Westfjords region comprises about 9400 km² of the country's land area or 9% (NLSI, n.d.). The landscape is characterized by steep mountains and deep and narrow fjords formed by the ice age glaciers. Agricultural land is limited but rich fishing grounds and sheltered fjords have been the foundation for many settlements over the past century. The landscape and difficult road transport, especially in winter, has influenced the region´s settlement pattern, and when urbanization started in

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the early 20th century, many small but independent communities were formed which relied on transport by sea, and later air. Throughout the ages, the region has interacted with foreign markets, such as, selling fish to the Dutch and Germans in the 14th century, and being used as a base century for Basque whalers in the 17th century, as recent archaeological excavations reveal (Edvardsson, 2015, 2010; Edvardsson & Egilsson, 2011). In the 19th century, the Norwegians built numerous whaling stations all around the Westfjords, which operated until 1915 when Icelanders banned whaling (Einarsson, 1987).

The Westfjords peninsula may be divided into three economic areas: the North, the South and Strandir, where small fishing villages are the basis for the economy (Icelandic Regional Development Institute, 2012). There are currently nine municipalities and 13 communities in the region, as more than one smaller community belongs to larger municipalities (The Prime Minister's Office, 2007; Karlsdóttir et al., 2012).

Demography. Since 1970 there has been a decrease in the population of the Westfjords. This decrease can be attributed to the following: introduction of the quota system of fisheries in 1983 and a few years later the individual transferable quota system in the fishing industry, changes in quota ownership in 1991, the bankruptcy of companies in the fishing industry, and devastating snow avalanches in 1995 (Hall, Jónsson & Agnarson, 2002; Matthíasson, 2003; Edvardsdóttir, 2016) However, with the recent rapid growth of the aquaculture industry in the region, the population is rising again. This is especially the case in the south, where the aquaculture industry has established itself (Edvardsdóttir, 2016).

Education and Gender perspective. More women than men pursue university studies and attendance has increased since 2000 but the trend seems to be that men finish further education, such as vocational and short courses and women pursue into university studies. No university is based in the Westfjords area, so in order to pursue a university degree, one must either leave or study on-line. Women tend to pursue education in the field of nursing or teaching that has been linked to the public sphere of life. Even though they get a degree in financing or business administration they do not seek jobs inside the dominant industries in their community, which in the case of the Westfjords are fisheries and aquaculture. Research has also shown that in rural communities where traditional fisheries and aquaculture are the dominant industries male values are the dominant values. In such communities, women do not have the access to the dominant discourse about the system (Anna Guðrún Edvardsdóttir, 2016; Edvardsdóttir, 2013; Byrne, et al., 2013, Pini et al., 2014; Karlsdóttir og Ingólfsdóttir, 2011).

As said earlier, industry development in rural areas tends to be on large-scale primary production industries, which seem to be more suited for men, especially those who have pursued a further education, such as technicians, mechanics, or captain´s certificate. Such jobs are often well paid.

Vesturbyggð and Tálknafjörður municipalities

Figure 21 shows the Westfjords peninsula, there are two municipalities in the southern part, Vesturbyggð and Tálknafjörður, but in Vesturbyggð there are two communities: Patreksfjörður and Bíldudalur. The lines on the map show where aquaculture production takes place in the fjords. Like other communities in the Westfjords region, the three communities have been facing out-migration, especially of young people and women, for a long time, which has led to minimum of infrastructure development and a struggle of keeping minimum services in the communities (Edvardsdóttir, 2016). However, the population has been slowly growing in recent years. What is notable is that Vesturbyggð

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seems to gain more from the aquaculture development than Tálknafjörður regarding population growth.

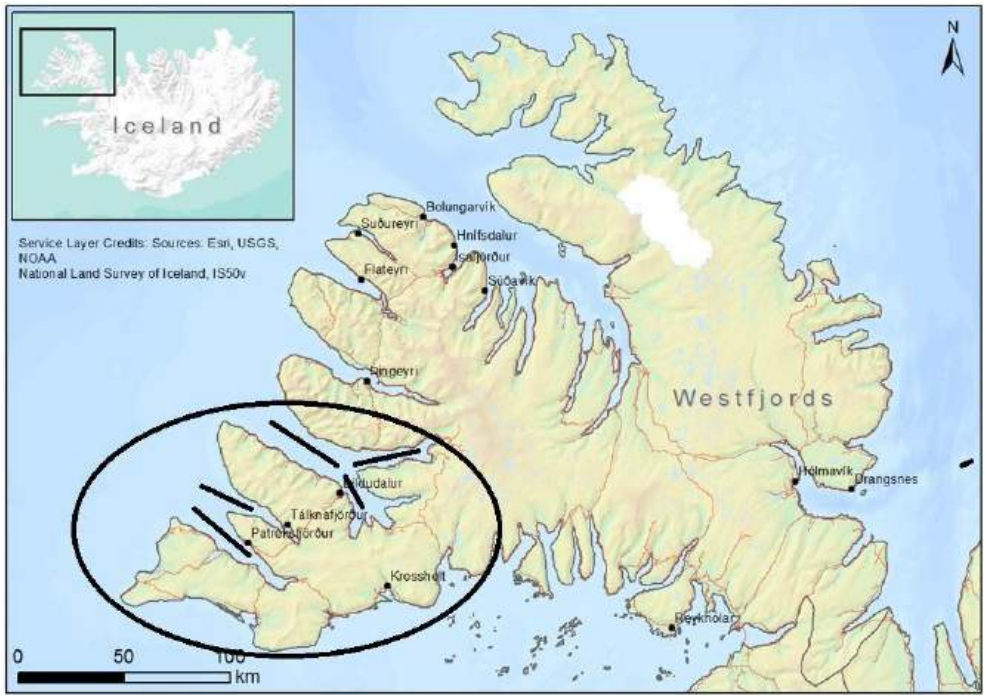

Figure 21. The Westfjords region (NLSI, n.d.)

Since 1990 more men than women live in the area and research shows that it is mostly young people and women who move from rural communities. Women seem to prefer to live in bigger communities where diverse job opportunities can be found and socially it seems that they feel better in bigger communities. It is also noteworthy that all over the world more women than men study at university level and are therefore not likely to move to rural communities where the job market is homogenous (Edvardsdóttir, 2013; 2016; Karlsdóttir and Ingólfsdóttir, 2011; Nikk I Norden and Nordic Council of Ministers, 2018). The gender gap seems to have widened in Vesturbyggð as nearly 100 more men live there than women. Edvardsdóttir (2013) points out that rural communities in Iceland are male dominated, with values, beliefs, and the labour market heavily linked to male dominated industries, such as: the primary production sector, fisheries, agriculture, and manufacturing industry. This suggests that the aquaculture jobs refer more to men than to women.

Additionally, there is a decline among the youngest age groups (0-19 years) from 1998 – 2022, however it seems that the population of the youngest age group is starting to increase again. In other age groups, the population seems to be increasing again after some time of a decline. What is noteworthy is the increase in population of the age group 20 – 29, which indicates that the out-migration pattern is changing as young people are moving to the area. In terms of migration, since 2009 the number of people of foreign origin living in Vesturbyggð and Tálknafjörður has increased; in 2009 180 people of foreign origin live in these two municipalities, but in 2021 330 people of foreign origin live there (Statistic Iceland, 2022d).

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Aquaculture. Aquaculture in open sea-cages is only allowed in the Westfjords and East Iceland regions. The reason is that in 2008 the Icelandic parliament agreed a regulation that forbids cultivation of salmon in open sea-cages in areas where it is likely that the wild salmon's route into the salmon rivers lie. The cultivation of salmon in open sea-cages started in Vesturbyggð and Tálknafjörður in 2009, when Fjarðarlax was established, later Arctic Fish, followed by Arnarlax. These companies were founded by Icelanders, but foreign investors, especially Norwegians, took part in the establishment from the beginning (Kristinn Ingi Jónsson, 2023). Today, both Arctic Fish and Arnarlax are owned by the same Norwegian parent company, SalMar ASA, which owned the majority of shares in Arnarlax. Recently SalMar ASA bought the majority of shares in Arctic Fish. For now, no changes have been made, but it is assumed that the companies will merge (Gunnlaugur Snær Ólafsson, 2022).

Figure 22 shows the scale of the aquaculture production in thousands of tons since 2011, both land- and sea-based production. As seen the sea-based salmon production is at the level with the land-based Arctic Charr production until 2017 when the salmon production in Westfjords and East increased rapidly. It is estimated that it will continue doing so. In the south part of Iceland and in the north-west smolt production for other aquaculture facilities is the foundation for the operation, both for Arctic Charr and salmon.

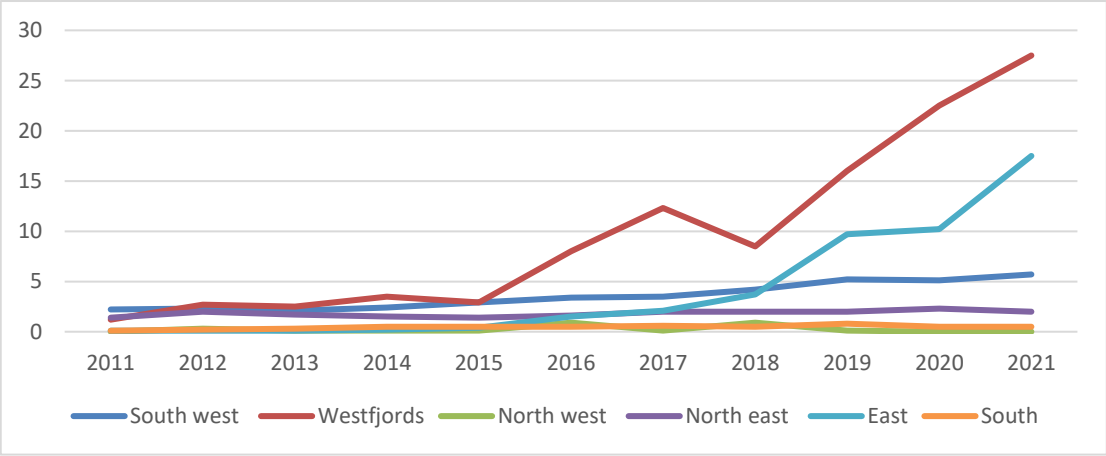

Figure 22. Land- and sea-based aquaculture by regions (Radarinn – The fishing industry dashboard, e.d.)

Figure 23 shows how much sea-based aquaculture has increased since 2011, while land-based aquaculture remains stable. The figure shows the national pattern, but the increase in aquaculture production in Iceland is mostly based on the increase in salmon production in open sea-cages in the Westfjords and East Iceland.

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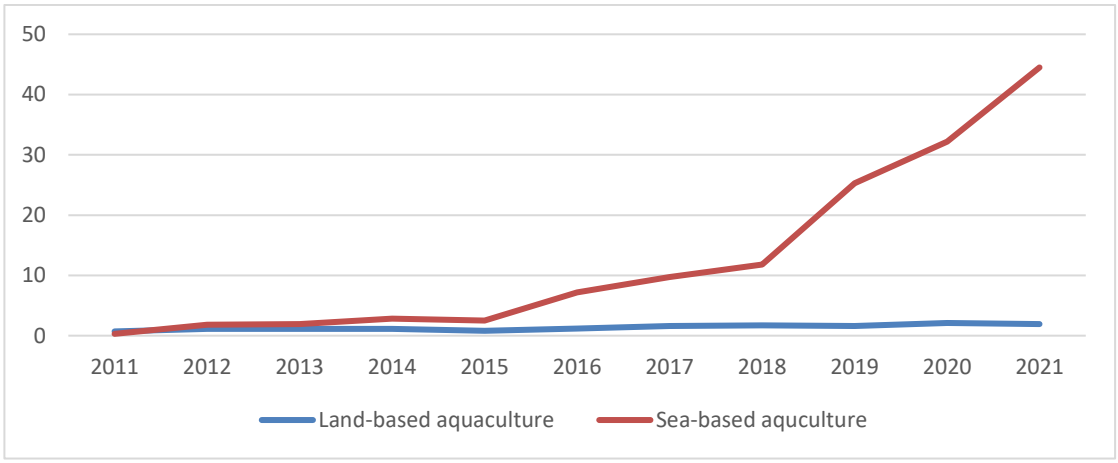

Figure 23. Land- and sea-based aquaculture in thousands of tons. *Source: Radarinn – The fishing industry dashboard, e.d.*

Employment. The number of those who work in the aquaculture industry has increased along with increased aquaculture activities. Figure 24 shows this increase from 2008 – 2018 at the national level. However, the importance of the industry is more in rural areas than in the capital area, as 87% of the aquaculture industry income is traced to rural areas.

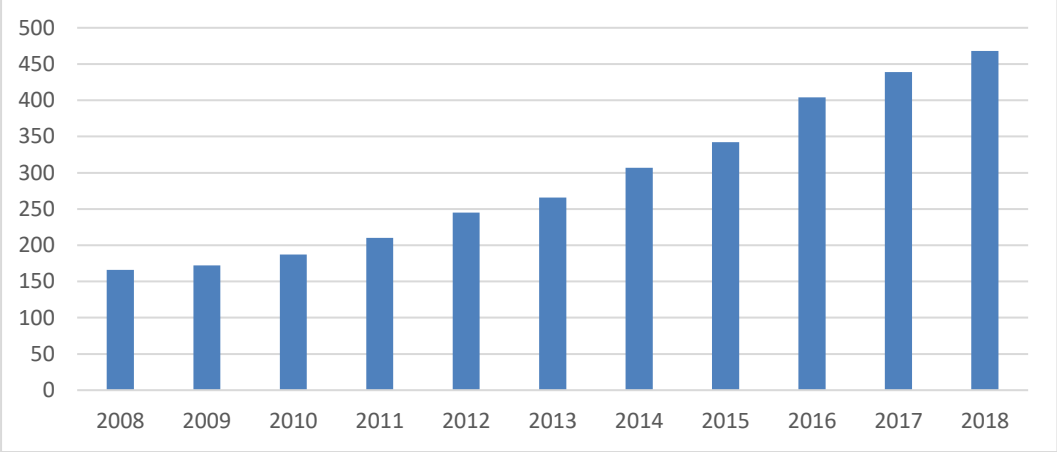

Figure 24. Number of those working in the aquaculture industry. *SourceRadarinn – The fishing industry dashboard, e.d.*

The increase of job creation in the aquaculture industry is mostly due to increase in aquaculture activities in the Westfjords and East Iceland. However, it is noteworthy that at the same time as more jobs can be found in the aquaculture industry in these areas, the gender gap in Vesturbyggð and Tálknafjörður, where most of Westfjords aquaculture activities takes place, is widening. That support various research, (Edvardsdóttir, 2013; 2016; Karlsdóttir and Ingólfsdóttir, 2011; Nikk I Norden and Nordic Council of Ministers, 2018) claiming that industrial development in rural areas tend to be male oriented and the aquaculture industry follows that pattern. Figure 25 shows the aquaculture part of employee compensation of the whole employee compensation in each region in Iceland. What is

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noteworthy is how important the aquaculture industry is in the Westfjords region from 0.3% in 2008 to 4.2% in 2018.

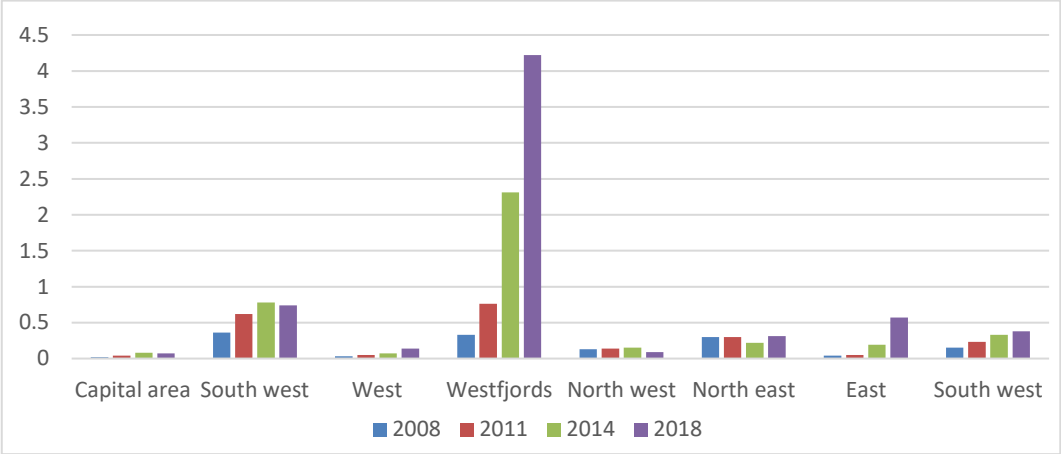

Figure 25. Portion of employee compensation in percentage by regions Source: Radarinn – The fishing industry dashboard, e.d.

This illustrates how important this industry has become as a major player in the future development of the Westfjords region.

When looking into conflicts at hub level, it seems that there is a consensus about the development of aquaculture in the area. At least the local interviews revealed that other industries in the region, f.ex., local fishermen, tourism, the calcareous algae mining industry and salmon anglers in the area have reached an agreement about how the aquaculture should develop in the fjords in harmony with the other industries.

4.2.3. Egersund, Norway

Description. Egersund Hub is located in the southwest part of Norway. This region of Norway has some naturally advantage in term of climatic and oceanographic condition for aquaculture purpose. In particular those natural conditions differ from the southeaster part of Norway due of the presence of the coastal currents that origin from the North Atlantic Current. The Norwegian Current (also known as the Norway Coastal Current) is one of two dominant arctic inflows of water. It is considerably warmer and saltier than the Arctic Ocean. This current dynamic is the reason why Norway have one of the biggest fishing industries in the world, harvesting an average of 3 million metric tons of fish each year (OECD 2021). Also, in Egersund hub area the water temperature, current and salinity conditions given by the costal water currents in addition to a bathymetric profile with very deep-sea bottom is one of the main reasons why aquaculture production in open sea pen is so well established.

Egersund hub is located between two important regions in Norway, the Agder in the East and Rogaland in the West side, the border of those two regions goes along Lundevatnet, who is the name of the lake that also set the border between Flekkefjord and the municipality of Lund and Sokndal (ICES 2021).

The location of the aquaculture sites and plants along the area of Egersund hub is mainly concentrated in the area of the region of Agder and municipality of Flekkefjord. The only exception is the freshwater plants of Bjerkreim, where they license to produce 100 tonns of trout (Salmo trutta) or arctic char (Salvelinus alpinus) in the freshwater lake of Ørsdalsvatnet (ICES 2021).

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Aquaculture. Fish farming business have faced a big growth during the pandemic year 2020 and 2021. In the whole Rogaland and Agder region the sale of slaughtered fish has increase from 66 thousand metric tons round weigh from Salmonidae, 613 tons of molluscs, and 0 reported tons of algae to 117 thousand tons from Salmonidae, 111 tons of molluscs and 249 tons of algae (Fiskeridirektoratet 2022) (fig. 26).

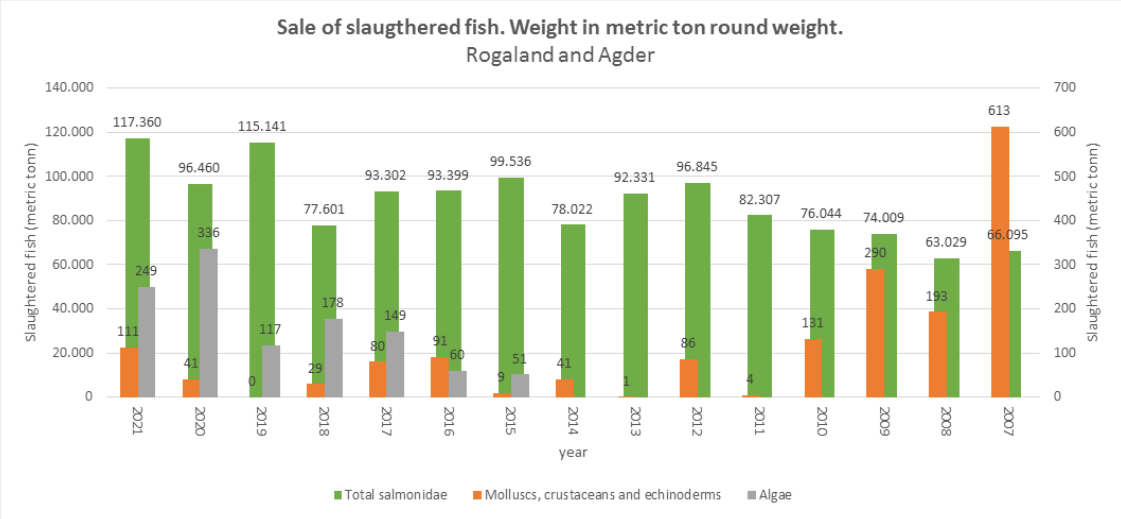

Figure 26. The figure shows the different sale of slaughtered fish in weight (metric ton round weight) in the time period 2007 and 2021. The three different colours of the columns refer to Salmonidae (green), molluscs (orange) and algae in grey. The study area is the region of Agder and Rogaland. Source: Fiskedir.no

The dominance of salmon industry is also reflected in the sale value of slaughtered fish. Only in 2021 the sale value of salmonidae in the Agder and Rogaland region only account for 5,7 billion NOK. In comparison, still for 2021, the sale value has been little bit more than 6 million NOK for alge and 799 thousand NOK for molluscs (fig. 27). The value increase of marine aquacultures industries, in the last decades, as shown in figure 8 in Annex 2 is an important driver for aquaculture growth in Norway as well as in Egersund hub. Meanwhile molluscs as crustaceans and echinoderms have been quite stable in value or even decrease, salmon sale, and especially algae have showed the biggest increase. The increasing global demand together with a god marketing and communication campaign globally is one of the main reasons of this growth of value (Fiskeridirektoratet 2022; Norwegian Seafood Council 2022).

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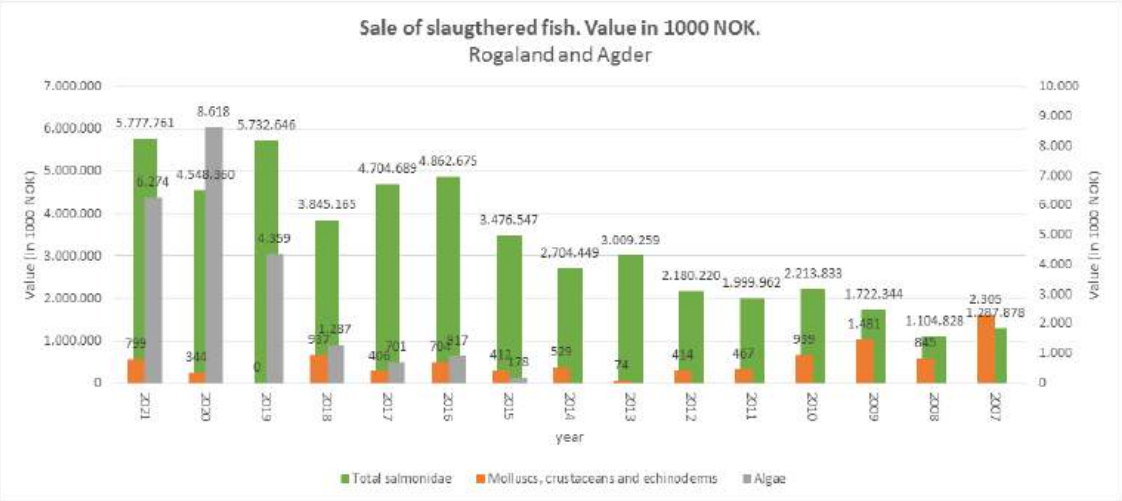

Figure 27. The figure shows the different sale of slaughtered fish (value 1000 NOK) in the time period 2007 and 2021. The three different colours of the columns refer to Salmonidae (green), molluscs (orange) and algae in grey. The study area is the region of Agder and Rogaland. Source: Fiskedir.no

In Egersund hub there are eight registered aquaculture company. For those working in marine environment the biggest biomass production licensed is still for Salmonidae, in line with the regional trends. All together the 5 localities placed in the municipality of Flekkefjord can produce 26 thousand tonnes of biomass. The second place in order of production capacity belong to seaweed production with 120 tonnes, this is also in line with the regional trends (figures 25 and 26). And last but not least there is licensed to produce 20 tonnes of cleaner fish and 10 tonnes of cod (land-based facility) (Fiskeridirektoratet 2022; Egersund group 2019).

Employment. Norway is an oil and gas nation, but fish export in form of both aquaculture and fisheries is the second biggest export in Norway. The region of Rogaland is characterized by a strong presence of both the industries meanwhile Agder is working in order to strength it's positioning in the seafood export (Statistics Norway 2023).

This political willingness is also reflected in the employment trends showed in figure 28 where the linear trend line reflects the steady increase of number of men and women employed in Agder together with Rogaland in the aquaculture sector in the time periods from 2010 to 2021.

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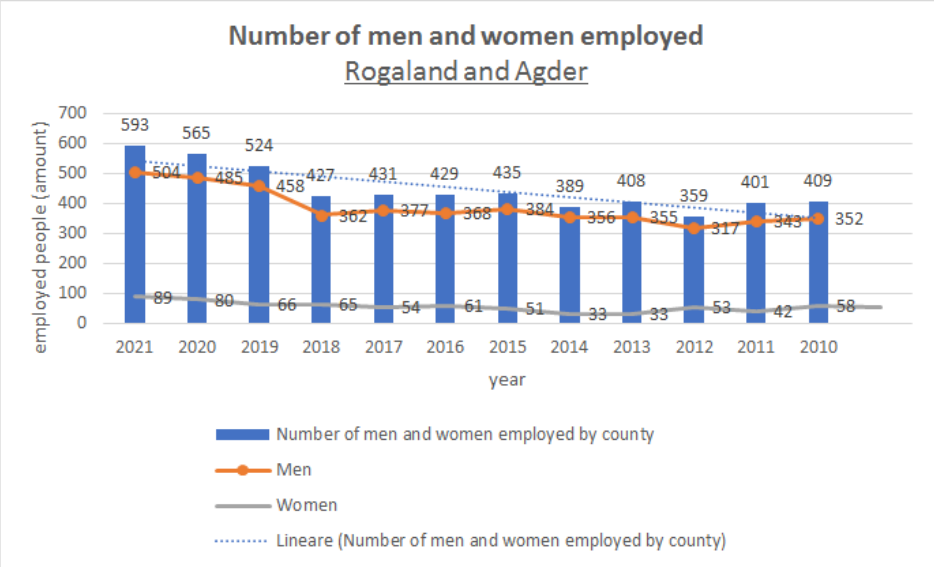

Figure 28. The figure shows the number of men and women employed in Agder and Rogaland in the aquaculture sector in the time periods from 2010 to 2021. The punctuate line show the linear trend of increase of employment in the sector. The blue columns show the total employment, the orange column account for the man and the grey for the women equivalent employed.

Moreover, the subdivision between man and women in work in the sector witness a very unbalanced situation. With relatively small variation with time the man has been the main gender at work in the field since 2010. The relation between man to woman at work are 5.8 in 2021 and 5.6 in 2010 (Statistics Norway 2023).

A concrete action done by the region of Agder to invert this trend and continue to guarantee the needed competence to this business is the establishment of an upper secondary school line in aquaculture, who took place in 2019. Those pupils, when they have concluded theirs 4 years long school and traineeship period is ready to guarantee the needed knowledge and competence to an industry in growth.

The aquaculture industries have always been facing many challenges due to the complexity to preserve the environmental balance when this are exposed to intensive production. In addition to the social pressure given by the occupation of natural marine and freshwater (but also land based) surface for industrial purpose. The main challenges related to intensive aquaculture industries, especially when it operated in open sea pens is its effect to the environment and consequence alteration of the habitat (Fiskeridirektoratet 2022).

Regarding the social pressure given because of the occupation of natural marine and freshwater (but also land-based) surface for industrial purpose, the conflict is particularly high in the area of Egersund hub where the crossing interest along the shore is very high. The main uses of the marine, but also freshwater environment are fisheries and recreational use. On the top of that, Norway is pressed internationally for sticking to the international convention that have been signed during the biologic biodiversity convention in 2010. In this convention Norway agreed to have 10% of the coastal shoreline protected before 2020, and there is now a new goal to increase this percentage to 30% for 2030. For

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comparison, Norway, today in 2022 have almost 4% of its shoreline protected, and of this only a very small part is totally protected from human intervention (Salt 2022).

All together there are promising perspective for the aquaculture field in Egersund hub, mainly given by the outgoing investment on the technology front that will most likely improve the research and development in the direction of more sustainable circular economy-oriented aquaculture. This provides the potential to strength the employment numbers of the district, the preservation of habitat and increase the reputation of this blue business.

4.2.4. Varangerfjord, Norway

Description. The fish farming hub in Norway is Varangerfjord. Varangerfjord is part of Troms & Finnmark County. There are 4 municipalities in Varangerfjord HUB populated with 21 413 inhabitants (year 2021). The municipalities are Sør-Varanger, Vadsø, Vardø og Nesseby (Statistics Norway 2023).

The Varangerfjord (Northern Sami: Várjavuonna, Kven: Varenkinvuono, Finnish: Varanginvuono) is the easternmost fjord in Norway. The fjord is located in Troms og Finnmark county between the Varanger Peninsula and the mainland of Norway. The fjord flows through the municipalities of Vardø, Vadsø, Nesseby, and Sør-Varanger. The fjord is approximately 95 kilometers long, emptying into the Barents Sea. Its mouth is about 70 kilometers wide, located between the town of Vardø in the northwest and the village of Grense Jakobselv in the southeast (fig. 29). The biggest municipality in the Varangerfjord HUB is Sør-Varanger with just over 11.000 inhabitants, followed by Vadsø (5600), Vardø (2000) and Nesseby with just above 900 inhabitants (Statistics Norway 2020b).

The number of companies in the municipalities differ from around 150 in Nesseby to over thousand in Sør-Varanger. In terms of company structure, Nesseby and Vardø have more companies in agriculture, forestry and fishing (where fishing is dominant). Sør-Varanger and Vadsø have a more diverse company structure (Statistics Norway 2023).

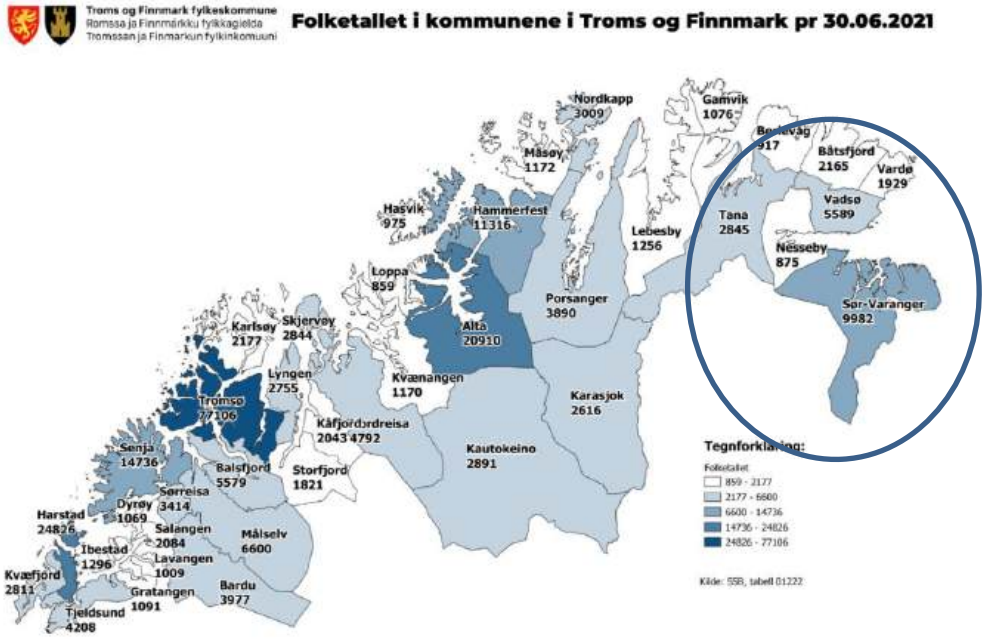

Figure 29. Map and municipality population in Troms and Finnmark County

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Employment. By 2020 there are 728 employees working in aquaculture in Finnmark. This includes farming, slaughtering and fileting, and smolt (juvenile) production. In the Varangerfjord HUB – the main activity is in Sør-Varanger municipality, which hosts 48 workers. Vadsø and Nesseby municipalities have 2 and 3 workers. Lerøy Aurora Ltd owns and operates farming and processing related to aquaculture in Varangerfjord. In Finnmark County there are only National Aquaculture companies who own and operate production. There are no local actors in the business (Statistics Norway 2023).

Aquaculture and fishery. In the Varangerfjord hub area four production licenses have been granted. Two in sea-based facilities and two land-based facilities with salmon smolt and arctic charr production. There is also one license for shellfish and macroalgae production. The sea cage farming license for salmon is owned by the company Lerøy Aurora (Norges Råfisklag 2020).

Fisheries are important in the hub too. The traditional fisheries in Varangerfjord hub are whitefish (cod, saith and haddock), halibut, shrimps and red king crab, where approximately 140 small fishing boats (size under 11 m) are fishing and delivering their catch in the Varangerfjord (fig. 30).

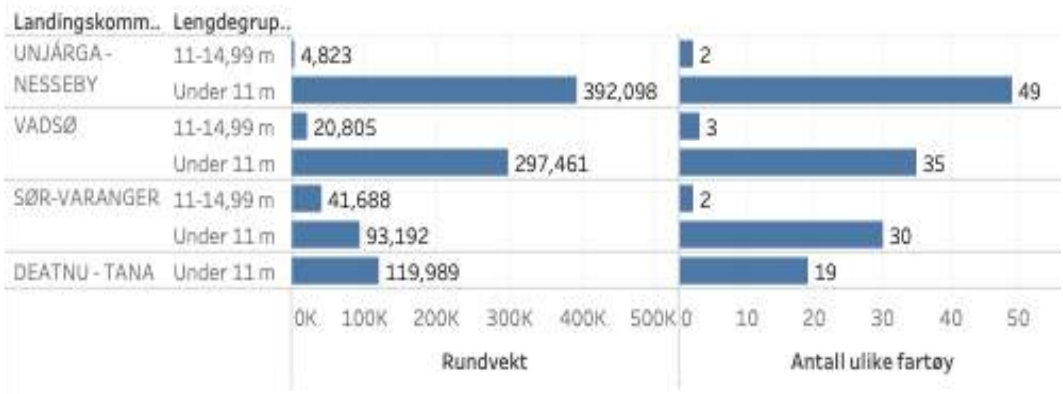

Figure 30. Catch (tons) and number of fishing boats fishing cod and saith in Varangerfjord in 2020. *Source: Norges Råfisklag (NRL).*

The red king crab (RCK) was introduced to the southern Barents Sea in the 1960's with the aim to develop a new, commercially attractive stock of the species. In the subsequent decades, the stock has indeed become abundant and widespread, but the species' presence also implies intense predation on benthic biota and thereby severe degradation of benthic ecosystems. King crab is the most valuable species currently exported from Norway. In Norwegian waters, the RCK is managed according to two different approaches. In the areas east of 26 °E (North Cape), the fishery follows a conventional management regime, whereas west of this border an eradication fishery is implemented. Since 2000, a total of 38 539 tons of RCK have been caught, 89 % of the catch has been registered in the quota area while the remaining catch has been taken in unregulated sea areas. In 2020, Norway king crab exported MNOK 668, equivalent to a volume of 2017 tons (Seafood.no). A total of 772 vessels with king crab concessions have been registered in 2020: 665 vessels in open group and 107 in closed group. Of this, 106 king crab vessels are related to Varangerfjord (Norges Råfisklag 2020).

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4.3. Discussion and Conclusions on Fish Farming

The four fish farming hubs included in ArcticHubs project have different characteristics, but they all show that the industry is growing in the Arctic and is generating high-value export products that contribute more and more to national GDP/GRP. Another common aspect is that the industry employs more men than women. This is an important challenge: as the hubs in Iceland and Faroe Island show, fish farming could be an attractive industry for new workers, and the presence of this activity could help reduce or even invert the rural outmigration trend. At the same time, since women migrate toward bigger cities more than men, rural communities are affected by gender imbalance: a more inclusive fish farming industry, today reported to be mostly male-dominated and male-oriented, could help facing this challenge. Main aspects are shown in table 5.

Table 5. Comparison of key characteristics between fish-farming hubs

Key characteristics	**Westfjords, Iceland**	**Suðuroy, Faroe Islands**	**Varangerfjord, Norway**	**Egersund, Norway**
Population dynamics	Decrease in population since the 70s caused by major changes in fishing industry. New rise from 2016 with aquaculture growth. Gender gap: nearly 100 more men than women	Population declines after economic crises in the early 90s, upward trend in recent years. population aging. Gender imbalance	Population decreases (county level)	Relatively stable no. of inhabitants from 2016 to 2022 Gender distribution is 7549 males to 7311 females (2022)
socio-economic challenges	gender gap is widening	Struggle to be part of the industries to benefit local community	Challenge to find synergies that help to create better dialogue between the different actors in the coastal zone.	Main uses of the marine resources (recreational vs economic use)
companies and ownership	Fjarðarlax, Arctic Fish, Arnarlax: founded by Icelanders but then bought by Norwegian company SalMar ASA	Bakkafrost. Expansion and production increase planned. Ownership is centralized and non-local	Lerøy Aurora Ltd, Norwegian but not local	MOWI ASA Flekkefjord – wold's biggest salmon producer Norsk Ørret AS Bjerkreim
production	Salmon and Arctic Charr	Salmon	Salmon and Arctic Charr	Salmon, Arctic Charr, trout, seaweed, cleaner fish
employment	Growing (data on national level)	Growing but unstable and variable between seasons. 100 new employees expected with Bakkafrost expansion	48 (Sør-Varanger) + 2 (Vadsø) + 3 (Nesseby)	Steady increase of men and women being employed in Agder and Rogaland in Aquaculture
gender	Aquaculture and fisheries are male-dominated industries: woman seek job elsewhere, mostly in bigger cities	Gender imbalance. Aquaculture employs more men	-	Men/women ratio in 2021 is 5.6

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education	More women than men have a university degree	-	-	establishment of an upper secondary school line in aquaculture (4 years of school and trainsheep), who took place in 2019 in Agder
conflicts	It seems that there is a consensus about the development of aquaculture in the area.	All available areas in coastal zone have been exploited: expansion will be off-shore or land-based (need for large amounts of energy, fresh water and land) Ownership is non-local: communities have no control over development Large volumes of wasted are released in the fjords: changes in the ecosystem services used by locals Smaller-scale industries have been displaced	The level of conflict between the various players in the coastal zone can be high at times. What is seen is that there is often a conflict about the use between existing and new industries.	Water quality: use of water from lakes from which are used by residents for drinking water; environmental impacts: spread of sea lice, disease, and emission of nutrients, organic waste, medicine and other foreign substances into the marine environment. To solve it, new technology of closed pens; cost protection and recreational use

In all three countries, aquaculture is a growing industry. While Norway and the Faroe Islands have had strong growth since the 70s and 80s, Iceland is now catching up. Aquaculture jobs are also well paid, requires higher education and have in general a better gender balance than traditional fisheries. For coastal communities, this new industry represents a possibility for new growth, in communities where the number of fishermen and employees in fish-processing has been decreasing (as fisheries modernize, the number of fishermen decrease, but with well-managed stock, the value of the fishery and the pay for fishermen increase). Aquaculture now employ more people than the wild fisheries in Norway and the Faroe Islands, while Iceland will need some time to get there.

However, aquaculture also has its challenges, both regarding environmental and social sustainability. All food production has an environmental footprint that must be understood, monitored, and held within limits given by a sustainability framework. Aquaculture still have issues with lice and escapes, many disease issues have been handled with vaccines (but some remain), and the release of nutrients is closely monitored and controlled (Hauge et al. 2021).

On the social sustainability side, the aquaculture industry is expected to contribute to local communities. The international market situation for salmon, with very high profitability, attracts global players to invest in the aquaculture industry, sometimes weakening the link with the local community. To the extent that local players want it, ownership changes from local to (inter-)national, often with good profit for the locals who sell. In Iceland, where the industry is now growing by foreign companies, it is feared that much of the labour will not be from the residents (Fiskeridirektoratet 2022).

A related challenge is the industry's ability to attract labour. We see that both jobs and economic values are created which can provide a basis for settlement. Still, we find that the peripheral

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communities are unable to recruit, especially younger people, but also families and women. They would rather live in cities and towns than in the peripheral areas where nature-based businesses often operate. We see a decline in the population in the periphery, even though the opportunities for work are good. This is part of a global trend of urbanization and centralization, though, and challenge that may be too big for aquaculture alone to turn around.

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5. MINING

In this chapter, we focus on the mining industry in the Arctic, particularly the eight mining hubs from three Arctic countries, Norway, Sweden and Finland, and one learning-case country, Italy. All the eight hubs are co-located with either tourism or indigenous hubs, and two of them are co-located with a third, fish farming hub. This will provide a summary of some of the key characteristics to analyze the socio-economic impacts of mining industry in the Arctic.

The detailed mining industry report is attached as Annex 3 to this report.

5.1. Overview of MINING industry in countries

5.1.1. Norway

Norway has a long history of mining and exploration with rich deposits. Large-scale mining started in the 17th century, and several towns were built up around mining resources. Foreign investments were important for mine development in the late 1800s and early 1900s, particularly in the northern part of the country. The first oil was found in the North Sea in 1969, and Norway entered the petroleum age. This affected other industries as the focus shifted to a strong State control over petroleum resources, securing decades of massive income to the State budget and welfare state through taxation. The Norwegian State has not given the mining sector the same financial support, which became less important for industrial priorities and for the national economy.

When presented in the national statistics, mining production in Norway is divided in five categories of products: building materials that are used in construction, industrial minerals that have non-metallic characteristics, metallic ore, natural stone, and energy minerals. In 2020 total value of mining product was 12 billion NOK, of which 5.44 billion went for export, which constituted 104 million tonnes of mining products (Dirmin 2021).

The mineral industry provides only 0,17 % of total employment in the country. The employment decreased from about 6300 persons in 2013., as a result of the closure of Sydvaranger mine in Kirkenes in 2016 (fig. 31). Rogaland and Nordland regions are the most important for mining employment.

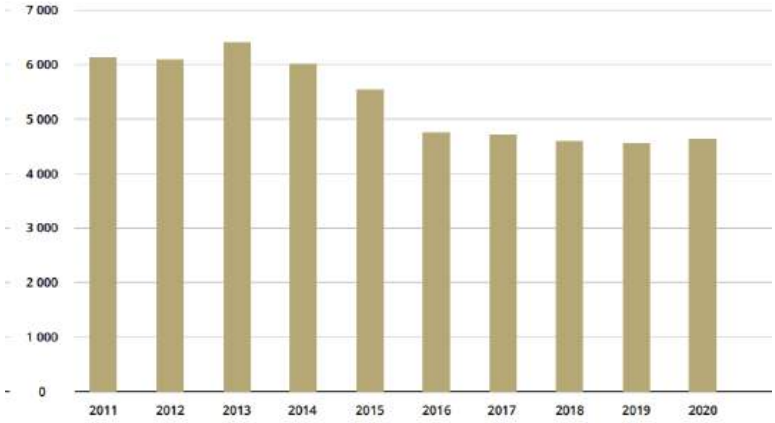

Figure 31. Employment in the mining industry 2011-2020 (Dirmin 2021)

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In 2019 the total investment in the existing mining industry was 2 billion NOK (DirMin 2020), which compared to the last 10 years, was the highest during the period. No new mines were opened in 2019. Another indicator is investments in exploration activities, which increased considerably in 2020 compared to previous years (DirMin 2021).

After many decades with moderate mining activities and no new mines opening, a shift appeared in the State mining policy with the increased focus on development of natural resources in the northern part of the country, particularly articulated with the first national "Northern strategy" in 2005 (Ministry of Foreign Affairs 2005). State programs for exploration of resources confirmed valuable deposits in the northern part of the country. Mining legislation was at this time fragmented and not suitable for attracting investments to the industry. A new Minerals Act was adopted in 2010, and the Government worked out a national Mineral strategy (2013). This led to several foreign and national initiatives in exploration, but few of them were taken to the level of application for license, due to a long and complicated planning and bureaucratic process. Most of the planned mining projects are in the northern part of Norway, in areas where Sámi interests and rights holds a strong position, particularly traditional reindeer herding. Another challenge in gaining local acceptance for new mining projects is the mining tax system not providing for a proportional economic benefit to the local societies affected by the industry. This, among other challenges, is raised in the Minerals Act now under revision.

Another contested topic for implementing the national mineral policy is the increased opposition to the deposit of mining waste in the Norwegian fjords, causing harm to marine life and fishing/aquaculture industry. Norway is one of very few countries to permit this form of waste disposal, and the Government decided in 2020, to stop this practice for new mining projects, but allowing two disputed mining projects (Nussir in Kvalsund and Nordic Mining in Engerbo) that already had the permit, to continue with their plan for fjord deposits. This practice is challenged by the EU water directive.

The role of the municipality is unique in Norway, as the Planning and building act entitles the Municipal Council to allocate land for mining operations. The municipality can consequently reject a mining initiative. This was the case when the Swedish company Arctic Gold tried to develop a mine in the sámi Kautokeino municipality in the period 2013-2015. Such a possibility to stop a mining initiative is often assessed as a "disadvantage" for attracting investors. Despite some local resistance, the regional level in Northern Norway is still eager to attract national and international investors to the mining industry, and in 2019 the County Councils of Nordland, Troms and Finnmark worked out a Mineral strategy of Northern Norway (Ministry of Foreign affairs 2005). The strategy aims to develop a sustainable northern mineral industry moving towards the green shift.

5.1.2. Sweden

The mining history in Sweden dates back to the end of the Viking age around the year 1000 (SGU 2022). During that period mining began at the Falu copper mine. The mine became vital for Sweden's economy and politics and during the 17th century. Production of ore and metal industry was difficult in the low populated, harsh environment and it was not until the early 20th century that the exploitation of these ores reached an industrial level. The other important mining district Boliden were discovered in 1924. Metals like gold, silver and copper from different mines in the area were produced locally and the Boliden gold mine became the largest and richest in Europe. Production from this gold mine ended in 1967 but the mining area has continued to be important with new mines opening up as old ones shut down.

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Mining production in Sweden consists of five categories of products (SGU 2022): metallic ore production, building materials, industrial minerals, dimension stones and energy minerals. The total export value from the mining industry (ores, metals and minerals) in Sweden was ca. 170 billion SEK 2021, which is about 11% of total export (SGU 2022). At the same time, the import value was ca. 130 billion SEK. Europe is the major export market followed by Asia. The total mineral export expressed in tonnage was ca. 35 000 tonnes while the total import reached ca. 16 000 tonnes.

In 2021 the reported number of employed in the mining industry was 7 387, with 25 % of the workers being women (SGU 2022). If subcontractors are included the number is slightly higher. In 2020 the total number was 7 934 (SGU 2021).

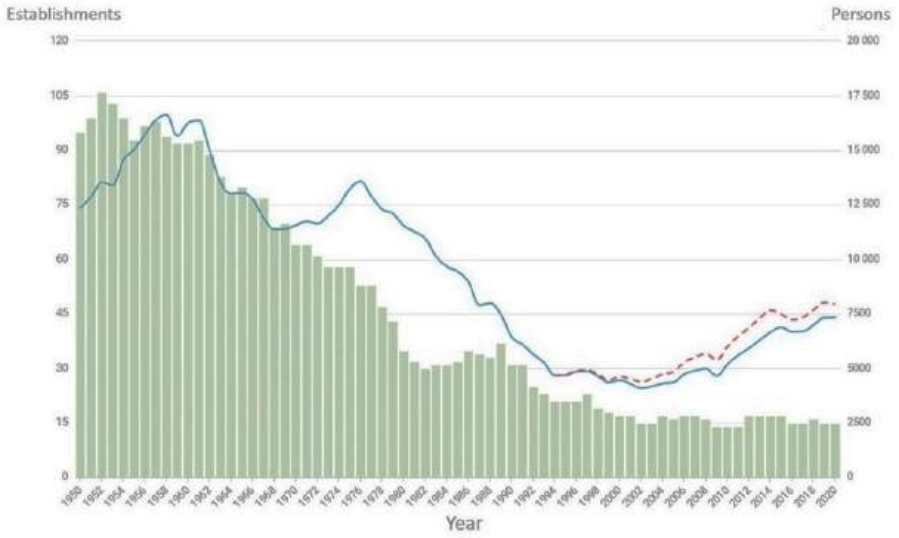

Figure 32. Number of establishments (green) and persons employed in the mining industry 1950-2020. Blue line is reported numbers, red line includes subcontractors (SGU 2021).

In 2019 the Swedish mining industry invested 6.3 billion SEK which is slightly higher than in previous years. The number amounts to approximately 9% of the total investments by all Swedish industries. Most of the mining industry investments go to fossil-free production.

Since 2018 no new mines have been opened. The number of active mines is currently 12 after the Maurliden mine closed down in 2019. Since the financial crisis in 2009 the total production from Swedish mines has almost doubled (SGU 2022). The exploration costs correlate with exploration activities and saw a sharp increase in the beginning of the 2000 due to growing international demands for metals. Exploration costs went up from 970 million SEK 2020 to 1 230 million SEK in 2021. During 2021 the number of exploration permits increased to 585 compared to 550 in the end of 2020. Exploration activities are mainly focused around already present mines rather than attempting to find new mines (SGU 2022).

Sweden is currently ranked 10th by the Fraser Institute in their annual survey of mining and exploration companies (Fraser Institute 2020). Sweden's current mineral strategy was published 2013, which aim to increase that position showing the State's positive attitude to the mining industry. Recent survey among the Swedish political parties (Svemin 2022) showed that the right-leaning parties are much

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more positive to changing the mining policies in favour of the mining industry than the left-leaning parties. Thus, the result of the upcoming election will likely have a profound impact on state support of mining.

Most of the operating mines are located in Norrbotten and Västerbotten counties, in areas where Sami interests and rights holds a strong position, particularly traditional reindeer herding. The reindeer herding communities have long been opposed to new mining activities because of the large impact on reindeer and reindeer husbandry. As a response, the Sami Parliament made a statement in 2013, approved by the plenum, calling for an immediate stop of all new mining activities such as new exploration permits, work plans and mining concessions (Sametinget 2014).

Mines also have an unavoidable impact on the environment and Swedish environmental groups have strongly opposed new mines in the area claiming that biodiversity, ecological values and climate will be negatively impacted and that there are risks for pollution of air and water (Naturskyddsföreningen 2015).

5.1.3. Finland

The history of mining in Finland goes back at least to the 1500s (Nurmi and Rasilainen, 2015). The Ojamo iron mine in Southern Finland, discovered in 1530, is considered to be the oldest metal mine in Finland. The pace for opening new mines was high during 1955-1975, diminished in 1975, and was low during 1990–1999, possibly reflecting the economic recession in the early 1990s and low commodity prices. The pace has been increasing since the change of 2000s, several mine projects being on the way.

The selection of metals mined in Finland has changed over time. By the end of the 20th century, mining volumes of all the base metals (copper, nickel, zinc, lead, cobalt) had decreased due to the closure of several major mines. Only chromium production had continued to increase steadily. Since the beginning of the 21st century, the mine production of base metals has started to increase again.

The mines that are operating now, have been established by the regulations of the Mining act (503/1965) or before that (Turja, 2022). The mining act has been reformed in 2011, and existing government has committed to reform this mining act again, in order to better meet the standards for environmental protection, securing the prerequisites for mining operations, and to better the acceptability and possibility to participation for locals.

There are 45 mines in total, of which 9 are metallic mineral mines, and 36 are industrial mineral mines. In 2020, a total of 48.6 Mt of ore was extracted in those mines (Vasara, 2021).

The industrial production value of mining was 1.7 billion euros during the year 2020 (Official Statistics of Finland 2021). Finland has unique mineral resources in Europe regarding battery production, which is becoming more and more important. The total output of mining activities and activities related to mining (like concentration and downstream plants, and the suppliers of services and machines), the mineral cluster, has been evaluated to be around 22,1 billion EUR, of which 12,2 billion is direct effect (Hokkanen et al., 2020). The mines in Finland are inputting material for refinement, and the sales volume of refinement businesses was around 10 billion EUR in 2020 (Teknologiateollisuus ry. 2021).

Even though the volume of domestic mining has multiplied during ten years, the production is not enough to meet domestic demand, and in 2020 3.8 Mt of metallic ore concentrates were imported to Finland (Vasara, 2021).

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Finnish Safety and Chemicals Agency (Tukes) is the supervising authority of mining, and it controls that the activity and land use required by the mining operations are operated socially, economically and ecologically sustainably (Mining act 621/2011). In addition, every mine established in Finland needs a mining permit, a mining safety permit, and a permit for handling and storing chemicals and explosives from Tukes (Tukes, 2022b). All mines also need an environmental permit from the environmental authorities, and a zoning plan by a local authority is often a condition for opening a mine.

The number of employees in mining industry has been rising during the last decade in Finland (fig. 33), and the rise has been bigger in the mining operation supporting activities (Ministry of Economic Affairs and Employment of Finland, 2021; fig. 33). The mineral cluster is employing 87 400 person-workyears by direct and indirect means, of which direct means are 24 600 years (Hokkanen et al., 2020). The regional effects are most visible in Lapland, Kainuu and Satakunta regions. The staff number in the refinement businesses has been around 16 000 during the last years (Ministry of Economic Affairs and Employment of Finland, 2021).

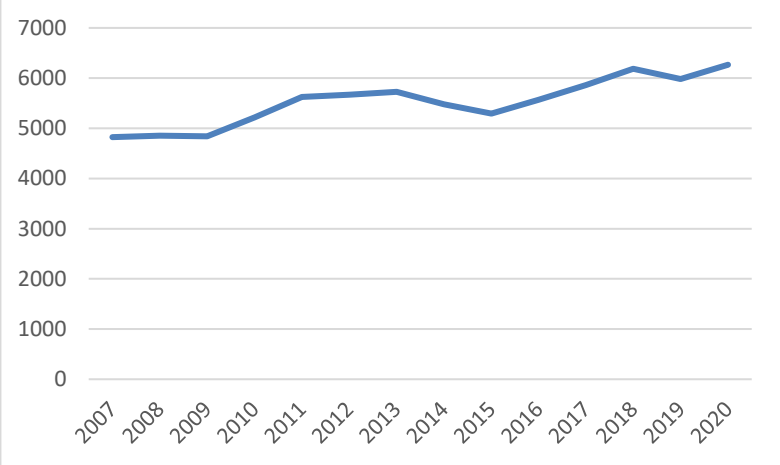

Figure 33. Employment in mining industry in Finland during years 2007-2020 (Official Statistics of Finland 2022a)

Mining in Finland has been developing during the last years, and new mining areas are being planned continuously; 50 companies were doing mineral prospecting during 2021. Most of them were happening in North-Finland, for example in Lapland. Lapland is an attractive place for new mining activities, since there are sufficient resources, good geological knowledge, a high education level and good infrastructure quality. There are many plans of opening completely new mines, or reopening some of the closed ones (Hokkanen et al., 2021). One of the most significant recent mining projects has been the opening of Sotkamo Silver Oy Silver mine in 2019 in Kainuu (Pokki, 2021).

Finland has been ranked one of the most attractive countries for mining by mining companies, based on their geologic attractiveness, the effects of government policies, such as regulations, taxation levels and the quality of infrastructure (Finland's Minerals Strategy, 2010; Yunis and Aliakbari, 2021). Finland offers a good working environment for mineral prospecting and mining activities (Finland's Minerals Strategy, 2010). Mining activities are also funded by different tax aids, like energy tax aid and electricity tax aids (Pietarinen and Roslund, 2018). However, during the last years, investors have been expressing increasing concerns over uncertainty concerning restrictions on land use, legislation becoming more

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complex, and lengthening of permission processes (Finland's Minerals Strategy, 2010; Yunis and Aliakbari, 2022). The competition on land use and the disputes and restrictions on that bring increasing challenges to all mining activities. Mining companies have to compete for example with nature protection and tourism. But usually, the land area needed for mines is relatively small, and a modern mine does not release significant amount of emissions.

5.2. Mining industry in the hubs

5.2.1. Norwegian mining hubs

ArcticHubs project includes four Norwegian mining hubs: Svalbard, Kautokeino-Kvalsund and Varagerfjord in Troms and Finnmark region and Egersund in Rogaland region. Industrial minerals are most important in the northernmost Troms and Finnmark. Metallic ore are mainly found in Nordland region. Rogaland region is dominated by building materials. The southwestern Rogaland is the leading region with 943 employed. The Northern region Nordland comes second with 753 employed, and our analyzed region Troms and Finnmark has a modest employment of 374 (DirMin 2021).

Troms and Finnmark region: Kautokeino-Kvalsund and Varagerfjord hubs

The two northernmost regions Troms and Finnmark merged in 2020, as a result of a regional reform. Here we present statistical data from the merged region.

The region had in 2021 a population of 242 000 (SSB statistics 2021). Population dynamics of Troms and Finnmark confirm that the region has experienced a steady population increase up to 2019. This is in line with the rest of the country, mainly driven by immigration, but in contrast to northernmost regions of Sweden, Norrbotten and Finland, Lapland, that has experienced a decline. The population increase came in the bigger cities, mainly driven by the locomotive Tromsø, but also in Harstad, Alta and Hammerfest. Smaller municipalities along the coast and the inland experienced in the same period a decline. This development follows the centre-periphery dimension of young people in fertile and working age moving to cities while the smaller communities are left with an increasing number of senior citizens.

5.2.1.1. Kirkenes/Varangerfjord hub

Kirkenes town is the center of Sør-Varanger, the easternmost municipality in Norway bordering Russia to the east and Finland to the south. The national interest of keeping the Norwegian population, businesses and presence in the area is high, caused by the strategic position with only border crossing point between Norway and Russia. As a mining hub, we limit the analysis and use of statistical data to Sør-Varanger municipality (Nord Norge).

Kirkenes, located in a side fjord of Varangerfjord is a transport hub in the Barents region, with an ice-free port and all year-round access to the Barents Sea. Kirkenes has a role in the Northern Sea Route with the potential for transport natural resources to Asia (Nord Norge). This has generated a market for ship repair, particularly fishing vessels from Russia, and the port is used for bringing in and out Russian crew. This generates retail trade, and the introduction of "visa border zone" in 2012 made travels across the border easier for the local population. The national institutions for Barents cooperation, the Barents Secretariat, is located to Kirkenes (Royal Ministry of Foreign Affairs 2010). Another important industry is tourism.

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Sydvaranger mine, located at Bjørnevatn outside Kirkenes, has a long history of iron ore mining and processing from 1907. The company town of Kirkenes has a strategic importance next to the Russian border and the state-owned industry kept employment and settlement in the border region. At its peak, a total of 1600 employees worked for the company, and during the whole period of operation 200 million tonnes of iron ore was extracted. The mine closed in 1997 due to low demand and decreasing global iron ore prices, and the Norwegian State was no longer prepared to subsidize an unprofitable company. The global mining boom resulted in a restart of Sydvaranger mine in 2009, now by the Australian company Northern Iron, but went bankrupt in 2015 followed by a new closure. During this short period, the company extracted and exported 8 million tonnes of iron to Europe, Middle East and China (Sydvaranger 2022).

A new Norwegian initiative based on American investments, planned for a reopening of the mine, but on a smaller scale. In January 2021, Tacora Resources Inc. (2021) was announced as the new owner. The company consists of several international investment partners, predominantly US lead, and currently runs a mine in Canada. Indicated reserves are 475 million tonnes of iron ore with the expected annual production of 4 million tonnes. Covid restrictions halted the planning of the startup in Kirkenes, and only a small number of local employees are engaged to look after the facilities and prepare for a new start. Local people question the lack of information on future plans, particularly as the town is badly affected by the sanctions towards Russia, with a considerable business sector relying on Russian customers, particularly within trade and maritime sector. A reopening of the mine could ease the effects of rising local unemployment caused by the politically tense situation.

Over time, the different mining initiatives revealed diverse local consequences affecting the population of the town as well as the landscape with huge landfills. Local opposition to the reopening of the mine is for instance linked to noise and air pollution/dust from heavy transport/traffic and processing as well as fjord, lake and river pollution from the tailings, negatively affecting the marine life and marine-based industries (Richardson 2023). Recreational and tourist sector is also affected, as well as reindeer herding.

Employment in mining, and the multiple closures and reopening, has affected the population dynamic of Sør-Varanger municipality (fig. 34). The closure of the state owned mine in 1997 lead to a sharp population decrease, but by the reopening in 2009, the figures had started to increase. Again, when the mine closed in 2015, the figures went down, but not so abruptly this time (Statistics Norway 2020b).

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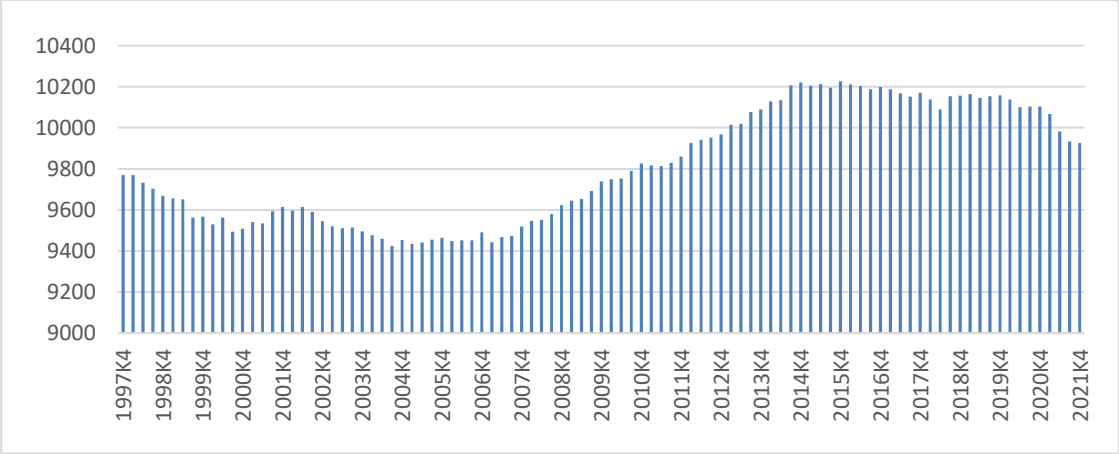

Figure 34. Population dynamics Sør-Varanger municipality

5.2.1.2. Kvalsund/Kautokeino hub

Kvalsund is a traditional sea Sámi community, which means that the main activity has been a combination of small-scale farming and fishing. These livelihoods have gradually diminished, and people found other work by moving or commuting. Due to more than a hundred years of assimilation policies, outmigration and commuting to neighboring cities, Sámi traditional livelihoods and language gradually impaired, as well as much of the Sámi identity (Minde 2003). With a thriving northern petroleum capital in the neighboring Hammerfest, a substantial part of the Kvalsund population commutes for daily work. In 2020 the two municipalities merged, confirming that they for some times have been one labour market region.

The territory of previous Kvalsund municipality is extensively utilized as pastures for reindeer husbandry in the spring, summer and autumn. Mining has taken place in the area for shorter periods, last time from 1972-78, and produced 3,1 million tonnes of copper ore. Kvalsund needs new employment, and a more diversified industrial structure as young people leave the area for more opportunities in the cities. Nussir ASA (2023), a new Norwegian mining company, dependent on foreign investments, have since 2006 planned for an opening of a copper mine. Nussir received an operating license from the Government in 2019, supported by the local council but plans for a sea deposit in the fjord and effects on land use utilized by reindeers caused protests from environmental NGOs, the Sámi Parliament Sámi organizations and other user groups. The Nussir project is currently on hold as the planning status of the new area for shipping out the copper, Markoppnes, is unsettled. Since this is a new territory, no previous EIAs have been conducted.

Kautokeino is Norway's biggest municipality when it comes to territory, and the Sámi "capital" with 95 % of its population indigenous Sámi, being one of only two Norwegian municipalities where the Sámi people are in majoritysami (Nygaard 2016). Reindeer herding is the main industry as well as a strong public sector with several Sámi institutions. The trekking patterns of the reindeers to the coast and other municipalities implies that land use changes in all these areas disturbs Sámi reindeer herding. The area Kautokeino-Kvalsund is affected by industrial development, infrastructure development, recreational and tourist expansion and energy projects. Unemployment rates reveal a need to find alternative employment and business development. Kvalsund is used as spring, summer and autumn

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pastures for reindeer husbandry, some of them with winter pastures within the territory of in Kautokeino municipality (Espiritu 2015).

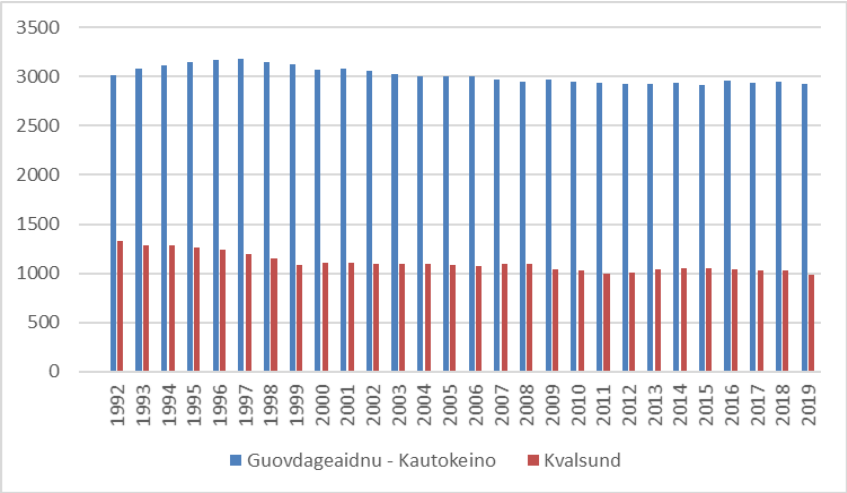

Figure 35. Population dynamics in Kautokeino and Kvalsund municipalities (1992-2019)

Back in 2004, a newly founded Norwegian mining searching company got permission to test bore for copper in the Nussir Mountain in Kvalsund. Copper mining previously took place in Kvalsund, the last time for a few years in the 1970s, but closed down due to low market prices. The global mining boom inspired the new company Nussir, based on Northern Norwegian capital, to start the licencing process for gaining access to the resources. The company presented the draft-planning program in 2010, and public authorities and interest groups had the chance to comment on the document during the process of scrutiny. The company ordered several environmental impact assessment reports from different scientific and consulting specialists to fulfil the obligations of Environmental Impact Assessment (EIA) studies. Kvalsund Municipal Council supported the planning program from the very beginning, and little debate have ensued on the possible adverse effect of the mine in that period. The local politicians are aware of the needs of the reindeer herders for future herding but do not consider the mine as the end of reindeer herding in the area. The local politicians have instead mainly focused on the project's role in facilitating new local jobs and possible new migration to the area (Nygaard 2016b; Nygaard, Carlsson, and Sletterød 2017). The new mine is estimated to give 150 new jobs, but with the limited available local workforce, employment must be based on migration or commuting. Such an influx of new residents can be a challenge and requires good planning on the part of the municipality and company to encourage permanent settlement instead of extensive "fly-in fly-out" arrangements (Eikeland et al. 2009; Storey 2010). The company got the final license for depositing the waste in the fjord in 2019, but is still not building due to objections from various stakholders like Sami Parliamnet, Reindeer herders, Governor. The company slightly changed the location of shipping out the copper to the industrial area Markoppnes, causing protests as this area was not studied in the EIA.

The Nussir company was originally funded by investors from Northern Norway and presented itself as grounded in the region. Gradually, when they needed more finances to continue with the preparations and the extensive EIA-studies, the company had to look for money elsewhere in Norway and abroad (Nussir 2017). Nussir today has just over 50 % Norwegian shareholders, and the rest international (banks and investment companies). Nussir has, during these years of planning and preparing, extended the area of test boring, and increased the number of indicated resources. The figures keep on changing

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but was in 2022 24,4 tonnes of copper ore, a considerable amount of waste rock, and tailings. The tailings deposited in the Repparfjord, will cover an area of 25 million m3 with masses contaminated with Xantat - SIBX, a flotation chemical used during extraction process to separate copper from the waste rock. This is the biggest copper reserve in Norway. The two mines at Ulveryggen and Nussir mountain is planned as an underground mine, the first with a 8 years lifespan, the other approximately 16 years (data from 2017) (Nussir 2023). A feasibility study from February 2022 presented the objective of making the Nussir project the first fully electrified mine in the world.

In August 2021 Aurubis, the potential buyer of the copper production, decided to terminate the memorandum of understanding regarding supply due to insufficient corporate social responsibility, as certain social aspects of the project need to be given even greater consideration. This decision was made after a long youth environmentalist protest camp at the site and active lobbying from the Sami Parliament.

5.2.1.3. Svalbard

Statistical data from Svalbard is produced separately as the island has a special status. Svalbard had 2726 inhabitants in 2019. The majority lives in the Norwegian settlement Longyearbyen, a traditional mining community and in the Russian mining settlement Barentsburg (Statistics Norway 2023). The Norwegian mining activity in Svea closed down in 2020 and the village has presently no permanent residents. A huge restoration project is going on to bring the mining town back to nature. The Russian village Pyramiden is also without a permanent settlement. Hornsund is a Polish polar research station with approximately 10 residents. The special status of Svalbard gives all nationals the right to free entry and work. It is not so easy in practice as housing is limited and mainly owned by the companies and the Norwegian authorities (SSB 2021).

Longyearbyen

The Svalbard treaty from 1920, recognizing the sovereignty of Norway over the Archipelago of Spitsbergen. The signatories were given equal rights to engage in commercial activities on the islands. Only Norway and Russian make use of this right. It is consequently a foreign policy and strategic reason for keeping Norwegian industry and permanent settlement at the Svalbard (Berg 2023).

Store Norsk Spitsbergen Kullkompani (2022)has a long history and started with the American John Munro Longyear who founded Longyearbyen (Longyear City) in 1906 and sold the mine already in 1916 to the Norwegian Store Norske Spitsbergen Kullkompani (SNSK). The company should play a significant role in securing Norwegian industrial activity and settlement on the island. Several mines have been opened and closed when they were emptied in the Advent Valley and Longyearbyen, and later in Svea. The company started as a privately owned, but the Norwegian state required shares when financial problems occurred with needs for new investments. By 1976, SNSK was a 100 % state owned company. With this, Longyearbyen gradually developed as a family-based community with schools, apartments, hospital.

In 2022, SNSK is the only state-owned mining company left in Norway, but the ultimate closure has been planned for decades, and is now scheduled for 2025. The latest closures are Svea mine closed down in 2016, and the Lucknefjell mine closed in 2018. Only one mine is in production: mine no. 7 in Adventdalen, which still operates on a comparatively small scale. The Norwegian state has initiated a 70 million NOK environmental project, intended to remove all traces of human activity in the Svea and

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Lunckefjell areas in Svalbard. Buildings and infrastructure are being removed, including roads, tank farm, power station and an airfield (Store Norske 2022).

The coal production of today has two main purposes; provide Longyearbyen with energy for heating and electricity, and export to the mainly European alumina steel industry. Both are disputed due to emission and commitments to reach the global and national climate goals. Coal as local energy source will be replaced with renewable energy, most likely hydrogen, or ammonia, but this will not be in place when the last mine close down. Diesel will probably substitute coal in this period (Store Norske 2022).

Nowadays, Longyearbyen is the centre for administration, service industry, science and tourism. The closed mines and mining legacy will become a tourist attraction itself, boosting the tourism industry severely hit by the corona pandemic.

5.2.1.4. Egersund

The Egersund Hub covers five municipalities (Eigersund, Sokndal, Lund, Bjerkreim and Flekkefjord). Statistical data shows that around 33 000 people live in the hub area today (SSB 2021). The Hub has since 2001 experienced an overall increase in population of about 2000 people, primarily in the Eigersund municipality. Statistical data for population projection estimate an overall decline in population in the hub with around 1000 people by year 2050, but there are significant differences between the municipalities. Egersund is expected to have a stagnant population, Lund and Bjerkreim are expected to have an increase, whereas Sokndal and Flekkefjord are expected to have a decline in population.

Population dynamics show that the hub experienced a significant increase in population between 2006 and 2016, when the population went from a relatively steady number of around 31 100 people to over 33 400 people. Since 2016, there has been a decline in population (fig. 36).

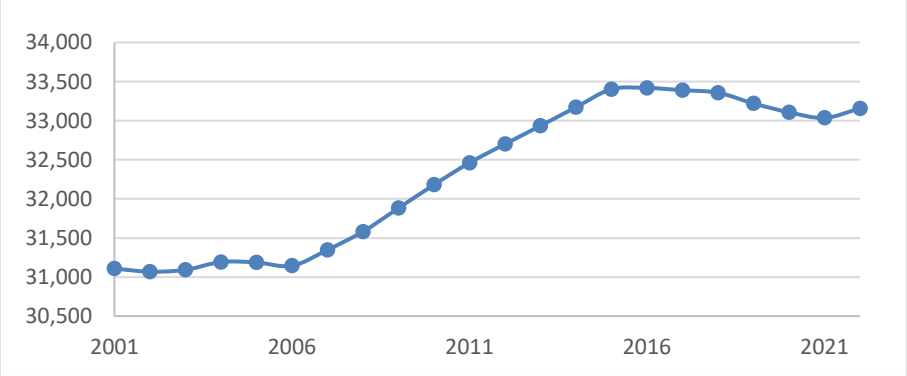

Figure 36. population dynamics Egersund Hub 2001-2022 (Source SSB 2021)

This is likely linked to a decline in employment rate for people living in all of the municipalities that started in 2014 (mining sector alone and in total for all industries). In 2014, 52,1 % of inhabitants in the hub area were employed, of which 3,7 % were employed in the mining sector. In 2021, these numbers were 49,8 % and 3,0 % respectively (SSB 2021).

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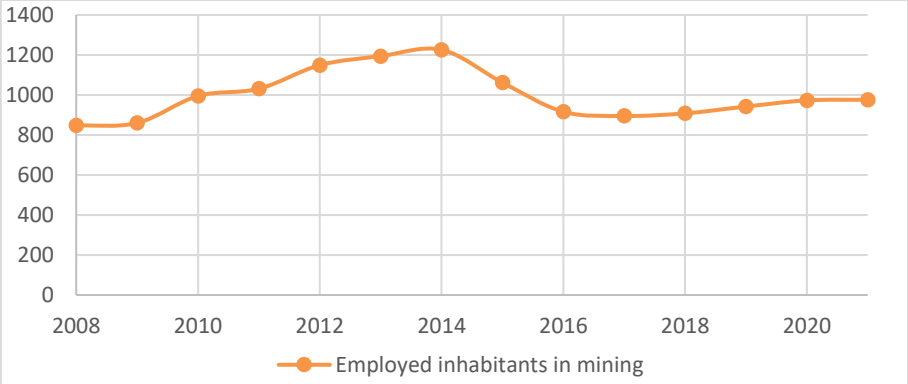

Figure 37. Number of employed inhabitants in mining (Source SSB 2021)

Egersund mining hub

The Egersund mining hub is located in southern Norway. The hub is geographically defined by Magma Geopark which is a UNESCO Global geopark covering 2320 km2 and five municipalities (Eigersund, Sokndal, Bjerkreim and Lund in Rogaland County, and Flekkefjord in Agder county).

Egersund is the largest town in the area with a population of about 15 000 (SSB, Q4 2021, Eigersund municipality). The town was officially founded in 1798, but several archaeological findings indicate settlement from the early Bronze and Iron ages. Mining is not the main industry in Egersund. In fact, Egersund's economy is largely based on marine activities and fishing. Most of the mining activities are located in other areas of the Hub. The municipality of Sokndal, for instance, has the highest level of employment in the mining industry in all of Norway compared to the number of inhabitants.

Magma Geopark has more than 300 years of mining history involving around 100 abandoned and 8 active mines. The active mines are extracting sand and gravel, aggregates, dimension stones and ilmenite ore. The abandoned mines were extracting feldspar, quartz, molybdenum, wolframite, mica and ilmenite. The main active mines/quarries are Titania, Rekefjord East and West, Hellvik, Egersund Granite and Espedal gravel.

Magma geopark, also known as the Rogaland anorthosite province, consists of anorthositic and noritic intrusions that were deposited between 920-930 million years ago. The Magma Geopark area contains large ore deposits containing phosphorus apatite, vanadium rich magnetite, ilmenite and possibly nickel. Anorthosite massifs are known to host ore deposits such as ilmenite and are considered excellent sources for high-quality rock aggregate and dimension stone. The exploitation of anorthosite for industrial mineral products is growing and the potential for future production of aluminum and other important constituents from anorthosites is substantial.

Rekefjord Stone AS is the largest producer of natural stone and building materials (construction aggregates) in the hub area. Production started in 1964 and today there are two quarries: Rekefjord East (0.54 km2) with an annual production of 0.8-1.2 million tons gabbronorite/norite, and Rekefjord West (0.46 km2) with an annual production of 1.0-1.2 million tons anorthosite/ansit. The rock is extracted as blocks and crushed stone and 99 % of the products are shipped and sold to Denmark and Germany. Since 1964 around 60 million tons of rock has been extracted from these quarries. Both Rekefjord East and West each have around 15 million tons of remaining reserves according to the current mining license. The company has 27 employees and 45 subcontracted employees and a turnover of 250 million NOK.

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Titania is by far the largest mine in the Hub area and with the longest history of mining. The company was founded in 1902 and is one of the main producers of ilmenite (titanium) in the world. Titania supplies raw material (titanium oxide) to the pigment industry and accounts for around 6-8 % of the world's global production. The ilmenite ore currently mined was discovered in 1954 and is one of the world's largest. Titania has open pit mines and production facilities at Tellnes in Sokndal municipality, and shipping facilities in the Jøssingfjord. Titania has enough resources to continue production for the next 100 years. Average annual production is around 800,000 - 850,000 ton ilmenite concentrate and 20,000 ton magnetite, in addition to some sulfur. The mine has a spatial extent of around 1,5 km2 and the company employs around 220-250 people. The mine is owned by Kronos World Wide Inc, American. Kronos Titan AS in Fredrikstad is a subsidiary of Titania. The facility in Fredrikstad processes the black ilmenite concentrate produced by Titania to make white pigment (titanium oxide), which is used in paint, varnish, papir, plastic, cosmetics and foods. Titania also delivers significant amounts of ilmenite concentrate to TiZir in Tyssedal.

Titania has experienced issues with their tailings deposits and environmental NGOs. For instance, Titania used to deposit tailings on the seafloor in the Jøssingfjord (1960-1983) and Dyngadjupet (2,2 tons of tailings, 1984-1993), but from 1983 there were several demonstrations from environmental organizations demanding that deposition on the seafloor had to stop. This initiated research and evaluations of the environmental impact of depositing tailings on the seafloor. Many scientists and subject matter experts argued that deposition on the seafloor was the better choice and pointed out all the negative impacts of land deposition. Nevertheless, the pressure from the environmental organizations was so strong that the government decided that Titania had to deposit their tailings on land. Tailings are now pumped into a large tailings dam near the mine and every year about 2 million tons of tailings are produced. The tailings dam is around 1 km2 wide, and grows around 2 meters in height every year. Studies have shown that after around 20 years of depositing tailings on land, the tailings dam has caused major environmental issues and these issues will continue to grow even if the deposition of tailings stops. Mobilized nickel is continuously seeping into the surrounding area and the tailings dam was recently re-categorized from impact class 0 to impact class 4 (highest impact class) due to newly discovered instabilities. Titania is now looking into new alternatives for tailings deposition.

5.2.2. Finnish mining hubs

Lapland is the largest and northernmost province of Finland, but the area is very sparsely populated. The total area of the province is 100 366 km2 (National Land Survey of Finland, 2021), but the population is only 177 161 (Official Statistics of Finland, 2022b), and hence the population density is 16/km2. Lapland has been experiencing a population decrease since 1993 (fig. 39). Locally, the migration flow has been centred from the country side to the cities (Rovaniemi, Kemi, Tornio), but also the birth rate has been decreasing.

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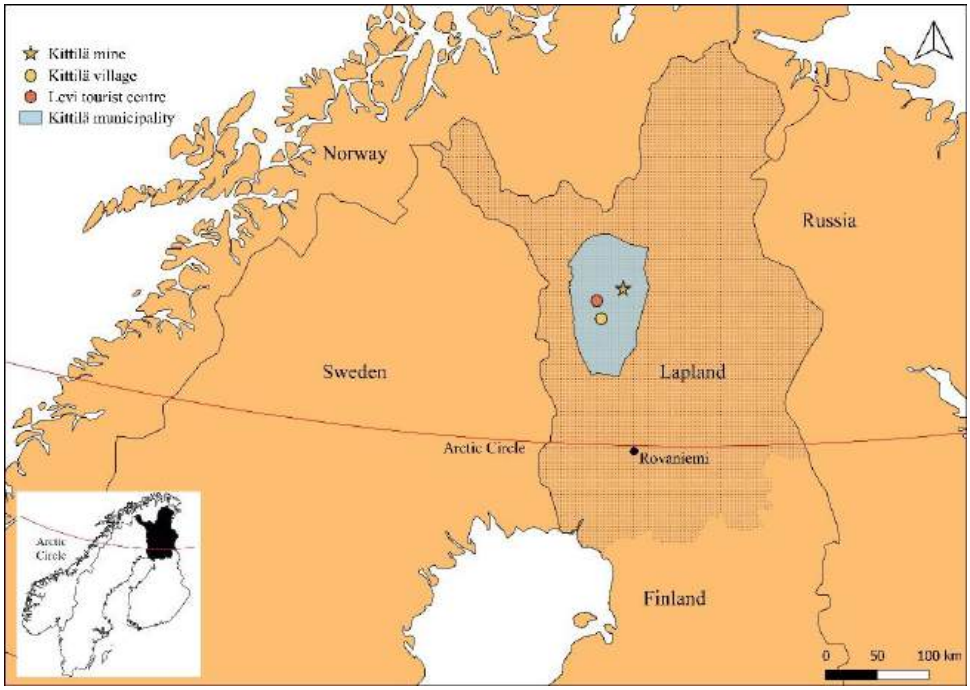

Figure 38. Location of the Kittilä mine, Kittilä village, and Levi tourist centre. Lapland highlighted with gray. Data: National Land Survey of Finland (2022). Map: Arctic Centre, University of Lapland.

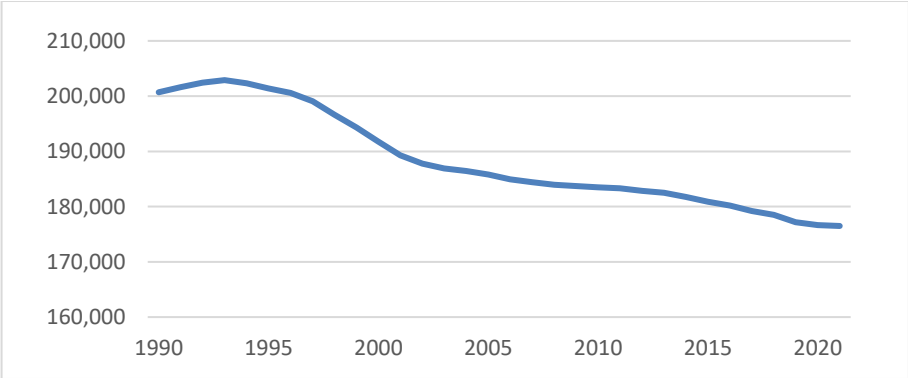

Figure 39. Population of Lapland from 1990 to 2020 (Official Statistics of Finland, 2022b).

However, during recent years, and perhaps because of the Covid-19 pandemic, the population of Lapland has been somewhat increasing, by bringing new inhabitants to the region (House of Lapland, 2021). Work and study related migration have somewhat been replaced by security and leisure-based motives. Together with the biggest town Rovaniemi, also smaller, mainly tourism-driven, municipalities, have got new inhabitants to the region. However, still more than half (56,8%) of the population live in the city area (Official Statistics of Finland, 2022b).

Lapland has gained more employment in mining during the recent years, due to the increased investments to mining industry, like in the Kittilä mine. The figure 40 illustrates the employment in

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mining industry in Finland (blue line) and in Lapland (red line) from years 2007 to 2020. The growth in the employment in mining industry has been quite steady from 2007.

In Lapland the number of employees in mining industry is the highest in Finland. In Kittilä hub, both mining and tourism are important to the municipality, have big effects to other livelihoods of the area, increasing employment (Kittilä municipal board, 2019). During the last decade, the total sales volume of the businesses has tripled in Kittilä.

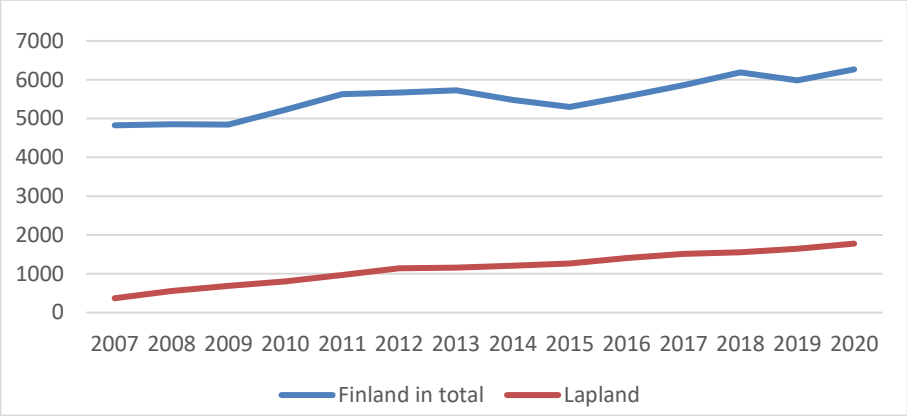

Figure 40. Employment in mining 2007-2020 in Finland and in Lapland (Statistics of Finland, 2022)

5.2.2.1. Kittilä hub

In the region of Lapland there are three metallic mineral mines; Kittilä gold mine, Keminmaa chromium mine, and Sodankylä mixed-mineral mine. In addition, there is an industrial mineral mine in Tornio, and an amethyst mine in Pelkosenniemi. Kittilä hub covers the municipality of Kittilä, which is located in the western part of Lapland in Northern Finland, about 170 km north of the Arctic Circle and the town of Rovaniemi. Kittilä is very sparsely populated, the population of the municipality is 6526 (Official Statistics of Finland, 2022c) in over 8000 km2 (National Land Survey of Finland (2021).

The main livelihoods of the lively municipality are tourism and mining, and the development in Kittilä has been quite rapid during the last decades. Levi ski resort is one of the biggest ski resorts in Finland, and the mine of Kittilä is the biggest gold mine in Europe. Kittilä has been gaining more population quite steadily from the turn of the 21st century (fig. 41). Kittilä's population is expected to decrease only by 3% by year 2040, which is noticeably lower compared to other similar sized municipalities in Lapland. Also, the demographic dependency ratio is in better shape in Kittilä (where it is 57,9) than in most of the municipalities in Lapland (Kittilä municipal board, 2019; Official Statistics Finland, 2022c).

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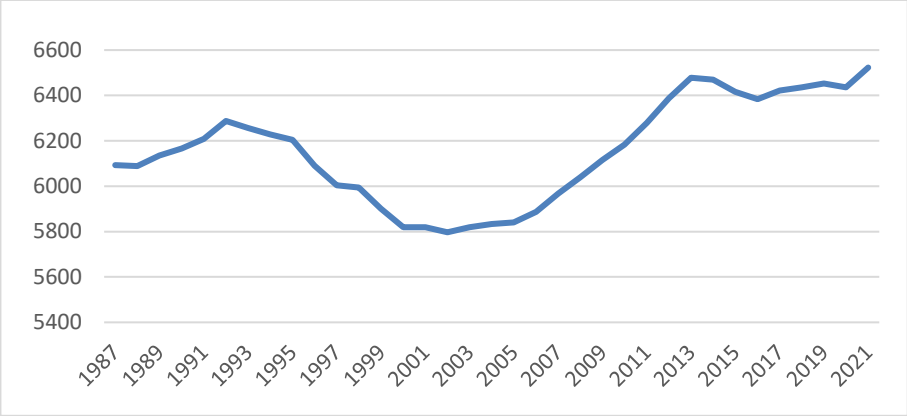

Figure 41. Population changes in Kittilä during 1987-2021 (Official Statistics of Finland, 2022b)

Compared to its size, Kittilä is offering relatively much employment possibilities (Kittilä municipal board, 2019), and the employment of Kittilä has been rising since the mid 1990's. The Kittilä gold mine is the biggest private employer in the Kittilä municipality with around 460 employees and 500 contractor personnel (Agnico Eagle 2022a). Employment in mining has affected the population dynamics of Kittilä municipality (fig. 42; Wyche al. 2015; Agnico Eagle 2022a). There has also been another mine in Kittilä, the Outokumpu Oy-owned Pahtavuoma copper mine, during the years 1974-1993.

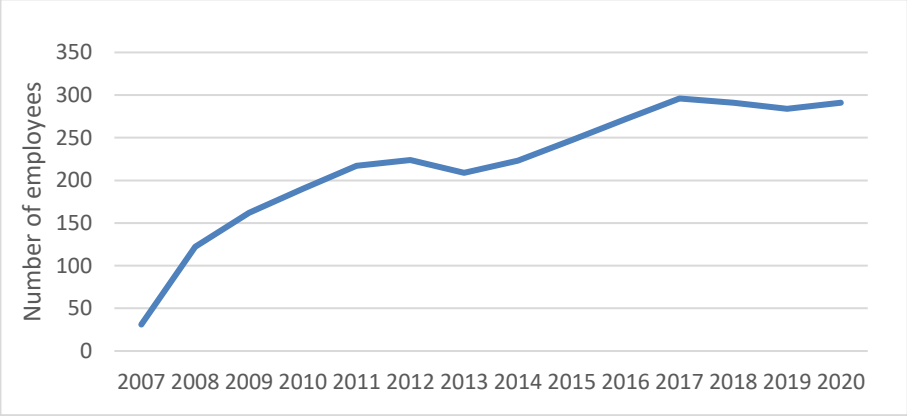

Figure 42. Number of employees in mining industry in Kittilä during 2007-2020 (Official Statistics of Finland 2022a)

Kittilä mine is located in the Kittilä municipality, 50km from the village of Kittilä. The mine belongs to the Suurikuusikko deposit is one of the largest known gold deposits in Finland, and the Kittilä Mine is currently the largest operating gold mine in Europe (Agnico Eagle, 2022a). The mine produces about 7000 kg of gold every year, and the mineral reserves of the mine contain 4,1 million ounces of gold. Around 16 kilometers of new tunnels are developed every year in order to keep sufficient ore production available. The processing plant is processing 6000 tons of ore per day, and the processing is done by grinding, flotation, pressure oxidation and carbon-in-leach circuits.

The Suurikuusikko area is located at the Loukinen river catchment area, which drains to Ounasjoki river, near the Levi fell (Agnico Eagle, 2022a). The mining site is located at the lower reaches of Seurujoki river catchment, which drains further to Loukinen river. The Kittilä municipality area is

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sparsely populated, the nearest village being about 1 km to the east of the mine, but the nearest residential houses are located about half a kilometer from the mine site. The principal land uses near the mine site are reindeer herding, forestry, and some agriculture. The mine area is surrounded by a natural wetland area with 1–2-m thick peat deposits. In some places, there are quaternary, low-permeable sandy and gravelly till deposits. The area is classified as subarctic and the annual mean temperature is − 1 °C. The annual mean precipitation is about 500–600 mm and evaporation 200–300 mm (see Turunen et al., 2020) The region around Kittilä mine is mainly mafic volcanic and sedimentary rocks of the Kittilä Greenstone Belt, and the work is focused on a 4,5 km segment of the Suurikuusikko Trend, that hosts the gold mineral reserves. The closest nature protection areas are Loukisen latvasuot-swamps and Ounasjoki river, which belong to the Nature2000 protection areas. The Pallas-Ylläs National Park is located around 40 kilometers west from the mine. (Wyche et al., 2015; Turunen et al., 2020; Malinen 2016).

The mining company, Canadian-owned Agnico Eagle Finland Oy, started the construction of the mine in 2006, the gold extraction commenced in 2008, and the mine achieved commercial production in 2009 (Agnico Eagle, 2022b). The underground mining started 2010, and since open pit mining at Kittilä was terminated in 2012, the mine is now only operating underground, with a mine lifetime estimated through 2034. The mine covers 192 square kilometers in total, stretching 25 kilometers along the major gold-bearing shear zone, Suurikuusikko trend. The mine area includes six gold deposits. Agnico Eagle is constantly doing mineral exploration in the area to find new deposits. Kittilä mine is investing heavily, and developing their operations all the time. Agnico Eagle Finland oy has big investments plans of 200 million euros, and the mine is to be extended north, south and at depth (Kittilän municipal board, 2019; Agnico Eagle, 2022b).

The nearest village of the Kittilä mine is located 1km east of the mine, and the nearest houses are located about half a kilometer from the mine site. The principal land uses near the mine are reindeer herding, forestry, and some agriculture. In Finland, Kittilä gold mine is often referred as a good example of mining operations, as there have not been major conflicts with other livelihoods, and the majority of the locals accept the mine (Wyche et al., 2015; Malinen, 2016; Turunen et al., 2020).

5.2.3. Swedish mining hubs

Mining activities constitute a significant part in all four hubs in Sweden. The Gällivare hub is designated specifically as a mining hub with forestry and indigenous components. In Gällivare Boliden AB and LKAB each operate large mines. The Malå hub has forestry as it focus activity but here Boliden operates several mines with Kristineberg being the most significant. Malå is also a hub with an indigenous focus. In the Gran hub reindeer husbandry is impacted by the Kristineberg mine but all hub work here come from the indigenous perspective. The focus hub theme in Jokkmokk is also indigenous, but the debate following the proposed Kallak mine has a significant impact on all indigenous matters.

Representatives of the mining industry or the government often emphasize the relative small areas of mines in comparison with other forms of land use especially reindeer husbandry. Swemin (the Swedish Association of Mines, Mineral and Metal Producers) compares the area of mines and limestone quarries, 175 km2, with that of the reindeer husbandry area, 247 280 km2, giving the impression that the mining industry has a small impact over all. We have instead chosen to define the hub by looking at available data on the impact on reindeer. The minimal disturbance distance from the mines is estimated to be 15 km (Åhman and Skarin 2014) which is the basis for the hub extensions for each

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mine (fig. 43). These estimated hub areas will also include the major population areas, the immediate mining infrastructure (e.g. transportation) and the effect on biodiversity other than reindeer.

Figure 43. The location of the Swedish mining hubs Gällivare, Jokkmokk and Malå. The extent of the mining hubs are shown in purple (15 km from mining/industrial sites). All three hubs are also indigenous and forestry hubs. The indigenous Gran hub is located adjacent to the Malå hub and partly affected by the Kristineberg mine.

Population dynamics of the Norrbotten and Västerbotten regions

Norrbotten and Västerbotten counties are the two provinces forming the northernmost part of Sweden. They are also the two largest provinces of Sweden, covering 23,9 % and 13,4 % respectively of the country's total area. However, both counties are very sparsely populated. The total area of Norrbotten county is 97 242 km2, but with a population of 249 693 (Regionfakta 2022), giving a population density of only 2,6/km2. The total area of Västerbotten county is 54 664 km2, with a population size of 274 563 (Regionfakta 2022), giving a population density if 5/km2.

Norrbotten has experienced a population decrease of 2,6 % since 2000 while Västerbotten has seen an increase in population by 7,4%. However, in both counties there are big differences in population developments between coastal regions and inland regions as people over time tend to move to the major cities by the coast. As a comparison, Sweden as a whole has a population density of 25,7/km2 and the country has experienced a population increase of 18% since 2000.

At the hub level we have used data from Gällivare municipality, Jokkmokk municipality and Malå municipality. They are all typical inland municipalities in the two northern counties.

Gällivare municipality had a population of 17 449 in 2021 which is 19/6% lower than 1996. The situation in Jokkmokk municipality is similar with a population size of 4780 (2021) which is 26,6% lower than 1996. Likewise, in Malå municipality the population is 3 034 (Ekonomifakta 2022) down by 22,9% since 1996.

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Regional employment figures mining

In Norrbotten county there are a total of 115 514 employees (Regionfakta 2022). The mining industry is an important provider of work opportunities where the mining company Luossavaara-Kiirunavaara Aktiebolag (LKAB) has 3525 employees in the county or 3,1% of the total employees rendering it a fourth place on the list of largest employers in the county. The other major mining company Boliden Mineral AB has 925 employees in the county or 0,8% of the total employees which is number 16 on the list of largest employers in the county. Number 12 on the list is SSAB EMEA AB which is a Steel producer which is linked to the mining industry. 1175 people from the county or 1% of total employees are working for the company. It is worth mentioning that 16 out of the 25 largest employers are either municipalities or government agencies.

In Västerbotten county there are a total of 123 849 employees (Regionfakta 2022). The mining industry is also an important provider of work opportunities in this county. Boliden Mineral AB is the fifth largest employer in the county. 2025 persons or 1,6% of the total number of employees in the county are employed by the company. In Västerbotten 13 out of the 25 largest employers are municipalities or government agencies.

As stated above, as hub level data we have used data from Gällivare municipality, Jokkmokk municipality and Malå municipality.

In Gällivare municipality the total number of employees are 5925. The largest employer are the municipality itself but as number two we find LKAB where 1175 persons are employed or 12,9% of total employees in the municipality. The third largest employer is Boliden Mineral AB where 925 persons or 10,1% of the total employees in the municipality. The employee numbers are identical to the Norrbotten County numbers showing that all employees from the county working for these two mining companies are all concentrated to Gällivare municipality.

In Jokkmokk municipality there are a total of 1235 employees. 31,8% of those are employed by the municipality itself. There are currently no mining industry operating in the municipality.

In Malå municipality there were 1511 persons working within the area of Malå municipality (2018). There used to be several operating mines in the municipality but currently there are no active mining companies in the municipality. The largest private employer in the municipality are Bennys gräv AB with 175 employees (Ekonomifakta 2020). The company is working with ore transports within mining areas. In 2015 ca. 30 company employees worked in Kristineberg, 25 in Björkdalsgruvan and ca. 15 in Maurliden (Entreprenad 2015). At that time 100 persons were employed by the company. The Kristineberg mine is located in Lycksele municipality directly on the other side of the border to Malå municipality. Boliden Mineral AB has 175 persons employed in Lycksele municipality and we assume that they are mainly working in Kristineberg. Boliden has no statistics on the individual mines but are instead referring to the overall Boliden area which includes Kristineberg as well as two other active mines.

5.2.3.1. Gällivare hub

The Gällivare hub area defined by the municipality boundaries is dominated by the mining industry. Gällivare is also defined as an indigenous and forestry hub. There are 10 500 people living in the town of Gällivare and 17 500 living in the municipality. With a municipality size of 16 800 km2 the population density is 1 p/km2 (Wagenius 2022). Gällivare is also part of the traditional lands of Sami people and

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the town of Gällivare is the meeting point of the four reindeer herding communities of Gällivare, Girjas, Baste Cearru, and Unna Tjerusj (Sami Parliament 2024).

Two major mines are located in or near the town of Gällivare also making the area a hub for mining activities. The Malmberget iron mine operated by LKAB is located directly in north end of Gällivare (fig. 44). Malmberget has been in operation since the 1700 and lay the grounds for the establishment of Gällivare as a town on lands, until then primarily used by Sami. Currently, this mine is expanding into urban areas (LKAB 2020). Whole neighborhoods are being torn down and residents are forced to relocate. Part of the future plans for the Malmberget mine include the major establishment of the HYBRIT and the first fossil free steel production system in the world. A demonstration site for fossil free production of direct reduced iron (sponge iron) will be established in Gällivare at the LKAB mining site Malmberget. The plant should be completed in 2026 and produce 1.3 million tonnes of direct reduced iron (in Swedish järnsvamp). By 2030 the production should be increased to 2.7 million tonnes per year. To provide energy for the project, Vattenfall AB will construct the world's largest site for production of hydrogen gas also in Gällivare. The site is located within the lands of Baste Cearru. Much additional press and documentation exists for this project. Further south in Norra Svartbyn near Boden but also on the lands of Gällivare RHC the The Swedish company H2GS AB (a project named H2 Green Steel) plans to establish another steel plant based in hydrogen gas with plans to start production in 2024 (LKAB 2020).

On the south side of Gällivare, Boliden AB (2022) operates the Aitik mine and processing plant, established in 1968. Today, mining is carried out in two open pits and the ore is processed in an adjacent advanced and effective equipment enrichment plants for crushing and sorting minerals. This efficiency of the plant has made it possible to also explore adjacent mining sites. From processing plant the metal concentrate is transported on railway to Bolidens smelter, Rönnskärsverken, in Skelleftehamn where final products of copper, gold and silver are produced.

The Aitik mine has grown into the largest open pit copper mine in Europe covering an area of approximately 50 km2. The Aitik mine is mainly producing copper, but also gold and silver. The Aitik mine employs 770 people and many more are employed in jobs related to the mine. Aitik is expected to be in operation until 2029 but a number of expansions of the existing mine are planned and proposed which is expected to prolong operations with the Liikavaara expansion being first in line. This proposal calls for an open pit mine with the copper ore being transported to the near Aitik processing plant. To secure this project Boliden AB purchased properties in the two villages of Sakajärvi and Liikavaara (Boliden 2022). The mine will have significant additional impact on reindeer husbandry in Gällivare RHC in terms of additional habitat loss and increased fragmentation of grazing lands. Several EIS-reports and court documents exist for the project. An additional proposed expantion of the the overall Aitik operation include the underground Nautanen mine located within the lands of Baste Cearru.

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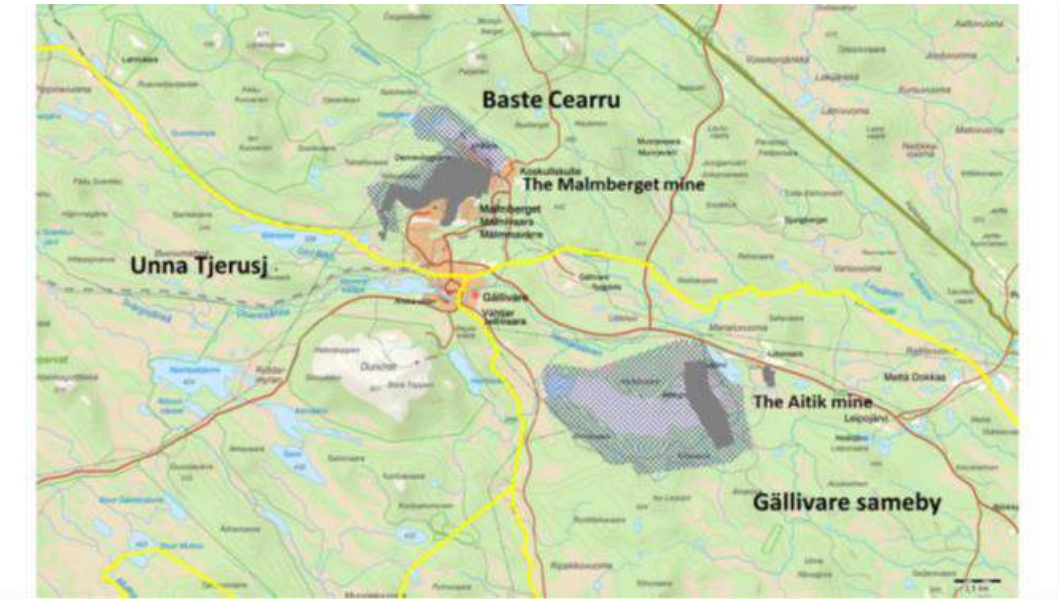

Figure 44. The townsite of Gällivare and mines

Figure 44 shows the townsite of Gällivare, which is located between the LKAB operated mine Malmberget and the Boliden AB operated mine Aitik. Liikavaara, the approved expansion of the Aitik mine is seen directly east of Aitik. Gällivare is also the meeting point of the three RHCs Gällivare, Baste Čearru, and Unna Tjerusj. The Europa highway E10 which run through the wintering area of Gällivare RHC and the railway line forming the western boundary of the RHC lead to significant reindeer mortalities.

5.2.3.2. Malå hub (Kristineberg)

Malå town and municipality is located in the county of Västerbotten. The population of the municipality is around 3000 with 2000 residing in the town. The size of the municipality is 1727 km2 making the population density 2 p/km2 (Statistics Sweden 2023). The Malå hub represents a complex land-use situation where mining, forestry, wind power developments, and infrastructure projects all overlap with the land use needs of Sami reindeer husbandry. Malå is identified as a mining, forestry and indigenous hub. From the forest industry perspective, we have defined the hub as Setra sawmill located in the town of Malå and its timber procurement area (se forest hub report). From the indigenous perspective the Malå hub is defined by Malå forest reindeer herding community (RHC), covering and area of 7713 km2. The western year around grazing lands (åretruntmarker) are located in Malå, Sorsele and Lycksele municipalities. Winter grazing lands go all the way to the coast of Bay of Bothnia. The RHC has 100 members and 11 reindeer herding companies. The maximum number of reindeer are set to 4500 (Länsstylrelsen n.d.). On the other hand, from the mining perspective the hub is defined by a series of mines and the transportation corridor from the westernmost mine of Kristineberg to the final processing plant at Rönnskärsverken in Skelleftehamn (fig. 45). All mining operations are operated by Boliden AB (Boliden 2021).

Mining and prospecting have a long history in Malå RHC and has over time has led to losses of grazing land from direct impacts from the mines, as well as impacts related to roads and mining associated

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traffic. Malå RHC considers lands in and around the mines in Kristineberg, Storliden, Maurliden and Kankberg completely lost (fig. 45). Herder's observations as well as GPS data all indicate reindeer avoidance of areas around the mines. The recent closing of the Maurliden mine offers promising opportunities for restoration of lost grazing lands (Boliden 2018). On the other hand, the old, closed mines of Näsbergfältet, Rakkejaur and Adakfältet have not yet been restored, and are still considered lost grazing lands.

The main mining project and the focus mine in the hub is the Kristineberg mine operated by Boliden AB and established in 1940. A considerable additional impact of the actual mining operations, is that all ore is transported by truck to the processing plant at Rönnskärsverken on the coast. According the Boliden summary report (2020), the Kristineberg Mine produces ore from polymetallic mineralization's of Volcanogenic Hosted Massive Sulphide type. The mineralisation's have been explored to a depth of 1400 m, along a 3 km plunge between 900 m and 1250 m depth and takes place mainly by cut and fill methods. The production capacity of the mine is 750,000 tonnes per year making the Kristineberg mine the largest tonnage contributor to the Boliden Area Operations process plant. The expansion mine Rävliden 5 km west of the Kristineberg Mine and was added to the mine's Mineral Resources in 2015. In 2020, the mine produced 541kt of mineralised material grading 0.6g/t of gold, 45g/t of silver, 0.52% of copper, 5.73% of zink, and 0.34% lead. Since operating started in the 1940 the mine has produced 32.6 Mt of mineralised material in total, with average grades of 1.2g/t gold, 37.8g/t silver, 1% Copper and 3.8% zink (Boliden 2021).

The Kristineberg Mine is connected to Boliden and Skellefteå to the west by highways 370 and 95. A local all-weather sealed road links the main Malå 370 highway to Kristineberg. Total driving distance between the BAO Processing Plant and the Kristineberg Mine is approximately 95km. This complex land-use situation calls for innovative participatory tools to provide an effective and inclusive dialogue in search of solutions (Boliden 2021).

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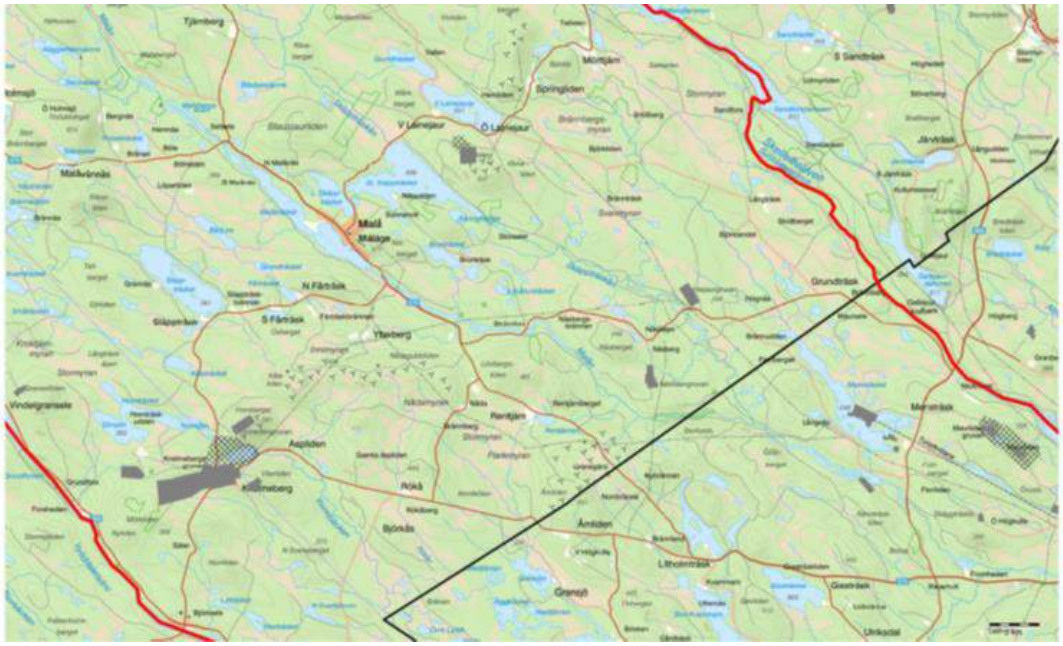

Figure 45. A number of active and abandoned mines surround the town of Malå. The largest and most active area is around the Kristineberg mine, operated by Boliden AB south west of Malå. The area is also characterized by active forestry throughout the area. The area has four wind power establishments Ytterberg, Åmliden, Storliden and Jokkmokksliden.

5.2.3.3. Jokkmokk hub

The small town of Jokkmokk, population of 2 700, is located in Jokkmokk municipality with a population of 4 766. The municipality covers 19 477 km2 making it the second largest in Sweden but with a population density of only 0.25 p/km2 (Statistics Sweden 2022). Jokkmokk is one of the most prominent places for Sami culture. Thus, the hub is foremost defined by the indigenous traditional land use that includes reindeer husbandry, hunting and fishing. Young Sámi from the whole of Sapmi go to Jokkmokk for education, and here is also the principal museum of Sami culture Ájtte, which is both an arena for research and information center for mountain tourism. Ájtte is now identified as the Jokkmokk hub center. Jokkmokk is also the meeting place for several Sami reindeer herding communities and located in the heart of their wintering areas. The three mountain RHCs are Sirges with 15 500 reindeer, Jåhkågasska with 4500 reindeer and Tuorpon with 9000 reindeer. In addition, the forest RHCs Slakka and Udtja have grazing land nearby. The Jokkmokk RHCs have a special agreement of their common use of their winter grazing areas (Ajjtte 2023).

Other land uses in Jokkmokk include forestry and tourism. But, energy production from the river Luleälven may be the most pronounced and impacting land use form in Jokkmokk. This river system is heavily regulated for hydroelectricity with 6 of the 10 largest hydroelectric plants in Sweden producing. The river produces 16.7 TWh, which is 25 % of all hydropower produced in Sweden (Flood 2015). The damming of the rivers has long-standing impacts on how reindeer husbandry can be carried out. Before the hydroelectric époque the lakes constituted the backbone of the reindeer migrations facilitating long range movements to and from winter grazing areas in the boreal forests all the way towards the

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coast of Bay of Bothnia. As these lakes now have turned to water reservoirs with unstable ice conditions the reindeer migration routes have been forced to adjacent forestlands. Consequently, hydropower development has made reindeer husbandry more dependent and affected by forestry activities (Larsen and Inga 2020). The hydropower époque lasted from 1910 when work begun in the Porjus area until about 1970 when the last lake was dammed. The impacts of these exploitation remain today. Forestry has an even longer history in the Jokkmokk area and intensive activities are still ongoing today. There are some 5 000 km2 of forest lands available for harvesting, while the 2 650 km2 are formally protected making about 35% of the forests are formally protected (fig. 46). Yet, forestry is considered the most impending threat to reindeer husbandry by most reindeer herders. Commercial forestry is ongoing throughout the unprotected area. Productive forest lands owned by Sveaskog AB, the National Property Board Sweden, SCA AB, Jokkmokk forest common and small private landowners provide jobs and income (Swedish Forest Agency 2015; Sandström et al. 2016).

Today there are no active mines in the Jokkmokk area. There is however, a long-time, ongoing dialogue and conflict around the establishment of the Kallak mine (Gallok in Lulesami language). Since the first exploration license was granted in 2006 by the Mining Inspectorate the conflict between opponents and proponents have divided Jokkmokk (Zachrisson and Beland Lindahl 2023; Beland Lindahl et al. 2018). The conflict has gained significant international attention and is considered one of the most important environmental issues in Sweden today. In 2021, UNESCO stated that the mine would cause significant negative impacts on the Laponia Heritage site. The RHCs has been heavily engaged in the conflict. The proposed mining site is in Jåhkågasska Tjiellde and Sirges RHCs would have the major transportation corridor through its lands. The question of allowing this mine or not has been dividing and to some extent paralyzed the Jokkmokk community for long.

The Kallak iron ore deposit located approximately 40 km west of the Jokkmokk townsite and 80 km southwest of the major iron ore mining center of Malmberget in the Gällivare hub. According to Beowulf Mining reports test drilling in Kallak has produced magnetite concentrate at 71.5 % iron content (Beowulf Mining 2017). The mining site is located directly adjacent to the river Luleälven and near major hydroelectric power stations. Luleälven provides drinking water for major cities and villages downstream. Kallak was discovered by The Swedish Geological Survey (SGU) in the 1940s. The first exploration licence for Kallak was awarded by the Mining Inspectorate of Sweden in 2006. Drilling was conducted at Kallak North and South between 2010-2014, a total of 131 holes and 27,895 m. For Kallak North and South combined, indicated a mineral resource of 132 Mt grading 27.8 % iron.

Beowulf Mining (2017) claims that the Kallak mine has the potential to create 250 direct jobs and over 300 indirect jobs in Jokkmokk sustained over a period of 25 years or more. Furthermore, they state that the mine has the potential to generate SEK 1 billion in tax revenues, considering the case where 70 % of the mine's workforce are based locally, with annual tax revenues of SEK 40 million. These tax revenues would help to develop and sustain public services and infrastructure in Jokkmokk. These figures are however, highly contested.

On March 22, 2022 the minister of enterprise and innovation announce the government's decision to grant a processing concession for the Kallak iron ore deposit (Government Offices of Sweden 2022). The highly disputed case is however far from resolved.

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Figure 46. The three reindeer herding communities (RHCs) operating in the Jokkmokk hub include from the north Sirges, Jåhkågaska and Tuorpon. The town of Jokkmokk is the meeting point of several RHCs. Just west of Jokkmokk is the controversial and much debated proposed mine Kallak located (red dot). The National Parks Sarek, Padjelanta, Stora Sjöfallet and Muddus forms the UNESCO World Heritage site Laponia (in blue).

5.2.4. Italian Learning cases

5.2.4.1. Val Germanasca hub

The character of the Germanasca Valley Hub in the Western Alps is both linked to the mining resources and to the history of the Waldenses (religious group born in 1173 in Lyon, France with the conversion of merchant Waldo, founder of the movement) marked by persecution and the fight for their own identity. The Hub illustrates a long-term interaction between the local population and mining companies in the case of mines of both industrial and cultural/educational/tourism interest (Ecomuseo delle Miniere e della Valle Germanasca 2023).

After centuries of the intense mining, an ambitious project for rediscovery the abandoned talc mines led to the birth on 1993 of the "EcoMuseum of Mining". Later a new Geoscience educational project "ScopriAlpi" (DiscoverAlps) was built for showing the magnificent internal geological structure of the Alps, within a new proposed UNESCO Global Geopark. In the meanwhile, IMERYS TALC ITALY is still managing the talc mining activity in the Chisone and Germanasca valleys in the province of Turin. The company produces about 32,000 t of talc and 21,000 t of aggregates annually and it has a workforce of more than 80 employees. The local mining activity involves the whole Germanasca valley, since the talc extracted from the Rodoretto mine in the municipality of Prali undergoes its first screening in the sorting station before it is transported to the Malanaggio facility in the Porte municipality, where it is crushed, dried or decontaminated, milled and packaged according to its end use and the customers' needs (Ecomuseo delle Miniere e della Valle Germanasca 2023).

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Mining Hub

Company: Imerys Talc n.d. Italy S.p.A. (from 2011 – in progress). Before IMERYS the Talc exploitation was in charge of Rio Tinto Group and of Soc. Talco-Grafite Val Chisone.

Ownership: Multinational

Location: Germanasca valley: Rodoretto Mine (Municipality of Prali), Malanaggio dressing plant (Municipality of Porte).

Activity: underground talc mine (fig. 45). Operation method: *"underhand cut and fill".*

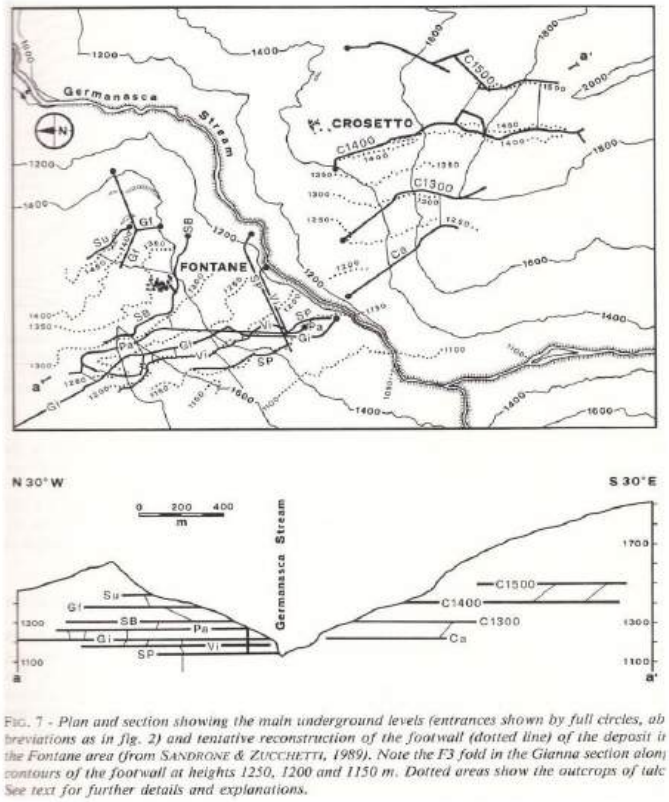

FIG. 7 - *Plan and section showing the main underground levels (entrances shown by full circles, abbreviations as in fig. 2) and tentative reconstruction of the footwall (dotted line) of the deposit in the Fontane area (from SANDRONE & ZUCCHETTI, 1989). Note the F3 fold in the Gianna section along contours of the footwall at heights 1250, 1200 and 1150 m. Dotted areas show the outcrops of talc. See text for further details and explanations.*

Figure 47. Plain and section showing the main underground levels

Spatial extent: access to the current mine through a 2,5 km tunnel. 1,2 km of new access drift are excavated every year, along the talc vein.

Natural resources: reserves estimated in 265,000 ton and resources estimated in 570,000 ton of talc ore to be excavated in 7-8 years. Geological exploration in progress for additional resources.

Employment expected: 80-man years (mine + dressing plant + administration at Italian level)

Production: **28,000-ton** average annual talc (in the past up to 36,000 ton/y).

Waste production: 20,000 ton of operating residues expected per year (140-160,000 ton in 7-8 years). 70% of operating residues will be used for filling in underground yards (at present several test activities are in progress). 7,000 t of rock waste (from tunnelling) expected per year (used as filling material).

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Permits:

- Mining rights to operate till 2032 (probably it will be renewed due to the potential high volume of talc to be exploited.
- Authorisation for extractive waste management and landfilling (2 different active extractive waste facilities)
- Authorisation to discharge in surface water the treated water

Social data

These data were collected from the national social-demographic database ISTAT (Istat 2021) that provides very accurate information (fig.46). Anyway, there is not any specific aspect to underline, since the municipality of Prali, analysed individually with respect to the Germanasca Valley as a whole, shows an almost constant trend for all the analysis variables.

Data variables	Fonte	N year	2017	2018	2019	2020	2021
n. of tot. residents	ISTAT	5	242	243	252	252	251
n. of female residents	ISTAT	5	113	113	118	117	119
n. of male residents	ISTAT	5	129	130	134	135	132
n. of employed residents	ISTAT	2		102	107		
n. of unemployed residents	ISTAT	2		121	124		
average income from self-employment (€)	ISTAT	1	12.542				
average salary as an employee (€)	ISTAT	3	15.483	14.994	15.927		
n. of residents without educational qualifications	ISTAT	3		2	3	3	
n. of residents with primary school license	ISTAT	3		54	52	45	
n. of residents with secondary school license	ISTAT	3		84	87	71	
n. of residents with high school license	ISTAT	3		83	85	104	
n. of residents with a degree	ISTAT	3		6	10	14	

Figure 48. National social-demographic database

Residential Data

These data were collected thanks to questions addressed directly to the municipality of Prali. These data could show hypothetical increase or decrease in the urbanization of this area and in this case, they show a slight rise in the number of first houses, while the number of second houses remains almost unchanged (fig 47).

Data variables	Fonte	N year	2017	2018	2019	2020	2021
n. of first houses	Comune di Prali	5	124	125	134	133	131
n. of second homes	Comune di Prali	5	131	133	126	132	133
n. of houses rented to seasonal workers							
n. of tot. vehicles	ACI	4	284	281	289	299	
n. of cars and motorcycles	ACI	4	219	217	223	228	

Figure 49. Residential data of municipality Prali

Economic data

Economic data are inherent to the employment situation in the municipality of Prali and they were collected from both regional (Rupar Piemonte) and national databases (ASC.Istat and MES) (fig. 48). Unfortunately, the available information stops at 2019, so it is not possible to understand the impact of Covid-19 restrictions on the workers' situation, even if the Gross Regional Product suggests an

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economic growth until 2019 and then a slight decrease in 2020. It could be useful to know the data related to 2021, that would better explain the path across the pandemic period

Data variables	Fonte	N year	2017	2018	2019	2020	2021
n. of local business units (no accomodations)	Rupar Piemonte; ASC.Istat	3	26	29	33		
n. of farms	Comune di Prali	1			6		
n. of tot. workers	Rupar Piemonte; ASC.Istat	3	88	98	104		
n. of employees	Rupar Piemonte; ASC.Istat	3	28	31	32		
Gross regional product (€)	MEF	4	2.650.648	2.752.116	3.039.098	2.953.471	
Value added - contribution of agricultural sector to the GDP							
Value added - contribution of tourism sector to the GDP							

Figure 50. Employment data in the municipality of Prali

5.3. Discussion and conclusions

This report showed that important differences at the local level exist when it comes to positive and negative impacts of the mining industry (tab. 5). The sector itself is developing according to different patterns in the countries: consistently with the fact that Sweden and Finland are considered more friendly and attractive for the mining business, we saw that the production and the number of people involved in the industry are higher comparing to Norway, and that there are important plans for expansion and the development of new plants in Swedish and Finnish hubs. In northern Sweden we also found important innovation project like HYBRIT, even if it does not come without controversial and conflictual aspects, as mentioned in the introduction. The sector is generally less important in Norway, where two hubs, Kautokeino-Kvalsund and Vargerfjord, have currently no mining activities at all (even if reopenings are expected in the near future) and one hub, Svalbard, is almost at the end of a process for the full ceasing of the mining activities.

Differences can be found in the mine-induced population dynamics: as Varagerfjord example shows, the closure of a mine can determine a sharp decline in population. Quite the opposite, Svalbard hub seems to represent a virtuous example of how mining activities can be ceased when they become unsustainable without affecting the local population. As we saw, the number of employees in the mining sector strongly decreased and will decrease further, but the population stayed relatively stable, as the number of employees in other sectors, like research and tourism, increased. Furthermore, the positive case of Kittilä illustrates the opposite and demonstrates that mining can contribute to invert, stop or at least reduce the outmigration from remote and sparsely populated areas.

However, as noted in the introduction and shown by Varagerfjord case, a major issue should be considered when evaluating the positive impacts on employment and demography: mines are subject to sudden closures because of bankruptcies and/or unprofitable global prices, and they are almost never locally owned. This means that local interests, such as stable jobs for local residents, could be easily overlooked by the company. On the other hand, strong local oppositions have proved to be able to stop mining projects that were considered harmful: this is the case of Kautokeino-Kvalsund, where environmental NGOs and Sami organizations took action against the reopening project, managing to put it on hold and causing the potential copper buyer to withdraw. Local opposition, however, is not always effective: notwithstanding negative impacts over reindeer herding, plans for further expansion of the existing extraction activities or for new plants are numerous, especially in northern Sweden. One of the possible mitigation initiatives could be the recovery of land to restore pastures but, as the cases of Näsbergfältet, Rakkejaur and Adakfältet show, it is often not implemented. Very important is,

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at this regard, the process currently going in Svalbard for the complete removal of a mining plant and related infrastructure to restore nature.

All the examples recalled here and the ones that were illustrated in the report, beside the strong differences that makes each context specific and in need of tailored solutions, point to one important conclusion: the meaningful involvement of local groups, indigenous and non-indigenous, is fundamental to avoid negative impact on other livelihoods such as reindeer herding and tourism. Beside the cultural loss, the disappearance of other activities could endanger the possibility of a sustainable future in the area: as a matter of fact, the mine will, sooner or later, shut down and if the area is too dependent on it for job and services provision it could be hard for the local population to re-organize and thrive. A well-balanced management is crucial during the lifetime of the mining activity too, especially when it comes to housing and welfare services, to avoid rising prices, overload and inconsistency between the offer and the needs of residents, and to limit environmental degradation as much as possible. Furthermore, and in spite of the strong power imbalance between big international companies, often attracted and supported by State policies and strategies, and local communities, if a mining company fails to obtain SLO the level of conflict could affect or even paralyze the activity. Is therefore essential to set up involvement and participation processes since the very beginning of the planning phase and to stay accountable, keeping on providing a fair share of benefit to local population.

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Table 6. Summary of key characteristics in the mining hubs

Key characteristics	Kautokeino-Kvalsund	Varagerfjord	Svalbard	Egersund	Kristine Berg	Gällivare	Kittilä
N. of mines currently operating	0	0	1 (closure planned in 2025)	8		2	1
population dynamics		Strong population decline after closure in 1997, increase in 2009 and lighter decrease in 2015 with new closure					Population growth since the beginning of 2000s thanks to employment opportunities in tourism and mining
employment	150 esitimate new employees	1600 employees at industry peak. Now few local employees	97 in 2019 vs 410 in 2008	Titania: 220-250 Rekefjord Stone: 23 + 15-25 new with new licence		Aitik: 770+	460 employees + 500 contractor personnel
products	copper. estimated production of 24,4 (per year?) + tailings	Iron. For reopening: expected 4 million tonnes/year (reserves: 475 million tonnes)	Coal	sand and gravel, aggregates, dimension stones (natural stone produced by Rekefjord Stone: 600.000 m^3/year + recent additional licence of additional 60 million tons) and the ilmenite ore (Titania produces 800,000 - 850,000 ton ilmenite concentrate and 20,000 ton magnetite, in addition to some sulfur)	zinc, copper, silver and gold	LKAB: Iron Aitik: copper, gold and silver	Gold (7000 kg/year)
ownership	(owner from 2006, has operating licence in 2019 but reopening is on hold) Nussir ASA. Norwegian but dependent on foreign investments	(for potential reopening) Tacora Resource Inc. International, mostly US	Norwegian state	Titania (Kronos World Wide Inc, American) is the main one. Others: Rekefjord East and West, Hellvik, Egersund Granite and Espedal gravel	Boliden AB	LKAB Boliden Minerals AB Aitik	Agnico Eagle, Canada

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conflicts	Environmental NGOs and Sami groups are against: negative effects on reindeer herding; shipping area location; fjord tailing deposit	Noise, air pollution, water pollution (fjord, river and lake). Tourism, reindeer herding and sea-based industries are negatively affected		Environmental NGOs protested against seafloor tailing deposit in the 80s and the waste deposit was moved to the land, but this turned out to be vvery harmful too. new solutions are under research	reindeer herding	reindeer herding	No major conflicts and good acceptance by local population
opportunities	New employment opportunities for young people who now outmigrate	Ease unemployment caused by sanctions against Russia				HYBRIT project for fossil-free steel	

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6. TOURISM

In this chapter, we focus on the tourism industry in the Arctic, particularly the 10 tourism hubs from six Arctic countries: Faroe Islands, Finland, Greenland, Iceland, and Norway. This will provide a summary of some of the key characteristics to analyze the socio-economic impacts of tourism industry in the Arctic.

The detailed tourism industry report is attached as Annex 4 to this report.

6.1. Overview of TOURISM industry

6.1.1. Faroe Islands

The Faroe Islands also known as Faroes, is an archipelago of 18 islands located in the North Atlantic, between Iceland and Norway. The Faroes were settled by the Celtic and Norse settlers, and belongs to the Norse cultural tradition with Faroese as their own language and with their distinct culture. The Faroese landscape is dominated by mountain pastures, grazed by sheep, which also made the islands known as Føroyar, that means “Sheep Islands” (Visit Faroe Islands 2022).

With regards to population, Suðuroy experienced population decline after the severe economic crisis in the early 1990s. Although, the population has remained relatively stable in the past decades, with an upward trend in recent years, the population is ageing. Further, the gender balance indicates that women move away (Statistics Faroe Islands 2023) (refer to Annex: detailed tourism report: figure 4 and 5)

In the past decades, there are also great changes in the traditional fisheries industry, which had a great impact on local communities. The fisheries industry and the aquaculture industry in Suðuroy are still mainly locally owned and controlled, with a large number of fishing vessels and fish processing plants. Currently, the fisheries industry became centralized, and ownership is to a large extent non-local (Ministry of Fisheries and Natural Resources 2010). With the aquaculture and tourism industries growing rapidly in the Faroes and in the whole Arctic region, the local communities in Suðuroy still had difficulty to be part of these industries.

The emerging industries, aquaculture and tourism increasingly dominates the Faroese society. In the past decades, aquaculture significantly contributes in the Faroese economy and in the recent years accounted around 40% of export value. The tourism industry was estimated to be around 2% of GDP before Covid19 pandemic (Statistics Faroe Islands 2020)

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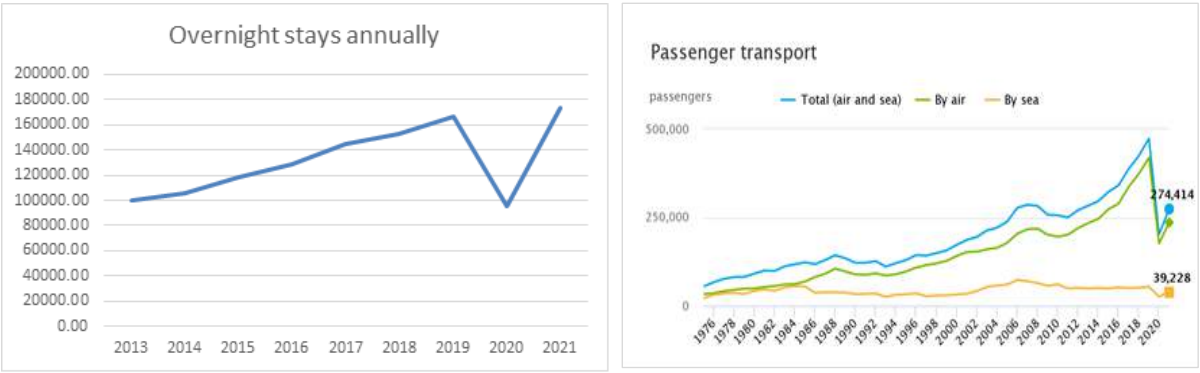

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Figure 51. a) Overnight stays annually for the Faroes. b) Passenger transport to the Faroe Islands (Statistics Faroe Islands)

In 2013, Visit Faroe Islands implemented the strategic plan to market the Faroe Islands, with the aim of increasing tourist numbers, and making tourism a "third leg" of the Faroese economy. Income from tourism was estimated to 784 million Danish Kroner in 2019 (VFI 2019), the year before the pandemic. This strategy is effective as depicted in the trends of passenger transport, and the numbers of overnight stays (fig. 51). The number of tourists coming to the Faroes has increased rapidly in recent years. Total passenger transport numbers have been increasing, with a downturn after the financial crisis in 2008/2009, but have grown rapidly in the last decade. It also shows the downward trend due to covid 19 pandemic and in 2021, the trend is going upward again and continuously increasing in 2022.

6.1.2. Greenland

Greenland is the largest island in the world with an inland ice cap occupying 80% of the dry land. It is situated in the Arctic region on American continent. Politically, Greenland is within the Danish realm thus more in connection with the EU than the countries on American continent. With the lowest population density in the world (0.14 pr km^2 of ice-free area) and with access to tundra wilderness and pristine nature in the Arctic, Greenland is focusing on attracting adventure tourists to the country (Statistics Greenland 2020).

In Greenland, it is evident that GDP has grown and that the gross investment has been increasing even during the covid-19 pandemic (fig. 52). In addition, the interest in cruise tourism in Arctic has been increasing over the years, until the covid-19 pandemic stopped the traffic in 2020 (Statistics Greenland 2020).

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Trends in GDP	2015	2016	2017	2018	2019*	2020*
			Current prices			
GDP, million DKK	16,814	18,224	18,829	19,296	19,970	20,124
Per capita, 1,000 DKK	299	326	337	345	357	359
Annual growth in per cent	5.4	8.4	3.3	2.5	3.5	0.8
			2010-prices, chained values			
GDP, million DKK	14,312	14,983	14,990	15,084	15,426	15,481
Per capita, 1,000 DKK	254	268	268	270	276	276
Annual real growth in per cent	-2.5	4.7	0.1	0.6	2.3	0.4

Source: https://bank.stat.gl/NRE10 **Preliminary figures*

Figure 52. Trends in Gross Domestic Product (GDP) in Greenland between 2015-2020*
**Note that figure from 2019 and 2020 are preliminary.*

Tourism led to the development and expansion of airports in Nuuk, the capital of Greenland, and in Ilulissat, "the capital of tourism". With the aim to provide better access to Greenland, tourism industry could flourish, but is the full infrastructure ready to accommodate larger amount of tourist? However, upon arrival to Greenland the tourist will see crowded airports, busy fishing ports and modern buildings and international car brands, educational institutions, cafés in larger towns but the smaller towns have the primary source of income in settlements is still from fishing and hunting with was the "original" identity of Greenland (Sustine Consult for Visit Greenland 2023).

Investment on entire tourism value chain ensure a stable flow of tourists and ensure a long-term economic viable tourism in Greenland. The investments should include structures that prevent erosion of lands and historical sites, that could sustain tourism for the future generations and important not to forget local infrastructure such as health care system, handling waste and transport etc. to benefit the Greenlandic society that is part of "Support services" in the tourism value chain (Visit Greenland 2021).

There are several cultures that have lived in Greenland between 2500 BC until now. The known different cultures are: Saqqaq, Independence, Dorset and Norse cultures, all of them specialized in arctic climate environments (Greenland National Museum & Archives: www.nka.gl).

Since Greenland is an island, with no international commercial sea routes except cruise ships, nor connecting roads or railways between towns and settlements, the tourists can choose between the international airports as arrival destinations. Only Kangerlussuaq airport has the runway to support larger airplanes (>50 pax). The landing strips of Nuuk and Ilulissat will be expanded to increase the number of direct international flights (Visit Greenland 2021).

6.1.3. Iceland

Iceland is known for its diverse landscapes and the largest glaciers that can be found in Europe. Iceland is located in the middle of the North-Atlantic Ocean just south of the Arctic Circle.

Over the past decades, tourism in Iceland has grown rapidly from about 4,000 foreign tourists in 1950 to approximately 2.4 million in 2018, which is seven times the country's population that year. Due to the COVID-19 pandemic, overseas tourists decreased slightly in 2019. Then, it increased to around 700,000 in 2021. (ITB, 2022). There are indications that it will return to rapid tourism growth in the post-COVID era. Similarly, to how natural destinations like Iceland will become very popular after a period of restraint. Tourism has also been a critical counteraction against the persistent migration of

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people in rural areas to the capital area and thus, been seen as an effective catalyst for rural development.

Throughout the centuries, the main occupation in the Westfjords, the ArcticHub region located in the Northwestern part of Iceland, has been agriculture and fisheries, both have been gradually declining during the past decades. In the last decade, aquaculture and tourism have been contributing in the region's rural development, in which aquaculture is now the major industry in many of the region's small settlements. Most of the aquaculture companies operate in open sea cages in the fjords, that provide good shelter for the cages.

Before the COVID-19 pandemic, around 10.7% of all foreign visitors to Iceland visited the Westfjords (ITB, 2020). The majority of visitors to the area engage in nature-based tourism activities including hiking, biking, horseback riding, bird watching, and simply taking in the landscape while driving. Over the past few years, all sorts of adventure and sport tourism, as well as marathon tourism, have been quickly expanding. Further, the cruise tourism grew fast before the Covid pandemic. In 2019, there were 126 cruises that came to Ísafjörður, compared to 61 in 2015, and 26 that came to Patreksfjörður, compared to 1 in 2015 (ITB 2022).

6.1.4. Norway

Norway encompasses vast mountains, glaciers and deep coastal fjords. In winter, the activities offered are dog-sledge trips, snowmobile tours, northern light and king crab safaris. During spring /summer the cruise ship tourism and fishing tourism are now being the main activity. The economic contribution of the tourism industry was 194 330 million NOK in 2019. The share from the tourism industry on GDP on mainland Norway corresponds to 4.2 %. Out of this, non-resident' share of total tourism consumption is about 30.6 %. (Statistisk sentralbyrå 2022a).

6.1.5. Finland

Finland is located in northern Europe which is one of the world's most northern and geographically remote countries and is subject to a severe climate. Nearly two-thirds of Finland have thick woodlands, which is known as most densely forested country in Europe. It also forms a symbolic northern border between western and eastern Europe: dense wilderness and Russia to the east, the Gulf of Bothnia, Norway to the north and Sweden to the west. (Weibull et all, 2022.). It has the world's biggest archipelago, as well as Europe's largest lake district and last untamed wilderness, Lapland (Visit Finland, 2022).

Currently, population growth is slowing down and without international migration, Finland would be approaching zero population growth. In recent years, population growth has recovered to around half a percent. According to the latest population forecasts, the natural population increase, i.e. the difference between the number of births and deaths, would turn negative at the end of the 2020s or the beginning of the 2030s. Without immigration, the population of our country would probably decline at that time (Tilastokeskus, 2022).

The most significant change in the demographic structure in Finland and throughout Europe is the aging of the population structure. The share of pensioners in the population is growing strongly at the same time as the working-age population is decreasing. The shares of children and young people are also decreasing, and no significant change in the birth rate is expected in the future either (Kuntaliitto, 2019).

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Relative to tourism industry, it is significant in the Finnish economy in recent years, before the Covid-19 pandemic. In 2017–2019, foreign tourism demand increased at an annual rate of about 8%. The covid pandemic in March 2020 and the resulting restrictions had a significant impact on tourism. Before the pandemic, the GDP share of tourism remained at 2.7% but, according to the preliminary data for 2020, it decreased by a whole percentage point to 1.7% (TEM).

In 2019, more than half of tourists' consumption in Finland approximately EUR 8 billion, went to Uusimaa and almost EUR 1.1 billion to Lapland. Regionally, in addition to Uusimaa, tourism demand was particularly concentrated in Lapland (7 %). Lapland and South Karelia were the only provinces where more than half (54 %) of the tourism demand was foreign. Tourism has also significant multiplier effects on other sectors, such as construction, transport, and commerce. In addition, the use of temporary agency labour is common (TEM).

6.2. Tourism industry in the hubs

6.2.1. Suðuroy

Suðuroy is situated at the southernmost of Faroes islands. It is known for its picturesque landscapes of the west coast of the island and its villages. Suðuroy is receiving more visitors in past years. A significant part of the overnight stays at hotels and guesthouses are Faroese residents. During Covid19 this trend clearly increased as there was a boom in domestic tourism in this period. This is reported to be very clear in Suðuroy, where the number of overnight stays was higher than ever before in 2020 (Statistics Faroe Islands 2020). The tourists coming to the Faroe Islands are mainly residents of the other Nordic countries, especially from Denmark, but the number of visitors from other regions was increasing (Figure 53a).

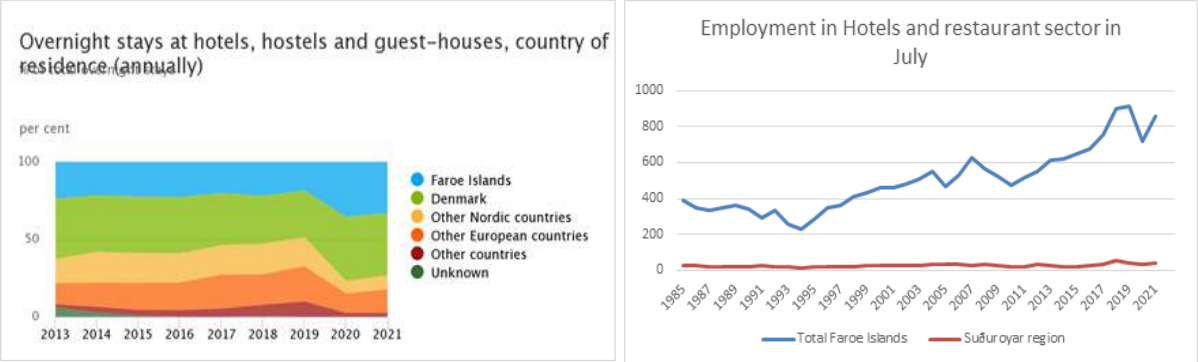

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Figure 53. a) Overnight stays in the Faroes by country of residence. b) Employment in hotel and restaurant sector in the Faroes and Suðuroy. *Source: Statistics Faroe Islands*

The increasing visitor would also indicate the trends in employment in tourism sector as it would demand more persons to be employed. However, it is difficult to account the number of persons directly employed in tourism sector so it was captured from those employed in the hotel and restaurant sector (Figure 53b). The number of hotels, and lodging places as well as places serving food and beverages has increased in recent years. This trend is most clear in the capital area, but it is also discernible in Suðuroy.

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As the number of tourists arriving to the Faroes is increasing every year, and is projected to continuously increase, all regions of the country are receiving more visitors. This growth trend is a result of a conscious political and marketing strategy, but it also means that conflicts are arising. Firstly, not all residents agree with the strategy to increase tourism. Secondly, especially in the peripheral areas, and the smaller settlements, there is discontent with the fact that although these areas are often major tourist attractions, they benefit little economically from tourism. Thirdly, tourism is conflicting with other landuse practices (Statistics Faroe Islands 2020).

6.2.2. Nuup Kangerlua

Nuup Kangerlua is situated in a low arctic climate. The arctic vegetation of low bushes and few grass species that can withstand harsh winter and high windspeed on ground that can grow between bedrock and glacial deposits dominates the landscape. The landscape is formed by abrading glaciers that formed rolling hills along the coast but high rugged mountains in Nuuk fjord can reach 1220m above sea level (DMI 2020).

There is a demand from adventure tourism that can be met by Nuuk and Nuuk fjord. Nuuk is the largest town and capital of Greenland, which has all the comforts of a town and better infrastructure in terms of housing, service etc. compared to other towns in Greenland. Nuuk has along with other towns and settlement in Greenland, easy access to pristine nature for convenience for citizens and the tourists (Visit Greenland 2021).

Accommodation capacity over time in Nuuk has steadily increased until 2020 (fig. 54). The hospitality services investments began just before the covid-19 pandemic outbreak due to increasing demand (Eskildsen 2021).

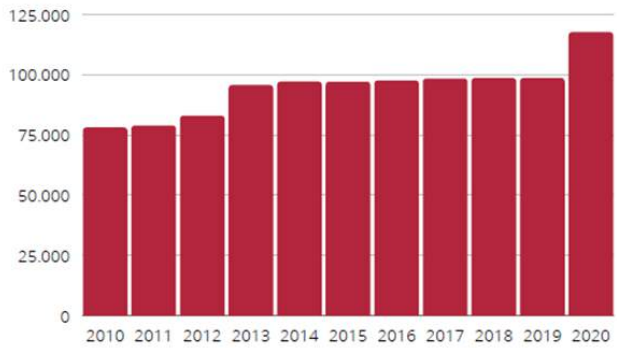

Figure 54. Accommodation capacity over time in Nuuk. *Source: Eskildsen 2021*

The monthly international flights of passengers to Nuuk (refer to Annex: detailed tourism report: Table 12) shows that there is a seasonal variation. The summer months have more flights than the winter period with less flight traffic. This indicates that tourists prefer the summer months to travel to Greenland.

Nuuk has the second or third highest arrivals of cruise ships in Greenland. The number of passengers has almost doubled nationally since 2015, while passenger arrivals in Nuuk has more than doubled between 2015 and 2019 due to a larger number of ships calling Nuuk and also vessels of larger passenger capacity. Cruise ship passengers are often of German and US origin (refer to Annex: detailed tourism report: Table 4).

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The pandemic stopped the cruise ship traffic in 2020 and the first cruise ships has reached the 2019 numbers and the arctic cruise tourism will most likely increase in 2023 based from the local tourism industry (Statistics Greenland 2020).

Aside for cruise tourism, there is a potential to develop gastro tourism based on traditional food in restaurants in Nuuk. There are restaurants that serve local food with culinary inspiration from other countries.

Nuuk is also known for its rich culture, compared to other towns in Greenland, it has the largest cultural sector available. Most cultural heritage items in Greenland are displayed at Greenland National Museum in Nuuk. In addition, there is an art museum in town, and temporary exhibitions at the cultural center Katuaq. Now, the organized cultural tours for the tourists around Nuuk Fjord include some historic settlements in the area. Most tours are focusing on nature like sailing, fishing, and whale safaris.

Opportunities exist to develop new concepts of tourism activities within cultural heritage or art for Nuuk region because in other parts of Greenland, tourists visit former or active settlements to learn about past and modern lives. Geological tourism – "geo-tourism" is a possible asset since the geological regions around Nuuk include gold deposits and rock formations of extreme age from the earliest times of the Earth – and a nearby small island containing sedimentary rocks holding perhaps the oldest evidence of life on Earth. Development of these themes will involve new investments and targeted management. Municipality of Sermersooq in co-operation with Government of Greenland has commenced a project to open a visitor center in Nuuk called: "Nature and Geo Center" that focuses on geology of the area, but when the facility is available is unclear (Visit Greenland 2021).

Greenland has potential to provide an all-year-round tourism all over Greenland. Dog sledding is only available in North Greenland (due to regulations about Greenlandic husky) during the Spring season but can be combined with other activities in Nuuk and its fjord system 4-600 km away. This requires interregional planning and co-operation concerning services and infrastructure, followed by destination development around Nuuk. The Nuuk fjord can be developed further in tourism but with respect for local's decision in the area.

6.2.3. Westfjords

The project focus on two out of nine municipalities in the Westfjords region namely, Vesturbyggð and Tálknafjarðarhreppur located in the region's Southwestern part. These were selected because of persistent migration of people since mid-1930s, and was the region in Iceland where depopulation was greatest in the first decade of this century, with relative population change 1998-2008 of minus 14.2% (IRDI, 2022a). During the past few years new industries, like aquaculture and tourism, seems to change this development.

The population development in the two ArcticHubs municipalities since the turn of this century was gradually decreasing in both municipalities until 2011. In Vesturbyggð, the total population dropped to 890 in 2011 but has since been gradually increasing and had reached 1064 on the 1st of January 2022 (Statistics Iceland 2023). In Tálknafjarðarhreppur, the number of people continued to decrease until 2012 when 276 were registered there, in the years after the number increased little, but in 2016 the population dropped to 267 and a year later to 236. Since then, it has been slowly increasing and was 255 on the 1st of January 2022 (refer to Annex: detailed tourism report: Figure 37).

The gender ratio in both ArcticHubs municipalities has traditionally remained fairly equal. In recent years, however, the proportion of men in the total population in both municipalities has been rising,

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the proportion of men is now 55% in Vesturbyggð and 57% in Tálknafjarðarhreppur against 45% / 43% women (Statistics Iceland 2023) (refer to Annex: detailed tourism report: Figure 38). Today's age pyramids emphasize this development in the gender division in both municipalities. They also highlight negative growth with relatively few in the youngest age groups (refer to Annex: detailed tourism report: Figure 39).

Relative to the tourism industry, it is difficult to account the accommodation for the two hub municipalities, so the available figure only exist for the whole region.

Over the past decades, tourism sustained a rapid growth in the Westfjords, as seen by guests' arrivals in all types of registered accommodations that have tripled between 2008 and 2015 (fig. 55a). While the number of domestic guest's arrival remained relatively stable, international guests' arrival increased more than five times between 2008 and 2015 (Statistics Iceland 2021). These numbers then gradually decreased to stabilize just under 100,000 until the COVID-19 pandemic when these numbers dropped to about 30,000. Domestic tourists on the other hand increased substantially from 2018 to 2020, from about 27000 to nearly 65000. This can be connected to the difficulties for international travel at that time. Similar trends on guest arrivals are observed with overnight stays in all types of registered accommodations. Cruise ship arrivals increased greatly over the past decade. The multiplier effect of this increase in cruise ship arrivals to the Westfjords led to cruises also stopping in smaller ports. As regard the Westfjords hub study area, one cruise ship came to Bíldudalur in 2016 and one in 2017, and two in 2018. A total of 18 cruise ships came to Patreksfjörður in 2018 and a total of 21 in 2019 (Statistics Iceland 2021). This also indicates the growth of visitor numbers from cruises in the area, with nearly a fourfold increase between 2012 to 2019 (refer to Annex: detailed tourism report: Figure 46).

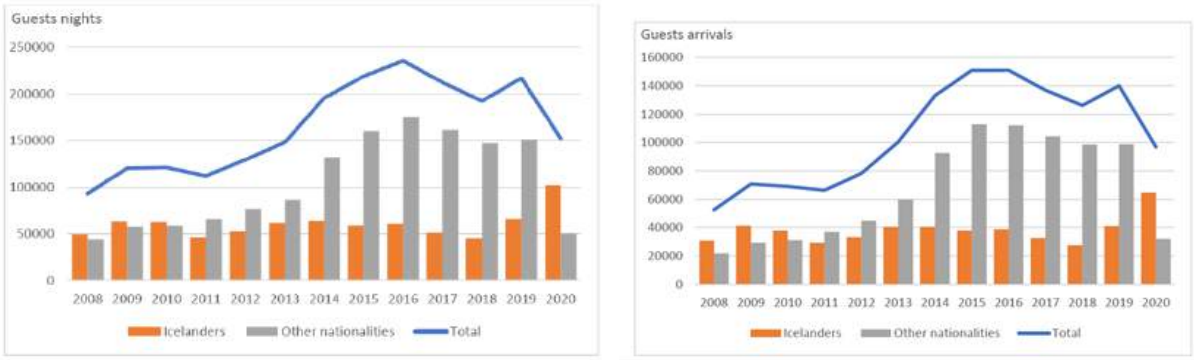

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Figure 55. a) Overnight stays in all kind of registered accommodations in the Westfjords. b) Guests arrivals in all kind of registered accommodations in the Westfjords. *Source: Statistics Iceland*

With the increasing guest arrivals, the total number of tourist operators in the Westfjords region have increased by more than two-thirds since 2014 (fig. 56a). However, there are considerably more enterprises that have an operating license. By looking at the accommodation and restaurant licenses divided by municipalities for the Westfjords region, there were a total of 129 in 2021, of which 28 were in Vesturbyggð and 6 in Tálknafjarðarhreppur (fig. 56b). When looking at the development of operating licenses since 2017 there was a gradual increase until 2020 in all municipalities (Visit Westfjords 2023).

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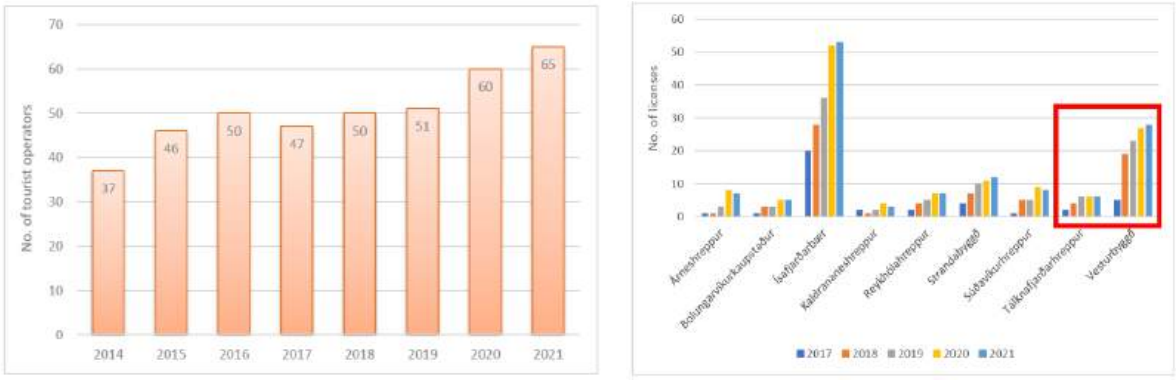

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Figure 56. a) Number of tourist enterprises operating in the Westfjords region 2014-2021 registered by Visit Westfjords. b) Accommodation and restaurant licenses by municipalities in the Westfjords. The red rectangle delimits the Westfjord Hub. *Source: the Westfjords Health Inspectorate and the Westfjords District Commissioner*

6.2.4. Svalbard

Svalbard is a high-Arctic Archipelago that is experiencing a rapid and multifaceted change: climate, industry, tourism, sea ice and glacier extent, terrestrial and marine biology, economic development, and population composition. Svalbard is strongly affected by changes in international markets, such as low coal prices and increasing interest from the tourist and fishing industries, which has resulted in a major change in economic activities in recent times. These changes have large impact on the population at large (nationalities, gender, age, professions), the economic system, infrastructure and environmental management. Since 1995 the population in Longyearbyen and New Ålesund has increased from 1,218 people to 2,552 in 2021 (Visit Svalbard 2022; Statistics Norway 2023).

Nowadays, tourism and research/education are more important for employment. Increased interests from tourists, especially from the cruise industry, to experience the fragile Arctic nature, is already on the limit of sustainability.

Tourism industry has value creation of 520 million NOK in 2008 and has increased until a peak in 2017 reaching 893 million NOK. In 2019 the income had decreased to 851 million NOK and further to 539 million NOK in 2020 (Statistisk sentralbyrå 2022c).

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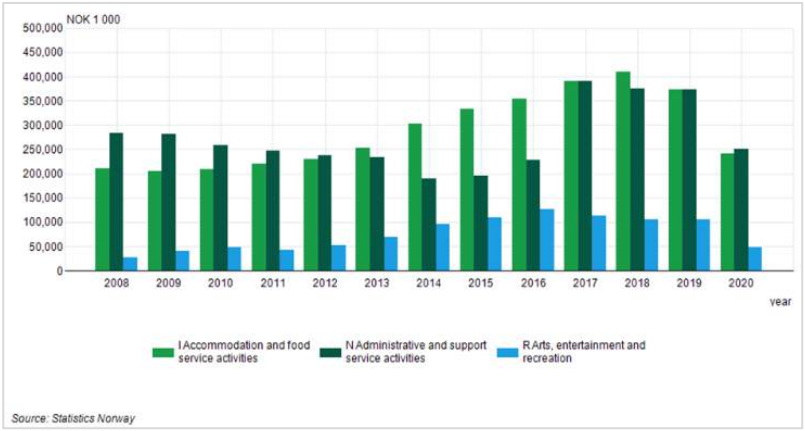

Figure 57. Svalbard industry statistics. Value creation from tourism and culture sector. *Statistisk sentralbyrå 2022c*.

Just under 30,000 tourists visit Longyearbyen in the course of a year. In addition to this, overseas cruise tourism accounts for about the same number, including crew. Svalbard has become a destination with varied and well-organized tourism. Despite visible growth, Svalbard tourism is still a small number. The traffic to Longyearbyen, for example, represents less than one percent of the total tourism on the North Calotte. (Eliassen n.d.)

Top ten activities in tourism industry on Svalbard in 2021 includes cruise tourism, dog sledding, scooter tours, food, and beverages, hiking trips, sightseeing and guiding, visiting mines, ATV trips, visiting ice caves, and watching northern lights (visitsvalbard.com). The following numbers on tourism also include the food and beverage-serving industry as Statistics Norway include this in their presentations of tourism and culture sectors.

The number of overnight stays reached a record 166,801 guest days in 2019 (Figure 58a). The largest increase is linked to the holiday and leisure market. The number of overnight stays in this segment more than trebled from 2005 to 2019. Since 2005, the number of overnight stays linked to business trips has fallen steadily, with the exception of 2018, which saw extensive construction work in Longyearbyen. The figures for overnight stays during 2020 are inevitably affected by the measures relating to the coronavirus pandemic which were introduced in March 2020. These measures resulted in a substantial fall in the number of overnight stays in Longyearbyen and we have to go back 20 years to find corresponding figures at the same level as in 2020 (Statistics Norway 2020a) .

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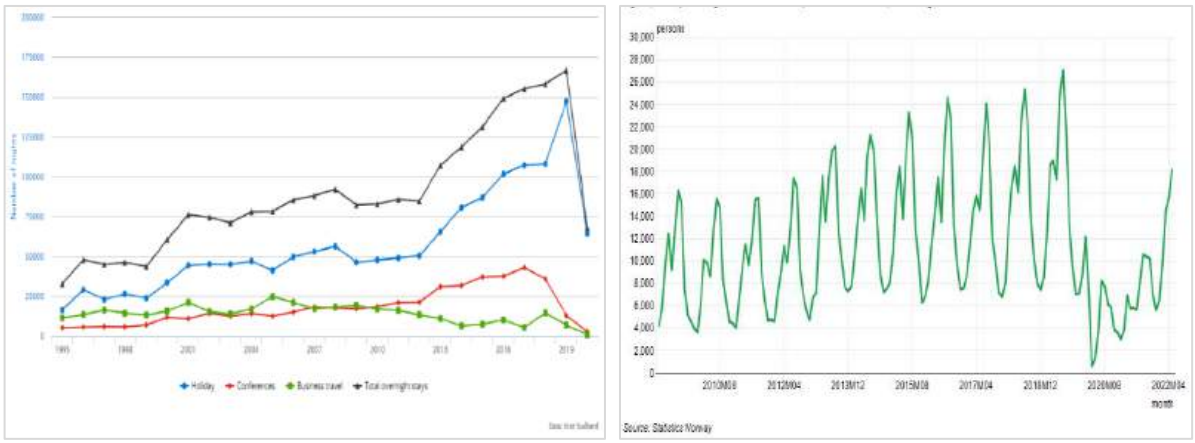

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Figure 58. a) Number of overnight stays from 1995 to 2020. b) Air transport to and from Longyearbyen airport. Number of passengers per month from 2009 to 2022. Source: Visit Svalbard 2020

From 2009 to 2019 number of passengers in commercial flights has increased. There was a dramatic decreased in 2020 due to covid-19 but in 2022, it is now increasing (Figure 58b).

Cruise tourism makes up a major part of tourism on Svalbard with a large number of operators and vessels. There are two main types – ocean-going cruise ships (luxury ships) and expedition cruise ships. In addition, several small vessels (research vessels) offer day trips in Isfjorden (Visit Svalbard 2020).

With regards to the number of businesses which is connected to the income from the industry, the businesses peaked (2008 to 2016) from 46 to 115 businesses and reduced to 111 businesses in 2019. In 2020, there was again a small increase with 142 businesses registered (Statistics Norway 2022d). The Covid-19 pandemic forced many of the smaller businesses to close, but there is yet no available statistics on the exact number of closed businesses.

The tourism industry provides employment on the tourism and culture sector in which it increased from 638 in 2008 to 1,001 in 2019 but went down in 2020 due to layoffs of employees caused by covid-19. The largest proportion of employees is in accommodation and food service activities.

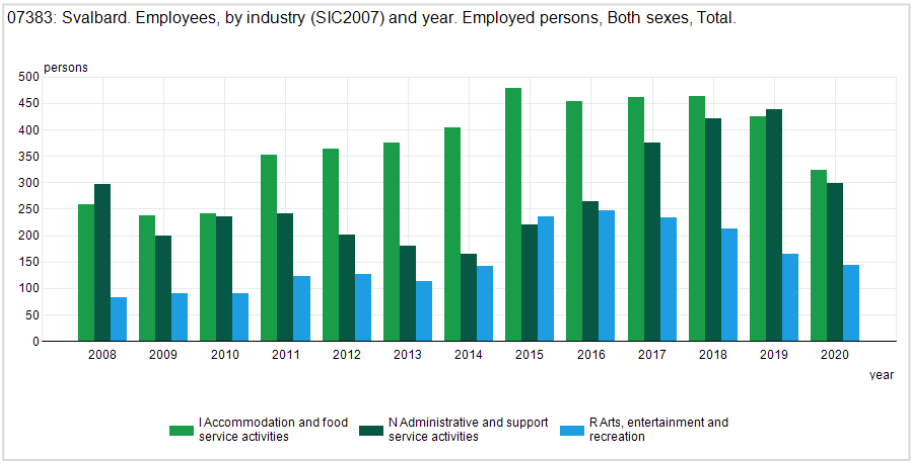

Figure 59. Number of employees in tourism and culture sector from 2008 to 2020.

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In terms of culture and cultural heritage, exploration and exploitation of natural resources have left a tangible human imprint on the Svalbard landscape since the Dutch explorer Willem Barents (re)discovered the archipelago on 17 June 1596 (Thuestad et al. 2015a). The cultural monuments are often located at places that from earlier times have been suitable for disembarkation, which contributes to the cultural monuments being particularly exposed to the influence of visits by tourists and other traffic.

However, there has been raised concern about unorganized tour operators and the fact that all operators are not required to be members of Visit Svalbard or AECO, and that the guides might not have necessary knowledge in order to minimize the impact on the environment. There is also a lack of consolidation for courses and education (Ikonen & Sokolíčková 2020).

There are conflicts in relation to tourism on Svalbard as emphasized in the workshop initialized by Visit Svalbard and AECO (Ikonen & Sokolíčková 2020). Tourism triggers a major structural change in a community. Svalbard attracts more non-Norwegians, the turnover is extremely high plus the numbers in the population register might be inaccurate, the housing situation is described as critical, and there is a clear risk of social dumping. In addition, the attitude towards tourism varies among people living in Longyearbyen. By some, the economic benefit is questioned given the social loss. Unorganized tour operators and stakeholders exploiting the destination are seen as a risk. The community sees unskilled and/or uncertified guides as a threat also because they fear that the destination's brand might be at stake. More local value creation is desired, and the existing rules and regulations are perceived as insufficiently adapted. Another area of concern are the practical issues related to the booming tourism industry, such as scarcity of housing, seasonality and instability of tourism-related jobs, unequal employment contracts, illegal and/or morally questionable working practices, and growing pressure on infrastructure.

6.2.5. Varangerfjord

The Varangerfjord is the easternmost fjord in Norway. The fjord is located in Troms og Finnmark county between the Varanger Peninsula and the mainland of Norway. The fjord is approximately 95 kilometer's long, emptying into the Barents Sea. Its mouth is about 70 kilometres wide, located between the town of Vardø in the northwest and the village of Grense Jakobselv in the southeast. The fjord is 3200 square kilometers, while the main land and islands are 7267 km2 (Statistics Norway 2020b).

The aquaculture and tourist hub in northern Norway is Varangerfjord. There are 4 municipalities in Varangerfjord HUB populated with 21 413 inhabitants (year 2021). The municipalities are Sør-Varanger, Vadsø, Vardø og Nesseby.

In Troms and Finnmark there are 241,680 people per. 30.06.2021 with an average age of 41 years. In 2010, the population in Troms and Finnmark accounted for 4.7% of the country's population, in 2021 the population in Troms and Finnmark accounted for 4.5% of the country's population, and since the beginning of 2021 we have had a decrease in the population in the region of 0.2 % (Statistics Norway 2023).

The Varanger HUB population development in the four municipalities have been up and down except for Vardø. The development in habitants in Vardø have declined from over 4000 around year 1970 to under 2000 in year 2021. The total population in 2022 are 18244 inhabitants. The region eastern Finnmark have 26414 (Statistics Norway 2023).

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Despite this, forecasts for the future show that the population in the region will grow further towards 2040. In 2040, the average age in Troms and Finnmark will be 44 years, while the rest of the country will have an average age of 43 years. (Source: Troms and Finnmark County Municipality).

6.2.5.1. Tourism industry

The tourism industry is characterized as one of the land-based industries in North-Norway with the greatest value creation potential, with an estimated value creation of NOK 7.5 billion in 2020. This was a decrease of 23% from 2019. Troms and Finnmark had a decrease of 47% and 33%, while Nordland had an increase of 13%. Svalbard had a decrease of 50% (NHO Reiseliev 2021).

Like 2020, the tourism industry in the north was strongly affected by the corona pandemic. Statistics show large regional differences in relation to how the corona pandemic has affected the tourism industry's value creation in the north. It appears that the tourism industry in Troms and Finnmark and on Svalbard has been hardest hit.

Tromsø and Svalbard were the two regions that were hardest hit, with a decrease in value creation from 2019 to 2020 of respectively 53.8% and 50.1%. Other parts of Troms and Finnmark, as well as Lofoten, were also negatively affected by the pandemic. (NHO Reiseliv Regionforening Nord-Norge 2021).

The report states that it will take time before the biggest actors (Avinor, Hurtigruten, and atractions) will be back to the results are at before Covid 19 level. The last two years have been difficult, but the figures show a nice overall increase in 2022.

The most important players in tourism are: accommodation and food service establishments, transport companies, mediation – travel agencies and tour operators, attractions, activities, culture and experiences, trade and service companies, counties and municipalities, as actors and managers, the tourism joint organisations.

6.2.5.2. Employment

The figures for employment in the tourism industry had a clear decline in 2020, but have rised again to approximately the same level for all categories. Although some of the categories have a decline e.g. Transport with -7.6% compared to 2017 (NHO Reiseliev 2021).

The table 7. for Troms and Finnmark County shows a stronger decline in employment with more than 1000 fewer employees in the tourism business compared to 2019.

Table 7. Employment in the tourism sector in Troms and Finnmark - 2017-2021 (source: NHO Reiseliv, 2021)

	Employment in Troms and Finnmark County					
	2017	2018	2019	2020	2021	2017-2021
Accommodation business	2 159	2 165	2 221	1 515	1 925	-11 %
Severings business	3 462	3 553	3 619	3 112	3 505	1 %
Culture and entertainment	952	1 045	1 083	864	1 013	6 %
Dissemination	406	476	530	287	437	8 %
Transport	2 764	2 755	2 874	2 435	2 397	-13 %
Sum	9 743	9 994	10 327	8 213	9 277	-5 %

Tromsø has the biggest decline (-53,8%) from 2019 to 2020 with 1.2 billion NOK. Other regions have a nice increase in value creation like the northern part of Nordland County, Vesterålen/Narvik and the southern part of Nordland the region Helgeland. The increase in Vesterålen/Narvik was 87.6% while Helgeland achieved 14%.

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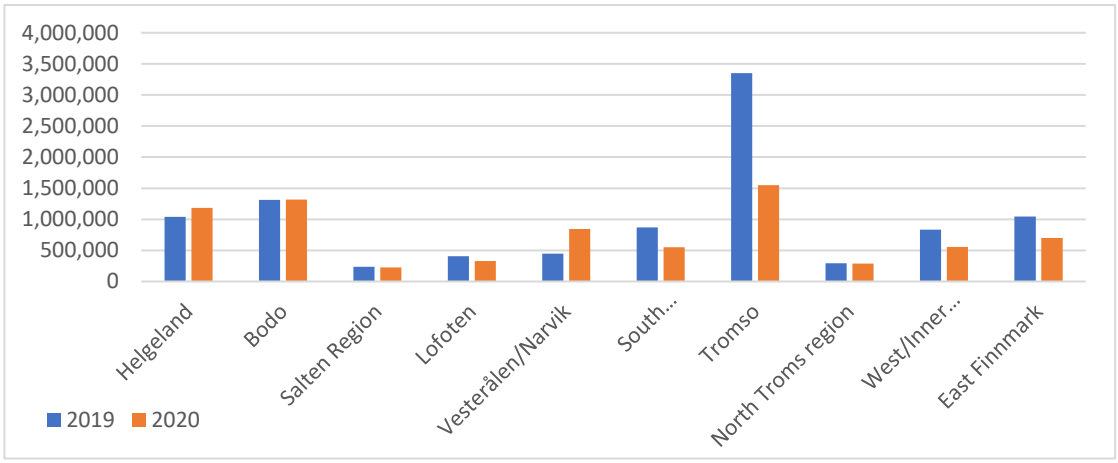

Figure 60. Value creations in the tourist regions north of Norway (in NOK 1000) (NHO Reiseliv, 2021)

The development in number of commercial overnight stays at hotels, campsites/cabin hamlets and hostels, county-wise distribution in Nordland, Troms and Finnmark shows a clear decline both for Finnmark (-25,4 % from 2017 to 2021) and Troms (-29,4%). Nordland has a minor decrease, -4.1%. If we compare 2020 with 2021 we see a positive development for all three counties (NHO Reiseliev 2021).

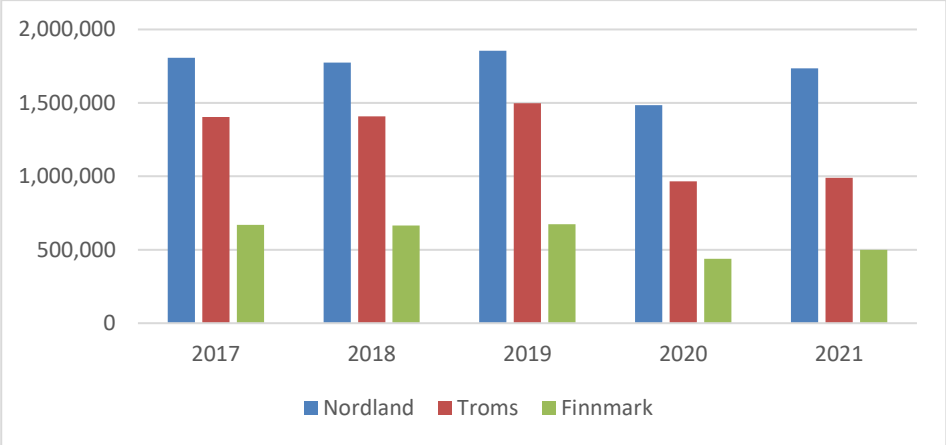

Figure 61. development in number of commercial overnight stays at hotels, campsites/cabin hamlets and hostels, county-wise distribution (source: NHO Reiseliv, 2021)

The overall figures for commercial overnight stays in Norway and Northern Norway show a clear decline before covid (2019). The relative part for northern Norway is stable around eleven/twelve percent of total Norway (NHO Reiseliev 2021).

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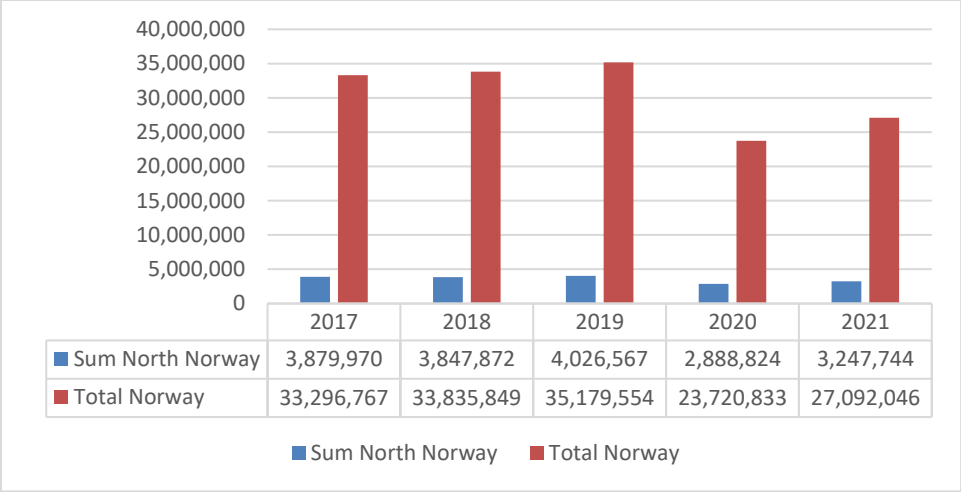

Figure 62. Overnights in northern norway compared with Norway (source: NHO Reiseliv, 2021)

Number of commercial foreign overnight stays at hotels, campsites/cabin hamlets and hostels have a clear decline, especially from 2019 to 2021. Finnmark had the largest decline with 64.7% in 2021 compared to year 2017. Both Troms and Nordland has a substantial decline due to the pandemic (NHO Reiseliev 2021).

6.2.5.3. Passenger transport (air, railway, water, road)

Aviation is an important transport activity. In figure 63 we see an overview of passengers in Finnmark. It is a decrease from 1.2 million passengers to different airports in Finnmark. The year 2020 was clearly very low with totally 686 thousand passengers. After the pandemic the figure raised to 854 thousand, an increase of 24,5 % (NHO Reiseliev 2021).

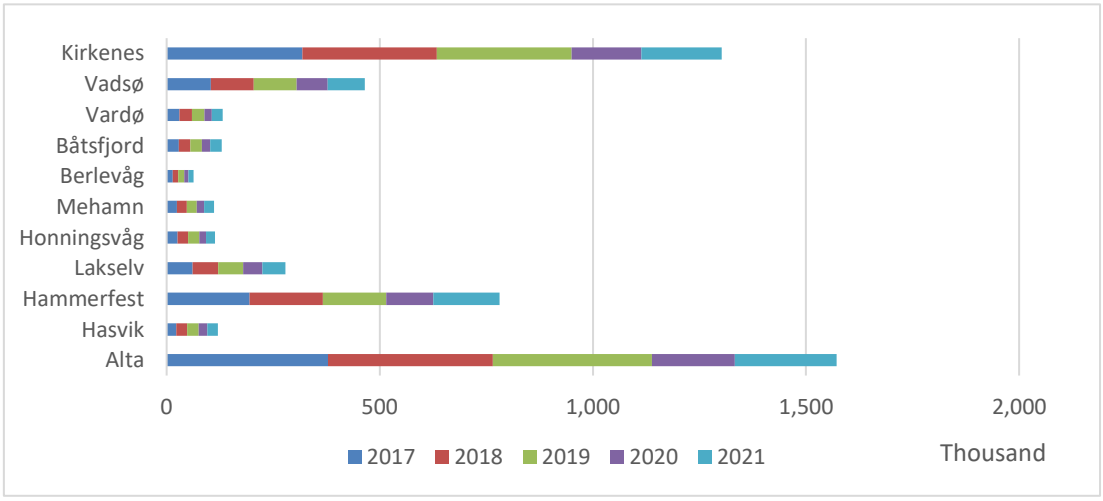

Figure 63. Aviation - scheduled, offshore and charter traffic including transfer and transit (NHO Reiseliv, 2021)

Cruise

In total, there were 112 cruise ship calls in North Norway in 2021, which is an increase of 111.3% compared to 2020. 47,228 passengers to port represent an increase of 10.8%. The number of passengers per port call in northern Norwegian ports has decreased by 47.5% from 2020 to 2021. In

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the period from 2017 to 2021, the number of calls in the northern Norwegian ports has decreased by 68.0%, while the number of passengers to port has decreased by 87.5%. Longyearbyen had no cruise calls/cruise passengers to port in 2021, i.e. a decrease of 100% from 2017 (NHO Reiseliv 2021).

Table 8. Number of calls in northern Norway ports (NHO Reiseliv, 2021)

	2017	2018	2019	2020	2021	Change 2017-21	Change 2020-21
Alta	18	18	27	15	12	-33,3 %	-20,0 %
Bodø	13	17	26	5	4	-69,2 %	-20,0 %
Brønnøysund	18	20	17	3	16	-11,1 %	433,3 %
Hammerfest	17	16	18	0	0	-100,0 %	
Harstad	4	8	3	0	1	-75,0 %	
Lofoten	74	115	84	0	28	-62,2 %	
Narvik	3	14	20	6	2	-33,3 %	-66,7 %
North Cape	96	100	99	4	22	-77,1 %	450,0 %
Tromsø	103	116	121	18	27	-73,8 %	50,0 %
Vesterålen	4	6	7	2	0	-100,0 %	-100,0 %
Sum North Norway	350	430	422	53	112	-68,0 %	111,3 %

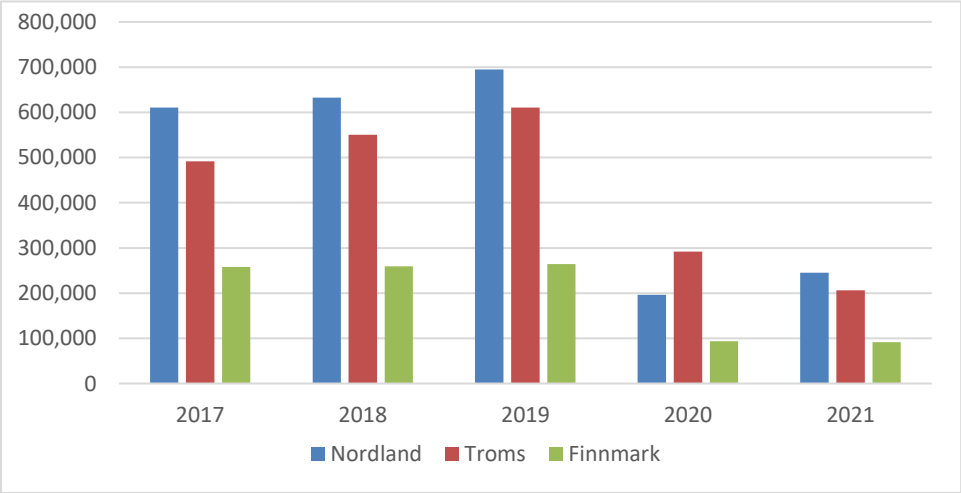

Figure 64. Number of commercial foreign overnight stays at hotels, campsites/cabin hamlets and hostels – northern Norway (source: NHO Reiseliv, 2021)

Commercial foreign overnight stays at hotels, campsites/cabin hamlets and hostels in North Norway are shown in figure 62. Largest markets are in summer (period May to September 2021) and in winter period (period October 2021 to April 2022). Visitors from Germany are dominant in northern Norway followed by Finnish and Swedish tourists (fig. 65).

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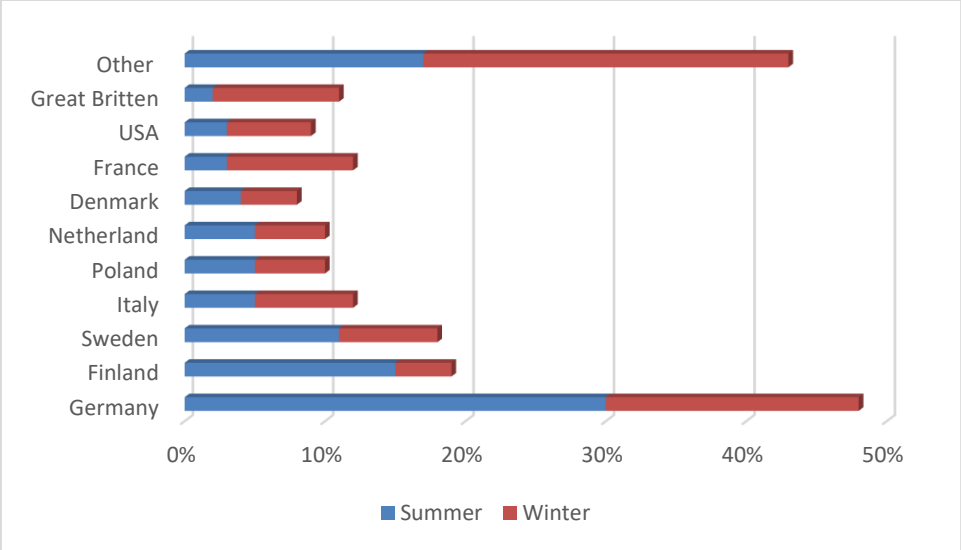

Figure 65. Tourist by country visiting northern Norway summer 2021 and winter 2022 (source: NHO Reiseliv, 2021)

6.2.5.4. Fishing tourism in Troms and Finnmark

The tourist activity in the Varanger HUB is important to the area. It consists of many traditional activities and attractions that are present in both in Lappland and Northern Sweden. One of the special activities in Varangerfjord is Sea Fishing Tourism. It is an important activity in many small communities and create both ripple effects and employment. Many young people work within this industry Directorate of Fisheries, 2021).

Since 2018, the Directorate of Fisheries has kept statistics on catches and landings of fish at Norwegian fishing tourism companies. In 2019, a catch of 2.49 million fish was registered at these companies, of which 40 % were released again while the rest, 1.49 million fish, were brought ashore (Directorate of Fisheries, 2021). Just over 95% were cod and saithe, and the number of fish registered increased by about 5% from 2018 to 2019. In 2020, activity in the industry fell sharply back as a result of the COVID-19 situation with infection measures and travel restrictions, and a total of 654,000 fish were caught, a decrease of 74% from the previous year.

In 2019, 318 000 fish were caught at 46 different tourist fishing companies in Finnmark. This was a decrease in the number of fish of 3% from 2018. In 2020, the catch fell to 65,500 fish, down 79% from the previous year, with registered activity at 38 companies. The five municipalities in Finnmark with the most activity and the largest number of companies are Hasvik, Loppa, Måsøy, Alta and Nordkapp. These house 80% of the tourist fishing companies in the region, and 80-90% of the registered catch is taken there (Robertsen et. al., 2022). A large proportion of the companies engaged in fishing tourism in Troms and Finnmark are sole proprietorships. The county has 164 companies registered in fishing tourism, of which 60 are sole proprietorships and 104 are limited companies. At country level, there are 1110 companies registered in fishing tourism, of which about 65 per cent are sole proprietorships.

Characteristics of fishing tourists in Troms and Finnmark

The nationality of the fishing tourists as well as the number of guests and guest nights at the fishing tourism companies are presented in the figure 65, that shows the distribution of fishing tourists' nationality within the old counties of Troms and Finnmark (Johnsen et al. 2022).

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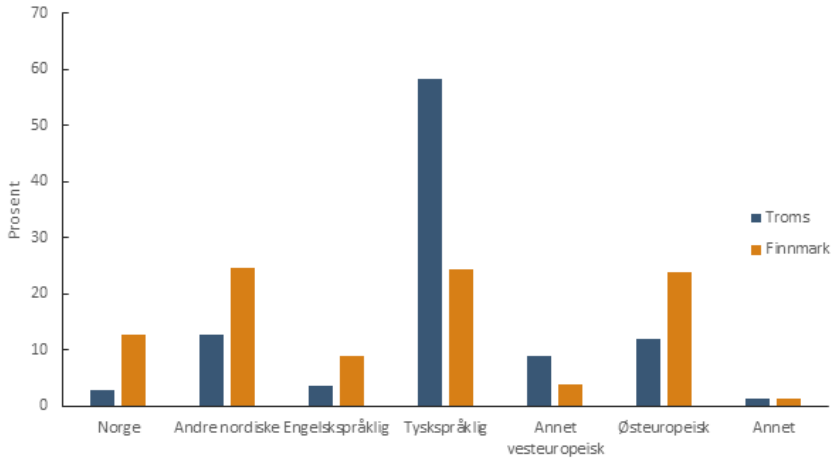

Figure 66. Distribution of fishing tourists' nationality (Source: Menon Economics) from left (Norway, Other Nordic tourist, English, German, Other western Europe, Eastern Europe, other)

The figure shows that there is a significantly higher proportion of German-speaking fishing tourists in Troms than in Finnmark. Almost 60 per cent of fishing tourists in Troms are German-speaking, while the corresponding figure for Finnmark is about 24. In Finnmark, the proportion of Norwegian and other Nordic tourists is higher, in total about 40 per cent. The corresponding figure for Troms is about 16 per cent. The proportion of Eastern European tourists is also higher in Finnmark, 24 per cent compared with 12 per cent in Troms .

The number of guests at the fishing tourism companies can be divided into guests who stay overnight as well as guests who stop by without accommodation. The figure below shows the estimated number of guest nights and the number of guests (regardless of length of visit) for Troms and Finnmark.

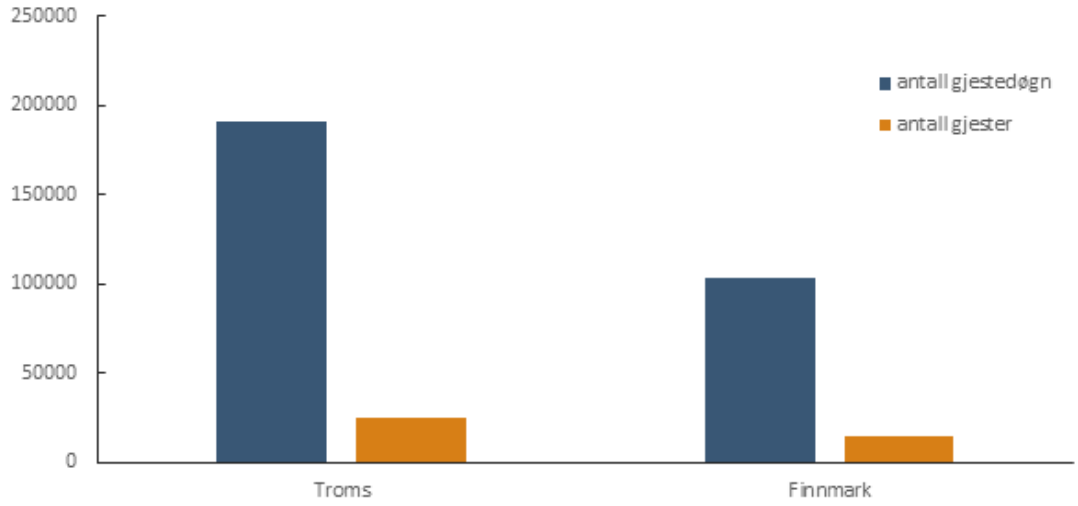

Figure 67. Number of guests and guest nights related to fishing tourism in Troms and Finnmark in 2019 (Source: Menon Economics)

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The estimated number of guest nights in fishing tourism in Troms and Finnmark is in the order of 190 000 and 100 000 respectively. The overnight guests stay on average for 7 nights, but there are also some visitors at some fishing tourism companies that do not take advantage of the accommodation offered. The estimated number of guests who have visited the companies associated with fishing tourism is approximately 25,000 and 14,000, respectively.

Employment

We find that the total employment effects of fishing tourism in Troms and Finnmark in 2019 were about 330 man-years. This is shown in the figure below.

In total, there are 190 man-years directly and indirectly linked to the fishing tourism companies in the old Troms county. In Finnmark, the corresponding figure is 140 full-time equivalents. A total of 280 man-years come from direct effects and 50 from indirect effects. In addition, the fishing tourism industry in Troms and Finnmark lays the foundation for 75 man-years in the rest of the country.

The largest fishing tourism municipalities are Senja, Tromsø, Harstad, Karlsøy, Lyngen, Nordreisa, Hasvik and Båtsfjord, all of which have employment effects of between 20 and 60. If we instead look at the relative effects, the effects are greatest in Hasvik, Loppa, Ibestad and Karlsøy, where the employment effects as a share of private employment are more than 2.5 per cent.

Value creation

The fishing tourism results in value creation in the municipalities of Troms and Finnmark. Based on the Menon ripple effect model, we find total value creation effects of NOK 194 million in 2019. These are divided into direct and indirect effects as shown in the figure 68.

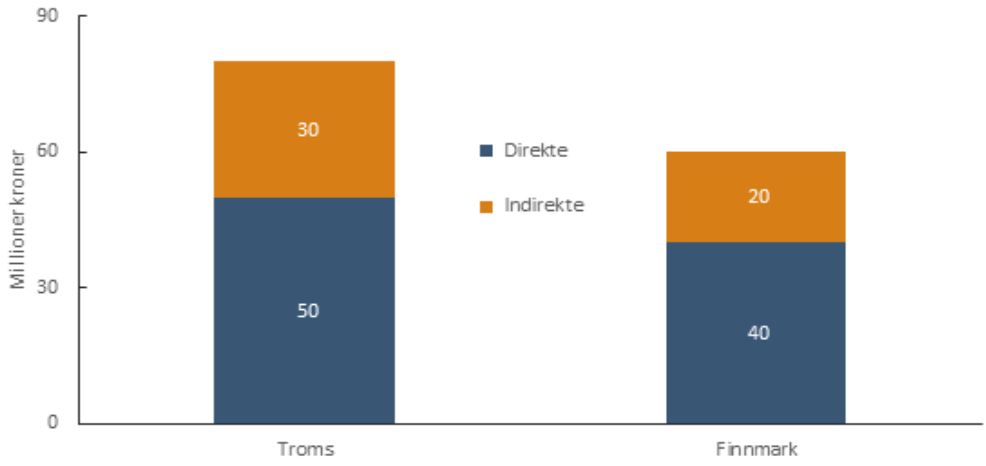

Figure 68. Value creation effects in Troms and Finnmark respectively from fishing tourism in 2019, Million NOK (Source: Menon Economics) (blue – direct in the industry, indirect orange – Value created in other industries)

These effects are distributed between NOK 80 million in Troms and NOK 60 million in Finnmark. In total, the fishing tourism companies had a value creation of NOK 130 million in 2019. In addition, they laid the foundation for value creation of NOK 50 million at their suppliers and subcontractors in the rest of Troms and Finnmark. The relationship between value creation and employment is a measure of how productive an industry is. For the activity in companies engaged in fishing tourism, we find productivity of NOK 460 000 per full-time equivalent, while among suppliers and subcontractors it is more than NOK 1 million.

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6.2.6. Egersund

Egersund town, where the head quarter of Magma Geopark is located, is the most populated city in Egersund municipality: one of the five Geopark´s municipalities together with Lund, Bjerkreim, Flekkefjord and Sokndal. The five municipalities and the two Counties Rogaland and Agder are owners of the Geopark together with 13 private investors, operating in the tourism sector. The name 'Magma Geopark' refers to the fact that most of the solid rocks in the area has formed from molten rock – magma – about 930 million years ago. Large volumes of magma crystallized to form the rock type anorthosite (Magma Geopark n.d.).

The main tourist activities are outdoor sport linked with the unique characteristic of the landscape: trekking, cycling, climbing and water activities (Rogaland fylkeskommune 2021).

The highest number of tourists are coming from the Nordic Countries, Germany, however more than 30 nationalities for about 120.000 overnight stays are registered. The trend from 2013 to 2021 in overnight stays are increasing. Overnight stays in hotels are significantly increasing (overnight stays are tripled compared from 2013 to 2021) in comparison with the stays in camping or other accommodation. The 2020 and 2021 were the most successful years for the number of Norwegian tourists in the Geopark, due to Covid-19 pandemic restrictions to travel abroad (Statistics Norway 2021).

Magma is positioned as a unique company, it is the management body of the only site in the southwest of Norway recognized by UNESCO, so it is in fact, irreplicable. Magma is, in fact, encompass education, tourist, development of innovation, internationalization, local and international networking (Magma Geopark n.d.).

From the environmental point of view, Magma is active on several fronts: we have been certified as EMAS for evaluation of internal environmental standards.

Promoting the use of km-zero food though the support to local producers within the GEOfood brand and MANIFESTO addressed to the major challenges detected by the UNSDGs.

Magma is developing tourist offer which are supporting the use of "green" transport" for reaching our localities, we are active in promoting the "leave nothing but footprint" motto for avoiding garbage abandonment in the nature.

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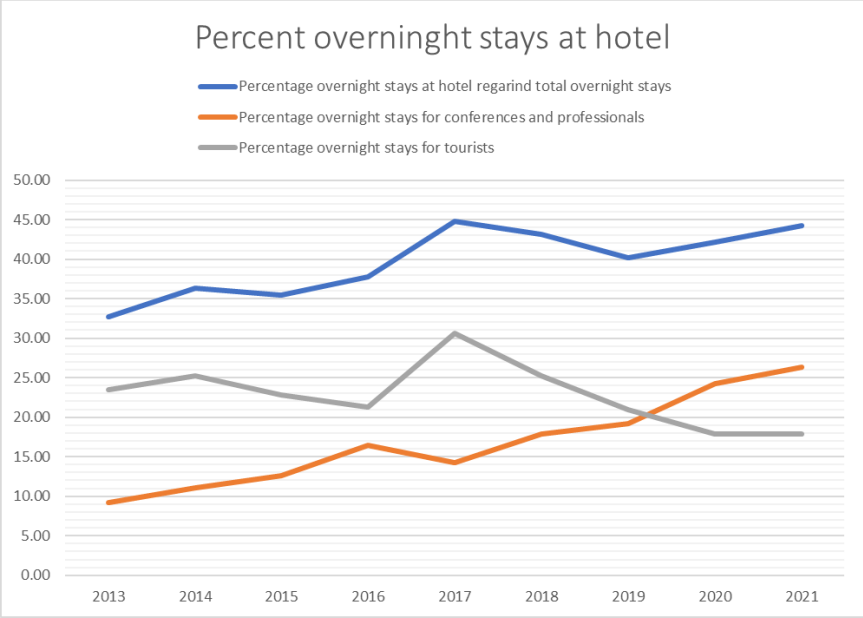

Figure 69. Development of tourist that stay at hotels in Magma Geopark for the period 2013 to 2021. The blue line is total overnight stays (conferences, professionals and holiday) at hotel relative to all kind of overnight stays in the geopark (cottage, camping and hotel). The red line is the growth in tourists (holiday) that stays at hotel relative to all kind of overnight stays. The grey line is conferences and professionals relative to all kind of overnight stays.

The overnight stays in the geopark have changes dramatically as overnight stays in hotels has increased significantly (see figure) as the total overnight stay just have had a smaller increase (see figure 69). This means that tourist that arrive to Magma Geopark choose to stay more at hotel than camping and cottages. Since 2017 there har bee a decline in conferences and professionals since 2018. At the same time there har been significant more Norwegian tourists compare to foreigners. Before 2019 there has normally been around 2/3 Norwegians but since 2019 the relative number of Norwegians compare to foreigners grown to more than 90%. It seems that Norwegians to a lager degree than foreigners prefer hotel to camping. Total overnight stays have had a smaller growth in the same period with about 10% growth (Statistics Norway 2021).

Passenger transport (air, railway, water, road)

Egersund and Flekkefjord towns has become cruise destinations the last years, starting in 2018. In 2022 are there planned that 8 cruise ships shall visit Magma Geopark.

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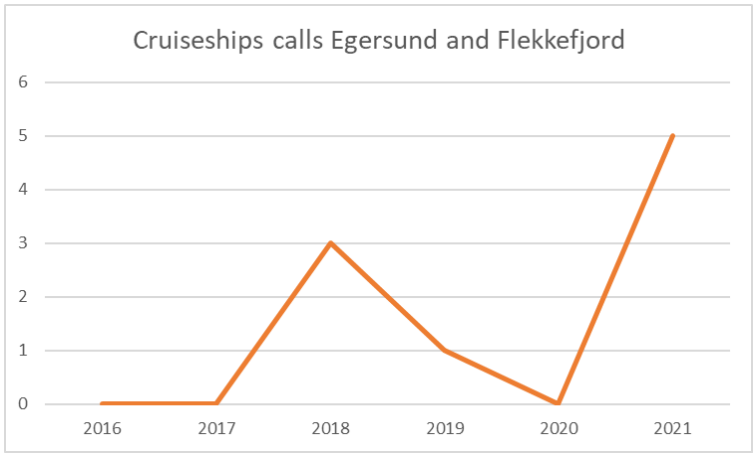

Figure 70. Yearly number of cruise ships visiting Magma Geopark.

No. of people employed under tourism activities

In 2017 made The configuration of Norwegian Enterprises an report that stated that 682 inhabitants in Magma Geopark was employed in a company working in tourism. This is 2.0% of the total population and 4.2% of the working population (Statistics Norway 2021).

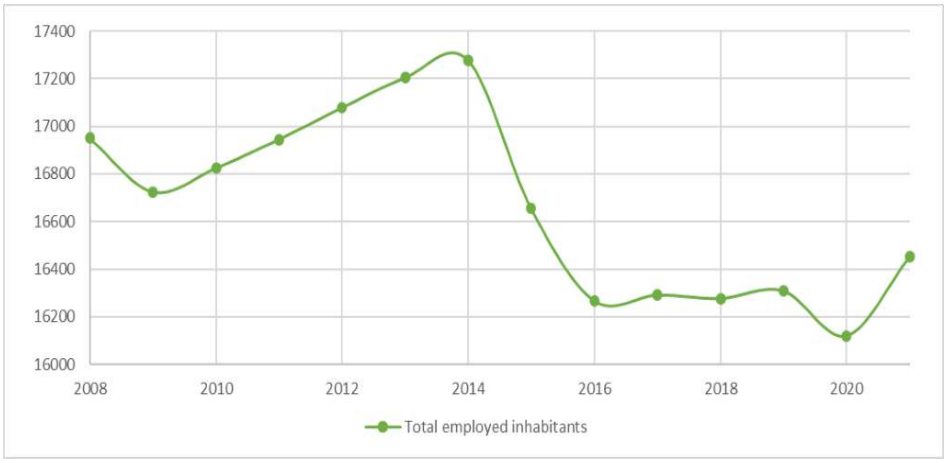

Figure 71. Total amount of inhabitants in Magma Geopark that are employed in a company. In 2017 4.2% of this was employed in tourism.

Conflicts/issues

Locally, there are some conflicts with local landowners due to the increasing amount of tourist in certain locations, however Magma is actively supporting the local communities within agreement with municipalities and with its own resources to build infrastructures, like parking places.

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6.2.7. Inari

Inari is one of the most important and international tourism destinations in Lapland and the largest municipality in Finland (refer to Annex: detailed tourism report: Figure 71). Inari is a village beside Lake Inari and is one of the main places of indigenous Sámi people, while Ivalo is a bigger village with bigger variety of services. A popular place among hikers is Kiilopää which is near Saariselkä and very close to the national park. Altogether, 72% of the municipality's area is protected wilderness, while 13% is water. Inari is also a popular place to stop when visitors travel to the most northern tip in Europe, North Cape. Together with the attractiveness of Lake Inari this makes the area popular tourist destination also in summer and not only in winter which is the high season in other parts of Lapland. A specific activity related to tourism has been gold panning, both mechanized and manual. The mechanized digging has been prohibited lately. Besides tourism, Inari has long invested in cold technology and tire testing, and the investments are yielding results. Internationally renowned tire and car brands are conducting cold weather testing in top-grade testing centers in Inari. (Inari.fi.)

Inari has always been a special destination, and it can look back on a long history of foreign tourists visiting the area. English nobles, for instance, came for fly fishing as early as the 1900s. (Kull, 2019, p. 110.). Inari is a tourist municipality with nature as its strong asset. Tourism business is quite international, as almost 60% of overnight stays are international. The tourism industry is also continuously growing and attracting new investments in the region. The strong development of tourism is also boosting other industries, such as construction. (House of Lapland, 2022).

Hiking, skiing, cycling and snow mobile and husky safaris are the most important activities. Lake Inari is popular among fishers. Besides the tourism industry, the main livelihoods are reindeer herding, fishing, forestry, training services and other private services. (Inari.fi b.)

The developing tourism is very evident in the increase in the amount of accommodation capacity which increased slightly in the last ten years (fig. 72a). The pandemic period caused a drop in the number of overnight stays, especially for international tourists. At the end of the last decade, the number of overnight stays has been over half a million per year (fig. 72b).

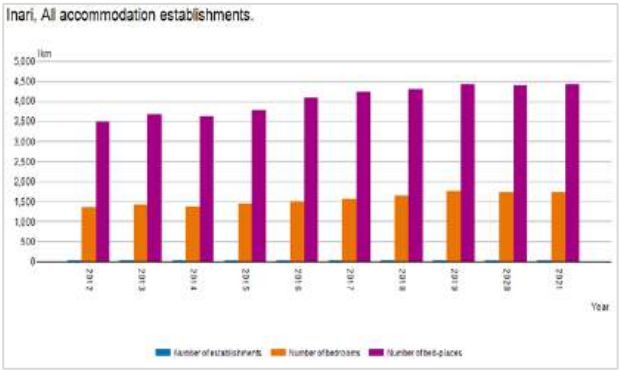

Figure 72. a) Capacity of accommodation growth has been moderate. *Source: Statistics Finland, Accommodation statistics, 2022.* b) Covid-19 pandemic caused a drop in the number of overnights. Source: inari.fi.

An important contributor to the positive economic trend in the area is the international airport at Ivalo. This is particularly important for the business sector, linking rural and Arctic Inari to the wider world. The northernmost airport in the European Union, Ivalo International Airport offers direct flights to

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European cities during the high season of winter. Year-round, flights can connect through Helsinki (Kull, 2019, p. 117.). After the increase in the number of passengers in the 2010s, the pandemic significantly reduced the number of air passengers (fig. 73).

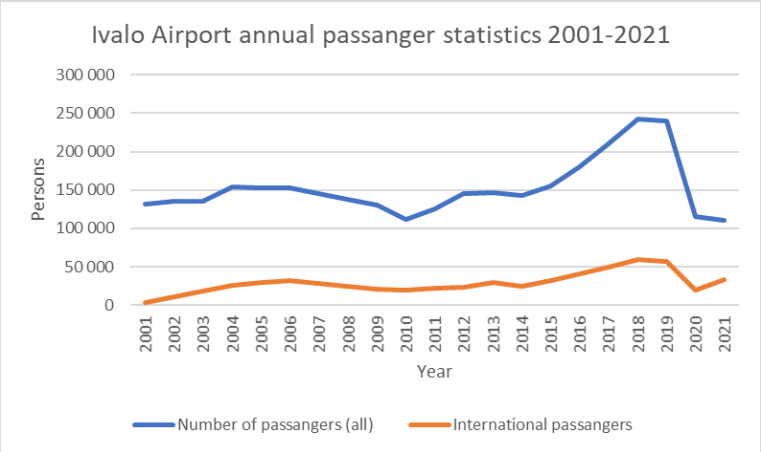

Figure 73. Number of air passengers in Ivalo Airport. *Source: Finnavia.fi*

Inari also offers educational courses to supplement the tourism industry. At the Inari Adult Education Centre it is possible to study languages and take general education courses. The Sámi Education Centre in Inari provides education on the Sámi language and culture, vocational education and training, and short trainings for supplementing prior competence. REDU Lapland Education Centre is the largest vocational education provider in Lapland, and it operates throughout the region. In addition, educational institutions around Finland offer remote studies so people could complete studies elsewhere while based in Inari (Inari.fi).

In general, the effects of tourism were regarded as positive when it comes to job and income and local services while more negative effects are related to the worsening of the quality of own living area. This is in terms of not respecting locals' privacy is seen everywhere in Inari village. This might be since private lands may look like no-man's land as the areas are not strictly fenced. Further, husky business is not ethical in that area and the problem is especially the location of the dog farms of which the locals are not asked beforehand – they only can make claims afterwards and then it is more difficult to change things. Also big snowmobiling groups cause disturbance.

From tourism entrepreneur's point of view there are conflicts with reindeer herding districts but they regard that the herders are against everything just out of principle and it is difficult to discuss the issues. Inari is an important Sámi centre and the Sámi Parliament has made ethical guidelines for Sámi tourism [15].

6.2.8. Kittilä

Kittilä municipality is located in northwestern part of Finnish Lapland. The terrain is shaped by several stately fells, extensive marshes and the large and free Ounas river flowing through the municipality. The municipality is one of the few municipalities in Finnish Lapland which has had net migration. In 2016, the municipality was chosen as the 6th attractive municipality in Finland. According to the population forecast for 2030, Kittilä will be one of the most growing municipalities in Lapland. The largest industries in the Kittilä region are tourism and mining. Situated in Kittilä village of Sirkka, Levi is Finland's leading year-round tourism and events centre and the Kittilä mine operated by Agnico Eagle

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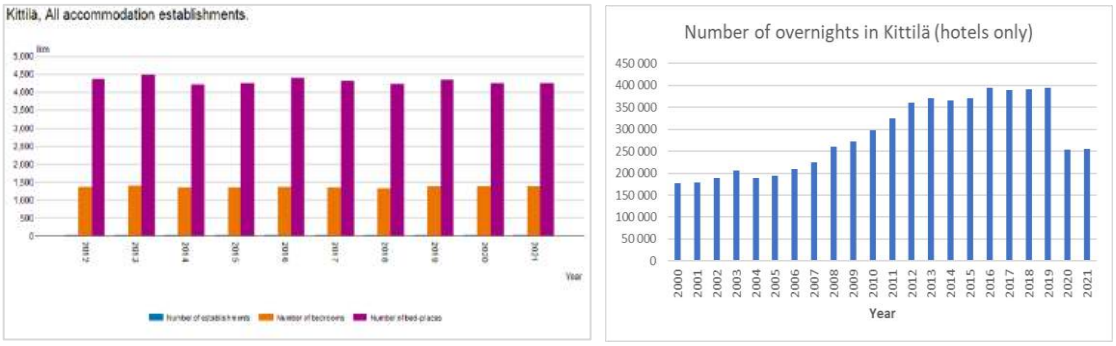
Finland Oy is the largest gold mine in Europe. Kittilä Airport is international and lively, with plenty of connections from Finland and other parts of Europe.

The largest ski resort in Finland, Levi, is located in Kittilä. Its centre is a city-like environment. In the surrounding forest, fell and bog areas, it has hundreds of kilometres of scooter tracks and skiing, hiking and biking trails. Almost all tourism in Kittilä concentrates on Levi which offers jobs for many in other parts of the large municipality, and tourism together with mining is the most important livelihood for the municipality. Levi has, to some extent, a conflicting reputation: it is seen as a party place for tourists from southern Finland but it is also an outdoor destination with many outdoor activities. Although only a part of the Finland's most visited national park, Pallas-Ylläs, is located in Kittilä, the village of Raattama in Kittilä is an important gate to the park, and the tourist resort of Ylläs is partially located on the Kittilä side. Also, river Ounasjoki is an important although slightly undeveloped fishing and water activity destination.

There have been no significant changes in the number of accommodations establishments in the last 10 years (Figure 74a). In terms of overnight stays, it has an increasing trend from 2004-2012 (Figure 74b). The gradual decrease in 2020 and 2021 is attributed to covid pandemic travel restrictions.



a b

Figure 74. a) Accomodation in Kittilä. b) Number of overnight stays in Kittila (Statistics Finland, Accommodation statistics, 2022)

In terms of air travellers, it was growing strongly before the pandemic began (refer to Annex: detailed tourism report: Figure 79). The number of air passengers decreased strongly during the pandemic, but the number of the air passengers have increased due to the lifting of travel restrictions.

The structure of enterprises is also related to the importance of tourism as the number of small enterprises dominates in March 2022 the number of business establishments was 766. (Kittila.fi).

The importance of tourism is visible in unemployment during 2015-2022 (refer to Annex: detailed tourism report: Figure 80). Unemployment rates became really high when Covid 19 started, and this was especially due to the termination of tourism as the situation did not affect e.g. to the mining industry.

In 2016, Kittilä's tourism income, including indirect effects, was more than 200 million euros, which is about half of the total turnover of Kittilä's companies (tab. 8). Years of long-term development work have produced results and the prospects for future development are good. Tourism is one of the largest industries in Kittilä, and many other industries are also indirectly related to tourism. Along with tourism, the mining industry is an important industry. Tourism employment in Kittilä in 2020 was 765 man-years (Satokangas 2022).

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Table 9. The direct income effects of tourism in Kittilä in 2017.

	Total turnover (€)	Share of tourism (%)	Tourism income (€)
Retail	70 789 000	55	38 933 950
Accommodation and catering,	67 874 000	86	58 371 640
Entertainment and recreation	45 062 000	91	41 006 420
Transport	22 642 000	51	11 547 420
Total	**206 367 000**		**41 639 740**

Source: Satokangas, 2019, p.9.

Despite the positive impacts of tourism industry, there have been contradictions between livelihoods are mainly related to land use. Reindeer husbandry and other natural livelihoods are usually competing for the same areas, as tourism, mining or now wind power. These activities are taking space from reindeer husbandry areas. There are some contradictions between the touristic routes and reindeer husbandry as well, but mainly tourism is working well with other livelihoods, because it is so cantered in Levi resort. Some of the reindeer herders are in the tourism business as well, benefiting from it. In Kittilä, both mining and tourism are big industries. However, differently than in many other places, they do not collide much.

6.2.9. Alagna Valsesia

Alagna ("Im Land" in Walser German language) is an alpine town of Upper Valsesia, NW Alps, Italy. It is the access point to the North face of Monte Rosa. It was settled by Walser colonist from Valais, Switzerland in the 14th century: since then, it has preserved its Alemannic language, culture and architecture.

Present day permanent resident population is about 600 inhabitants, while during winter season over 5000 tourists per day are present at Alagna Valsesia. Due to its particular alpine geomorphological conditions Alagna Valsesia is nowadays internationally known for being the freeride ski capital of the Alps. The local industry of tourism included Alagna Valsesia in the "Monterosa Paradise Ski", a huge ski-resort (180 km of runs) at the foots of Monte Rosa served by a series of cable cars and ski-lifts (Monterosa n.d.).

New development of the industry of tourism are now under regional and local debate from an environmental point of view, because of possible issues related to: 1) interactions with the Sesia Val Grande UNESCO Global Geopark and Alta Valsesia Regional Park; 2) climate change effects on both mountain environment and the potential of ski resorts; 3) energy consumption and waste production related to increasing tourism infrastructure (Beltramo et al. 2024).

By conducting research on local natural and cultural resources and developing discussion among public administrators, environmental managers and other stakeholders we aim at developing a participating environmental assessment and sustainable tourism planning in the Alagna Valsesia area.

Background information (source: (Monterosa n.d.)

Tourism - Ski

Company: Monterosa 2000

Ownership: regional - publicly owned company with the participation of the Piemonte region.

Location: Frazione Bonda, 19 13021 Alagna Valsesia (VC), Italy

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 869580.

Activity: alpine ski resort, public transport (mountaineers, trekkers, bikers)

Spatial extent: ski area ca 5 km2, ropeways 9 km

Natural resources used: soil, water

Production (winter season): ca 116.000 first entrances/year (skiers starting from Alagna), ca 1.100.000 transits/year (total, also coming from the neighbouring valleys)

Employment (winter season): ca 50 employees

Waste production: organic waste from canteen; special waste from maintenance activities (exhausted oil, lubricating greases, ferrous materials), rubber and plastic material (roller rings). Waste transportation service: waste from high mountain facilities to valley bottom infrastructures.

Energy demand: artificial snow production ca 350.000 kWh, ropeways ca 1,5 mln kWh.

Energy production: hydroelectric power plant 800.000 kWh, the other required amount coming from certified green energy.

Permits:

special environmental impact assessment ("valutazione di incidenza") for new infrastructure projects within Sites of Community Interest (SIC) and Special Protection Zones (ZPS);

screening for environmental impact assessment ("Verifica di assoggettabilità a VIA"), hydrogeological/landscape restriction, building permits;

agreements and economic compensation with landowners for private land use (e.g., minimum amount from law prescription and discount for ski-facilities use);

water withdrawal subject to concession by the provincial government. Constraints on: withdrawal volume, maximum and medium watercourse discharge, minimum vital flow, designated use (multiple uses: hygienic, energetic and snow production).

Infrastructure development

Since the year 2000, Monterosa 2000 started the renovation of the ski resort with the following important steps:

2000 - demolition of the old cable car replaced by one gondola and one fixed-grip chairlift;

2004 - interruption of the old Punta Indren cable car service, building of the funifor allowing the high-altitude connection with Monterosa Ski resort (Aosta Valley);

2003-2004 - creation of the Olen ski track;

2005 - programmed snow-making system building of the Bocchetta delle Pisse-Pianlunga-Alagna sector;

2017 - building of the Cimalegna detachable chairlift in order to increase skiers' flow;

2019 - building of the Mullero Competition ski track and the related snow-making system, completion of the programmed snow-making system on the Cimalegna plateau;

2020 - artificial water reservoir construction to support and empower the existing snow-making system.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 869580.

Data collection

The only aspect that is useful to underline before starting the analysis is that from the 1st of January 2022 the Alagna Valsesia municipality has been merged with Riva Valdobbia municipality. It explains why, in some cases, there is a sudden increase in the information reported.

Social data

These data were collected from the national social-demographic database ISTAT (2021)that provides very accurate information. Anyway, except for the over-mentioned union of the two municipalities Alagna Valsesia and Riva Valdobbia, there is not any specific aspect to underline.

Data variables	Fonte	N year	2017	2018	2019	2020	2021
n. of tot. residents	ISTAT	5	430	448	730	725	729
n. of female residents	ISTAT	5	202	214	349	351	352
n. of male residents	ISTAT	5	228	234	381	374	377
n. of employed residents	ISTAT	2		212	348		
n. of unemployed residents	ISTAT	2		186	299		
average income from self-employment (€)	ISTAT	3	14.682	70.887	78.028		
average salary as an employee (€)	ISTAT	3	23.368	21.016	23.526		
n. of residents without educational qualifications	ISTAT	3		4	15	16	
n. of residents with primary school license	ISTAT	3		70	112	107	
n. of residents with secondary school license	ISTAT	3		129	202	206	
n. of residents with high school license	ISTAT	3		169	287	276	
n. of residents with a degree	ISTAT	3		37	58	66	

Figure 75. national social-demographic database for Alagna Valsesia

Residential data

These data were collected from *Alagna Walser Green Paradise* report (Beltramo et al. 2024) and through questions addressed directly to the municipality of Alagna Valsesia. These data could show hypothetical increase or decrease in the urbanization of this area, though in this case they do not show any relevant change.

Data variables	Fonte	N year	2017	2018	2019	2020	2021
n. of first houses							
n. of second homes							
n. of houses rented to seasonal workers	Comune di Alagna	not available					
n. of tot. vehicles	AWGP; ACI	4	406	423	778	799	
n. of cars and motorcycles	AWGP; ACI	4	311	326	557	580	

Figure 76. Residential data for Alagna Valsesia

Economic data

Economic data are inherent to the employment situation in the municipality of Alagna and they were collected from both regional (Rupar Piemonte) and national databases (ASC.Istat and MES). Unfortunately, the available information stops at 2019, so it is not possible to understand the impact of Covid-19 restrictions on the workers' situation, even if the Gross Regional Product suggests an economic growth during the years. It could be useful to know the data related to 2021, that would explain the path across the pandemic period.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 869580.

Touristic data

The origin of these data is heterogeneous, because they were collected by different kinds of documents and databases. Anyway, most of these sources are regional or local. Visit Piemonte and Rupar Piemonte are regional dataset and they show more useful information to understand the touristic flows inside the municipality of Alagna. It is possible to see a sensible fall in the touristic flow between 2018 and 2020 (data relates to 2019 is absent), but from 2021 the number of tourists in Alagna started to rise again.

Data variables	Fonte	N year	2017	2018	2019	2020	2021
n. of accommodation facilities	AWGP; Visit Piemonte; Rupar Piemonte; ISTAT	5	18	21	20	45	42
n. of catering activities	Rupar Piemonte	3	16	16	19		
n. of shelters							
n. of overnight stays in shelters							
n. holiday homes							
n. of travellers							
turistic flows (total overnight stays)	AWGP; Visit Piemonte	4	48.992	72.910		67.906	74.347
average stay	AWGP; Visit Piemonte	4	3,19	3,15		3,18	2,92
plastic consumption (tot. n. of plastic bottles sold)	AWGP (survey)	1			55.537		
n. of buses	ACI	4	1	1	2	2	
n. of tourist lines	Monterosa 2000	3					
bus tickets	Monterosa 2000	not available					
parking data							
ratio of tourist vs residents							

Figure 77. Touristic data for Alagna Valsesia

Moreover, thanks to informal interviews on the territory of Alagna, it could be confirmed that the 2022 summer season was characterized by an extraordinary recovery, after the end of the sanitary emergency. In fact, the number of foreign tourists who in the past could not freely reach the Italian tourist resorts has returned to grow significantly.

Data variables	Fonte	N year	2017	2018	2019	2020	2021
n. of local business units (no accomodations)	Rupar Piemonte; ASC.Istat	3	89	95	96		
n. of farms							
n. of tot. workers	Rupar Piemonte; ASC.Istat	3	363	435	448		
n. of employees	Rupar Piemonte; ASC.Istat	3	196	254	274		
Gross regional product (€)	MEF	4	8.202.040	12.639.088	13.420.199	14.397.176	
Value added - contribution of agricultural sector to the GDP							
Value added - contribution of tourism sector to the GDP							

Figure 78. Touristic data for Alagna Valsesia

Ski data

This data was collected thanks to the collaboration with Monterosa 2000, which analyzes more detailed information about the ski flows in the area of Alagna. These ski facilities are included in a much larger area that connects Alagna to Gressoney (Aosta Valley). So, it can be assumed that a part of transit entrances concern people that come from Gressoney. Even in this case, it is easy to see a drastic fall during the pandemic period, during 2020. In the winter season of that year, in fact, the ski facilities were completely closed.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 869580.

Another aspect to underline is that the ski district remains open during both summer and winter seasons. People in fact use ski facilities even in summer, for walking or cycling.

Data variables	Fonte	N year	2017	2018	2019	2020	2021
ski slope metric development (km)	skiinfo.it	14,8					
n. of skipass (first entries)	Monterosa 2000	11	141.865	148.479	123.019	28.490	122.783
n. of skipass (transit entrances)	Monterosa 2000	11	309.040	297.210	276.594	37.110	285.316
n. of round trip skipass	Monterosa 2000	11	34.618	41.297	30.386	28.414	39.684
n. of daily skipass	Monterosa 2000	11	41.715	40.666	36.978	1.200	31.688
n. of weekly skipass	Monterosa 2000	11	7.738	7.027	5.080	3	5.532
n. of seasonal skipass	Monterosa 2000	11	1.340	1.418	1.088	73	1.277
n. of ropeways	Monterosa 2000	11	2	2	2	2	2
n. of chiarlifts	Monterosa 2000	11	2	2	2	2	2
n. of skilifts	Monterosa 2000	11	1	1	1	1	1

Figure 79. Ski data for Alagna Valsesia

6.2.10. Val Germanasca

Economic data

Economic data are inherent to the employment situation in the municipality of Prali and they were collected from both regional (Rupar Piemonte) and national databases (ASC.Istat and MES). Unfortunately, the available information stops at 2019, so it is not possible to understand the impact of Covid-19 restrictions on the workers' situation, even if the Gross Regional Product suggests an economic growth until 2019 and then a slight decrease in 2020. It could be useful to know the data related to 2021, that would better explain the path across the pandemic period.

Data variables	Fonte	N year	2017	2018	2019	2020	2021
n. of local business units (no accomodations)	Rupar Piemonte; ASC.Istat	3	26	29	33		
n. of farms	Comune di Prali	1			6		
n. of tot. workers	Rupar Piemonte; ASC.Istat	3	88	98	104		
n. of employees	Rupar Piemonte; ASC.Istat	3	28	31	32		
Gross regional product (€)	MEF	4	2.650.648	2.752.116	3.039.098	2.953.471	
Value added - contribution of agricultural sector to the GDP							
Value added - contribution of tourism sector to the GDP							

Figure 80. Economic data Val Germanasca

Touristic Information

The origin of these data is heterogeneous, because they were collected by different kinds of documents and databases. Anyway, most of these sources are regional and local. Visit Piemonte and Rupar Piemonte are regional dataset and they show more useful information to understand the touristic flows inside the municipality of Prali. We can see a drastic fall in the touristic flow between the period pre-Covid (2017-2018) and the period post-Covid (2020-2021), while any data relating to 2019 is shown. On the contrary from the Alagna context, in Prali municipality the tourist recovery seems slow and tiring.

Data variables	Fonte	N year	2017	2018	2019	2020	2021
n. of accommodation facilities	Visit Piemonte; Rupar Piemonte; ISTAT	5	4	3	7	12	11
n. of catering activities	Rupar Piemonte; ISTAT	3	9	11	12		
n. of shelters							
n. of overnight stays in shelters							
n. holiday homes							
n. of travellers							
turistic flows (total overnight stays)	Visit Piemonte	4	22.545	18.344		12.586	9.532
average stay	Visit Piemonte	4	7,77	7,13		5,19	4,46
plastic consumption (tot. n. of plastic bottles sold)							
n. of buses	ACI	4	0	0	0	0	
n. of tourist lines							
bus tickets							
parking data							
ratio of tourist vs residents							

Figure 81. Touristic data Val Germanasca

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 869580.

Ski data

This data was collected thanks to the collaboration with Nuova 13 Laghi, the company that manages ski facilities in Prali. Differently from the case of Alagna, the Prali ski area has no links with other ski resorts. This means that the transit entrances belong to the same people who make the first entries. Unexpectedly, the number of first entries was strongly increased during 2019 and 2020 (restriction period due to Covid-19 emergency) in respect to 2018.

Another aspect to underline is that the ski resort remains open during both summer and winter seasons. People in fact use ski facilities in summer for walking or cycling sports.

Data variables	Fonte	N year	2017	2018	2019	2020	2021
ski slope metric development (km)	skiinfo.it	25					
n. of skipass (first entries)	Nuova 13 laghi srl	4		43.480	60.631	61.619	0
n. of skipass (transit entrances)	Nuova 13 laghi srl	3			672.636	682.050	0
n. of round trip skipass							
n. of daily skipass							
n. of weekly skipass							
n. of seasonal skipass							
n. of ropeways	ARPIET	4	0	0	0	0	
n. of chiarlifts	ARPIET	4	2	2	2	2	
n. of skilifts	ARPIET	4	2	2	2	2	

Figure 82. Ski data Val Germanasca

6.3. Discussion and conclusions

Tourism is a significant part of the reginal economy of the tourism hubs as depicted in the Gross Regional Product. It contributes to more sustainable socio-economic growth. As the tourism is growing, the accommodation in the tourism hubs is increasing but the COVID 19 pandemic led to decrease in the trend for international visitors. The summary for the key characteristics across the different hubs is shown in Table 10.

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Table 10. Summary of Key characteristics for Tourism hubs

Key characteristics	Suðuroy	Nuup Kangerlua	Westfjords	Svalbard	Egersund	Inari	Kittilä
Population Dynamics	Population declines after the severe economic crisis in the early 1990s. Population has remained relatively stable during the past two decades, with an upwards trend in recent years, the population is ageing.	The population of Nuuk town has increased steadily since the 1980's, while the number of inhabitants in other towns are stable or declining.	Population decreasing in both municipalities until 2011. In Vesturbyggð the population is gradually increasing. In Tálknafjarðarhreppur, it has been slowly increasing in 2022.	Since 1995 the population in Longyearbyen and New Ålesund has increased from 1,218 people to 2,552 in 2021.		Finland's population has grown steadily every year	
Income from tourism	2% GDP (before pandemic	Increasing GDP		The value creation from the tourism industry increasing (2008-2017). In 2019-2020, the incom had decreased.		Before the pandemic, the GDP remained at 2.7% but, for 2020, it decreased by a whole percentage point to 1.7%.	
Accommodation for visitors	During Covid19 trend is clearly increasing as there was a boom in domestic tourism in this period. This is reported to be very clear in Suðuroy, where the number of overnight stays was higher than ever before in 2020.	Accommodation capacity in Nuuk has increased since the beginning of registration of the overnight stay data and is likely to increase in future (Eskildsen, 2021). Between 2015 and 2019, the overnight stays from foreigners have increased by 34%.	Increasing trends for Icelanders while decreasing trend for other nationalities due to COVID pandemic	The number of overnight stays reached a record 166,801 guest days in 2019. The largest increase is linked to the holiday and leisure market. The number of overnight stays in this segment more than trebled from 2005 to 2019.	Trend from 2013 to 2021 in overnight stays are increasing. Overnight stays in hotels are significantly increasing (overnight stays are tripled compared from 2013 to 2021)	The amount of accommodation capacity has increased slightly in the last ten years. The pandemic period caused a drop in the number of overnight stays, especially for international tourists.	There have been no significant changes in the number of accommodations establishments in the last 10 years. The number of overnight stays decreased in 2020-2021.

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Passenger transport	As is the case in the region as a whole, the number of tourists coming to the Faroes has increased rapidly in recent years. Passenger arrivals to the Faroes continue to increase in 2022.	If we look at the number of monthly international flight passengers to Nuuk there is a seasonal variation. The summer months are busy, while the winter period has less flight traffic. One can assume that the tourists prefer the summer months to travel to Greenland.	The increase in road traffic is particularly noteworthy within the Westfjords Hub study area as it nearly doubled in only four years between 2013 and 2016.	From 2009 to 2019 number of passengers in commercial flights is increasing. There was a dramatic decrease in 2020 due to covid-19 but in 2022, it is now increasing. Cruise tourism makes up a major part of tourism on Svalbard with a large number of operators and vessels	Egersund and Flekkefjord towns has become cruise destinations the last years, starting in 2018.	After the increase in the number of passengers in the 2010s, the pandemic significantly reduced the number of air passengers	The number of air travellers was growing strongly before the pandemic began. The pandemic drastically reduced the number of air passengers
Number of tourism enterprises		Presence of tourism operators: aviation, boat operator, and tour operators	There is a gradual increase on the issuance of operating licenses since 2017 until 2020 in all municipalities.	Increasing businesses in 2020			Small enterprises dominate in March 2022. The largest sector was travel agencies, tour operators and booking services
cultural industry including heritage sites	The Faroese landscape is dominated by mountain pastures, which are grazed by sheep, also giving the islands their name, *Føroyar*, meaning "Sheep Islands".	Nuuk has the largest cultural sector available. Most cultural heritage items in Greenland are displayed at Greenland National Museum in Nuuk. In addition, there is an art museum in town, and temporary exhibitions at the cultural center Katuaq.		Cultural monuments includes human graves, or traces of such, human skeletons, crosses, and inscriptions are protected regardless of age. . Tourism is now an important industry for Svalbard, and cultural heritage is a main			

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				attraction for many visitors.			
No. of people employed under tourism activities	The number of persons employed under hotels, and lodging places as well as places serving food and beverages has increased in recent years	The majority of employees at hotels and restaurants are Greenlanders.		Increasing from 2008 to 2018 but decreased in 2020 due to Covid pandemic			The share of the unemployed in the labor force rose more than the national average in Kittilä during the pandemic.
Educational level		Different courses such as trophy hunting and guiding and so on are conducted depending on the needs in different towns to train guides over the years. The educations were designed to fulfill the Greenlandic needs with collaborations with local tourism actors		"Norway is far behind other countries when it comes to requirements for nature guides' competence. Except for NORTIND's internationally approved mountain guide education, only UiT runs a Nature Guide course with a specific and clear focus on the nature guide profession."(UiT 2018)		Education Center provides education on the Sámi language and culture, vocational education and training, and short trainings for supplementing prior competence	
tourism income and other country/arctichub specific tourism characteristics.	Income from tourism was estimated to 784 million Danish Kroner in 2019 (VFI 2019),	The revenue from tourism has increased following the tourism activities, until the covid-19 stopped most of the international visits to Greenland.		Increasing snowmobiles			In 2016, Kittilä's tourism income, including indirect effects, was more than 200 million euros, which is about half of the total turnover of Kittilä's companies

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Conflicts/issues	Increasing tourism in Faroes lead to conflicts since not all residents agree with the strategy to increase tourism. Tourism is conflicting with other landuse practices.	Often the sectors can co-exist with non-conflictual activities. However, conflicts between tourism and other sectors also exist in Greenland, primarily within use of land and marine spaces and resources. This could be the mentioned ban on humpback hunting or hiking groups crossing local caribou hunting paths or areas.		Tourism triggers a major structural change in a community. Svalbard attracts more non-Norwegians, the turnover is extremely high plus the numbers in the population register might be inaccurate, the housing situation is described as critical, and there is a clear risk of social dumping.		Conflictual issues between local community, reindeer herding and tourism. Most important problems mentioned are crowding, noise, littering, landscape deterioration, husky sleds	Contradictions between livelihoods are mainly related to land use (reindeer husbandry, mining and other natural livelihoods)

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The positive impacts of tourism are providing employment to the locals in tourism enterprises. The increasing trend on the establishment of tourism enterprises signifies increasing tourism in the hubs. Meanwhile, there are improved business opportunities. Tourism is important to sustain the culture and maintain social relationships in the hubs. Aside from cultural tourism, the potential for gastro tourism like in Nuuk can be developed to serve culinary dishes.

In terms of education, Greenland offers courses in collaboration with local tourism actors for tour guide. This contributes to long term and sustainable tourism. Similarly, Inari provides education on the Sámi language and culture, vocational education and training, and short trainings for supplementing prior competence. However, Norway is not mainly focus on requirement for nature guide's competence.

There are infrastructural investments such as development of road networks and airports to facilitate accessibility on the tourism sites. This is evident in the expansion of airports in Greenland. Further, an important contributor to the positive economic trend in the Inari is the international airport at Ivalo. This is particularly important for the business sector, linking rural and Arctic Inari to the wider world.

All of the hubs show increasing traffic over the past years. In Svalbard, the cruise tourism primarily constitutes tourism with the increasing boat operators and vessels.

Despite the positive impacts of the tourism industry, increasing tourism affects the quality of life of the host communities. It leads to conflicts specially on areas that the residents do not agree with the strategy of increasing tourism. For instance, Suðuroy hub, tourism is in conflict with other land use practices on the construction of local housing. With the increasing demand for accommodation, it adds pressure on the housing markets, which in turn affects the living costs for local people. Further, most of the tourists demand to experience Faroese nature but, the landowners are negatively affected because of visitors on traditional fields for sheep pastures. This issue needs to reconciliation among tourism industry, landowners and concerned citizens.

Tourism also affects the community in Svalbard. There is scarcity of housing and unstable jobs due to seasonality in tourism employment. As mentioned earlier, Norway is far behind in terms of education on tourism with the threat of unskilled or uncertified guides. There is also increasing pressure on infrastructure developments that leads to environmental impacts such as emissions and noise pollution due to increasing traffic. Further, ship traffic negatively affects the marine wildlife.

In both Finnish hubs, there are also conflictual issues between livelihoods which are related to land use such as with reindeer herding and tourism. Specifically, on Inari, the problems are related to crowding, noise, littering, and on unethical issues on husky business. In terms of Kittilä, competing land use among natural traditional livelihoods are usually competing in land use with tourism, mining or currently the for wind power.

Generally, tourism has positive impacts on jobs, income and improvement of local services in the hubs while negatively affects the quality of life of the host communities. However, with the growing tourism, the hubs should develop strategies to solve sustainability issues in the forthcoming years. Reconciliation is necessary to resolve the conflicts with residents. Further, the hubs should focus on research and education/ training for the tour guides. The hubs should also develop awareness campaigns on the impacts of tourism industry. Tourism can be grown but it has to be sustainable and with social acceptability.

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7. INDIGENOUS CULTURE

In this chapter, we focus on the indigenous hubs in the Arctic, particularly the seven indigenous hubs from four Arctic countries: Finland, Sweden, Norway and Greenland. This will provide a summary of some of the key characteristics to analyze the socio-economic impacts in indigenous hubs in the Arctic.

The detailed indigenous hubs report is attached as Annex 5 to this report. This detailed report contains also information on main aspects of indigenous culture, their traditions and rights.

7.1. Sami People in Finland, Sweden and Norway

The Sámi homeland includes the northern and central parts of Norway, Sweden and Finland (fig. 83), as well as the Kola Peninsula in the Russian Federation (Ravna, 2013). In Sámi language this area is names Sápmi.

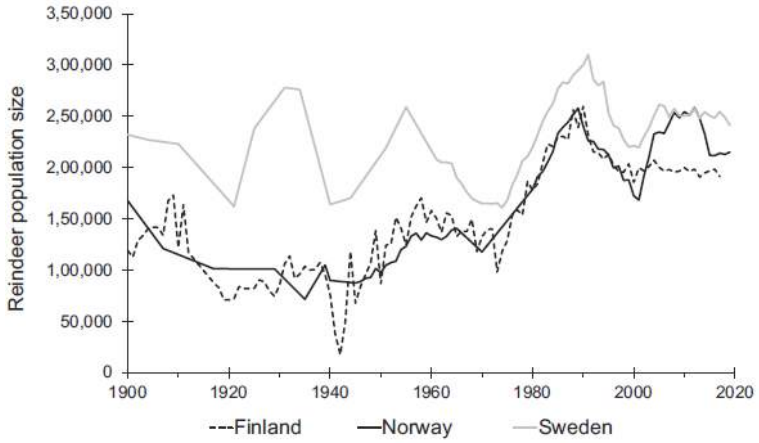

Figure 83. Population fluctuation of semi-domesticated reindeer in Finland, Norway and Sweden (Horstkotte, 2020)

Country	*Total area of RHA (km^2)*	*# Reindeer*	*# Owners*	*Meat Prod. (tons)*[a]
Finland	123,000	188,000	4,300	2,000
Norway	145,000	213,000	3,300[b]	1,600
Sweden	226,000[c]	241,000	4,600[d]	1,260

Sources: Data from Landbruksdirektoratet (2020a, 2020b) in Norway, Swedish Sámi Parliament (2021) and Paliskuntain yhdistys (2020) in Finland.

Notes:
a Registered by slaughterhouses.
b Only Sámi owners.
c The exact boundaries of reindeer herding areas remain largely undefined in Sweden. Sandström's (2015) estimate is presented.
d Concession owners included.

Figure 84. Key statistics for 2019/ 2020 of Fennoscandian reindeer pastoralism. Reindeer numbers are for the winter herds after slaughter.

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7.1.1. Sami people in Finland

There are about 10 000 Sámi living in Finland, but because the amount of Sámi people is not statistically compiled, the amount is only an estimate (Sámediggi, 2022). More than 60% of the Sámi people in Finland live outside the Sámi Homeland (Sámediggi, 2022). This brings new challenges for the provision of education, services and communications in the Sámi language. In Finland, the Sámi Homeland is legally defined, and covers the municipalities of Enontekiö, Inari and Utsjoki as well as the Lappi reindeer herding district in the municipality of Sodankylä.

There are speakers of three Sámi languages in Finland: North Sámi, Inari Sámi and Skolt Sámi (Sámediggi 2022). In Finland, North Sámi is spoken by approximately 2 000 people, Inari Sámi and Skolt Sámi both have approximately 300 speakers, most of whom live in the municipality Inari. Under the pressure of the dominant languages, many Sámi have lost their mother tongue. Since the ethnic awakening in the 1960s, a variety of measures have been taken to preserve the Sámi languages and bring them back to life. The Sámi Language Act of 1992, revised in 2004, made Sámi an official language. In Finland, all the spoken Sámi languages are endangered, but Inari and Skolt Sámi languages are threatened to become extinct.

Partly because of the ethnic awakening and the work for preserving Sámi languages, the amount of people speaking Sámi as their mother tongue has been rising since the start of 21st century (Official Statistics Finland, 2022). There is also a law regarding the right to use the Sámi language when dealing with the authorities (1086/2003). In 2021, the most Sámi speakers lived in the municipality of Utsjoki with 504 speakers, but a lot of Sámi speakers were living in the other parts of the Sámi homeland, as well as in the capital city area and the city of Oulu.

The status of the Sámi was written into the constitutional law in 1995 (17§ and 121 §). The Sámi, as an indigenous people, have the right to maintain and develop their own language, culture and traditional livelihoods. Since 1996, the Sámi have had constitutional self-government in the Sámi Homeland in the spheres of language and culture. This self-government is managed by the Sámi parliament, which is elected by the Sámi. The Skolt Sámi also maintain their tradition of village administration, under the Skolt Act (253/1995), within the area reserved for the Skolt Sámi in the Sámi Homeland. The Sámi Homeland is legally defined, and it covers the municipalities of Enontekiö, Inari and Utsjoki as well as the Lappi reindeer-herding district in the municipality of Sodankylä (Samediggi 2022).

The traditional livelihoods of the Sámi people are fishing, gathering, handicrafts, hunting and reindeer herding. The economic value of the traditional livelihoods is not big, but the livelihoods are crucial to the culture (Sámediggi, 2022). Some of the Sámi make their living from these traditional livelihoods, but a big part gets their income from more modern occupations.

In Finland, there are about 4400 reindeer herders in the reindeer herding area, but reindeer herding was is a significant livelihood for about 1000 households (Ministry of Agriculture and Forestry, 2022). The reindeer herding area is bigger and reaches more south, than the Sámi homeland (fig 85). About 38% of the semi-domesticated reindeer population in Finland are found in Sami Homeland Area. On this land, it is not allowed to operate in a way, that may significantly disturb reindeer herding. From the 13 Sámi herding districts, eight districts are located in the region of Inari municipality: Ivalo, Sallivaara, Hammastunturi, Muddusjärvi, Vätsäri, Paatsjoki, Näätämö and Muotkatunturi.

Reindeer husbandry is regulated through Reindeer Husbandry Act (848/1990). Contrarily to Norway and Sweden, in Finland, it is possible for any European Economic Area (EEA) citizen, living permanently in the reindeer herding area, to herd reindeer. In the reindeer herding area, reindeer have the right of

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free grazing, independent from the landowner. The reindeer owners from different areas constitute 54 reindeer herding cooperatives, and every herder belongs to one cooperative (Reindeer Herders' Association, 2022a). The Reindeer Herder's Association is the steering, advisory and expert organization of reindeer husbandry. The state-owned lands belonging to the 13 northernmost cooperatives forms an area, that is specifically intended for reindeer herding.

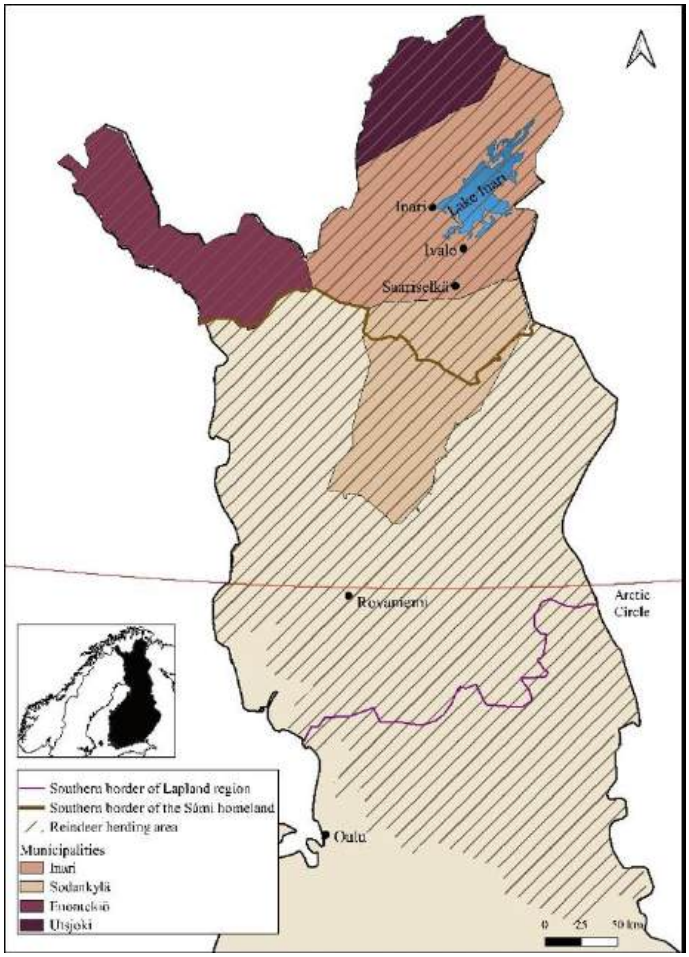

Figure 85. Map of the Inari hub and its surroundings, reindeer herding area and the Sámi homeland area (Data: Natural Earth 2022, Johanna Roto 2015, National Land Survey Finland 2022, Reindeer Herders' Association 2022. Map: Arctic Centre, University of Lapland 2022)

Number of reindeer owners, number of reindeer in winter stock and the number of slaughtered reindeer has been showing a decreasing trend during the past decades (1990/91-2019/20; Figure 86; Reindeer Herders' Association, 2022b).

The number of reindeer owners has decreased from 723 to 493, the number of reindeer in winter stock from 49672 to 33344. This has also affected the reindeer meat production, and the number of slaughtered reindeer. During the past decades reindeer numbers have fluctuated due to winter conditions. In Upper-Lapland, including the municipalities of Inari and Utsjoki, there have been disputes between different land uses, like reindeer husbandry and forestry, for decades (Turunen, et al. 2020).

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Figure 86. The number of reindeer owners in Finland from 1990 to 2021 (Reindeer Herders' Association, 2022b)

7.1.1.1. Inari Hub

Inari hub consists of the municipality of Inari, which is located in northern Finland, in the region of Lapland (fig. 85). The municipality of Inari is by area the largest municipality of the country. Because of its location, Inari has always been a cultural hub, and a natural passageway to the Barents Sea and Kola Peninsula, and also because Inari is located between two national borders; Norway and Russia. The status of Inari municipality is being improved by the location along the main road of Europe. The number of inhabitants is around 7 000 (Inari municipality, 2022; fig. 87), and its surface area is around 17 333 km^2, making Inari municipality an extremely sparsely populated: the population density is 0,5 inhabitants/km^2. From the land area 2 275 km^2 are water bodies, and there are around 10 000 lakes in the municipality. From the early 1990s, the municipality of Inari lost some of its inhabitants, as was the trend in other small municipalities in Lapland (fig. 87). But during the recent years, and Covid-19 pandemic, the inhabitant number has been rising. The economic dependency ratio in 2021 was 63,9, which is quite good compared to other small municipalities in Lapland. In 2019, 89,6 % of the inhabitants were speaking Finnish, 6,7 % Sámi, 0,3 Swedish and 3,2 other languages (Official Statistics Finland, 2022).

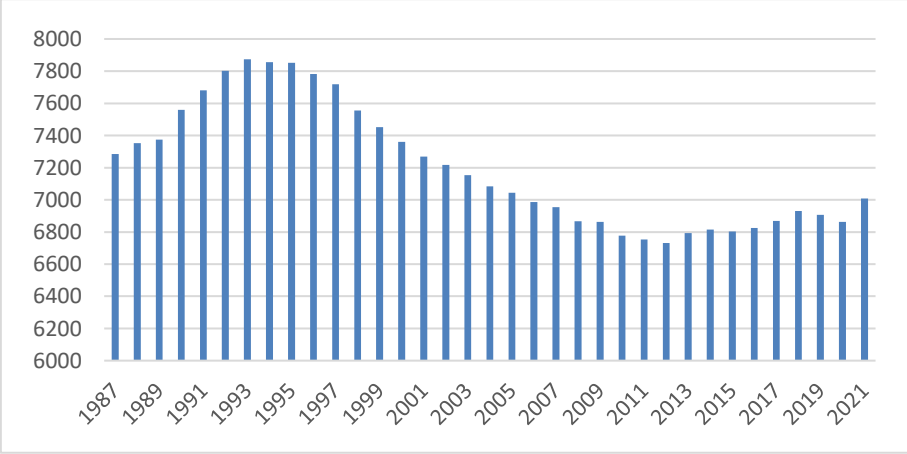

Figure 87. The population of the municipality of Inari from 1987 to 2021 (Official Statistics Finland, 2022)

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Inari municipality offers pre-, primary and basic education in three schools, upper secondary school education in Ivalo village and vocational college education in the Sámi Education Institute (SAKK). SAKK offers in its three campuses education as the only indigenous people's institute of post-secondary trade school in Finland.

Inari hub has a strong representation in Sámi culture and languages; In addition to Finnish, three Sámi languages: Inari Sámi, Skolt Sámi and Northern Sámi, are official languages in Inari (The Sámi Language Act of 2003), and all basic services are provided in the three Sámi languages (Inari municipality, 2022). Even though the municipal capital of Inari is the village of Ivalo, Inari village, with only 600 inhabitants, village is the capital of Sámi culture, since the Sámi culture center Sajos, the Sámi Parliament's main office, Sámi church, Sámi radio, as well as the Sámi museum are located in there. The Sámi culture is also represented well in the Skábmagovat film festival, as well as in the Ijahis Idja -music festival. As well as in the reindeer herding area in total, also in Inari municipality, the number of reindeer owners has been decreasing from the start of 1990s (fig. 88). Partly because of that, the number of reindeer has also been decreasing in the municipality (fig. 89). Among reindeer owners, the number of males has decreased more than the number of females. The number of young and middle-aged reindeer owners is considerably high. There have also been some disputes between different land uses, like reindeer husbandry and Sámi culture, forestry and tourism, in Inari (Saijets & Rasmus, 2017; Turunen, et al. 2020).

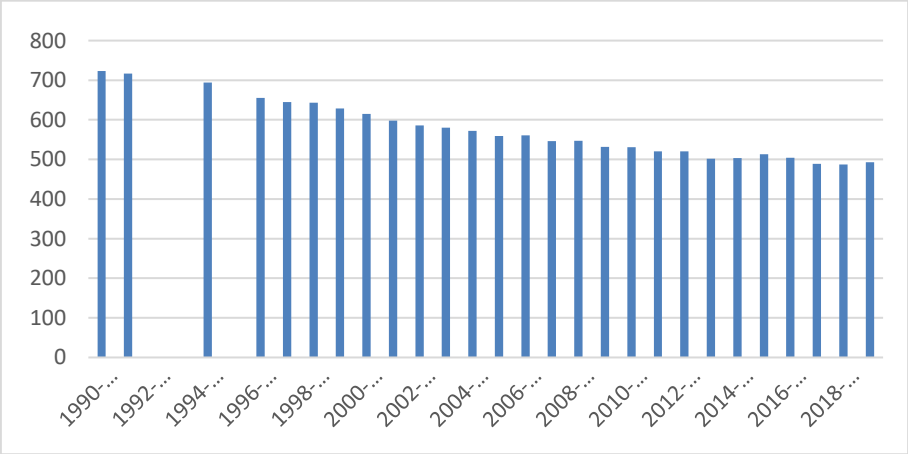

Figure 88. The number of reindeer herders in the municipality of Inari from 1990 to 2020 (Reindeer Herders' Association)

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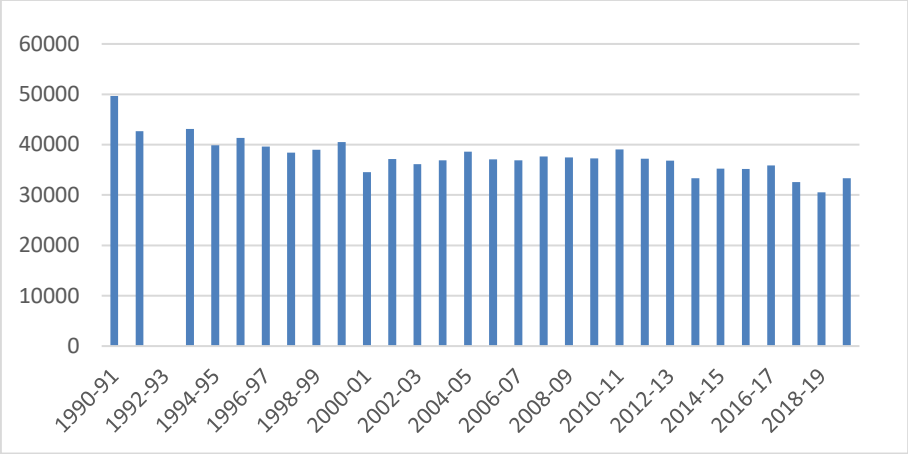

Figure 89. The number of reindeer in winter stock from 1990 to 2020 (Reindeer Herders' Association)

The Inari hub has long traditions in nature-based tourism, and the nature is bringing hundreds of thousands of tourists to the area every year (Inari Municipality, 2022). About 60% of the tourist overnights are made by foreign tourists, and the Ivalo airport, serving almost 250 000 customers annually, is helping by improving the accessibility to the area. The second biggest lake of Finland Lake Inari (fig. 85), dozens of fells, forests and river areas attract tourists for leisure, fishing or different nature-based sports (Inari municipality, 2022). Saariselkä ski resort is also located in the municipality, offering many kinds of sports activities. There are also two national parks, Urho Kekkonen national park and Lemmenjoki national park in the hub. Apart from those, a huge part of the surface area is classified as a wilderness area, where no significant land use, apart from traditional livelihoods, can take place (Ministry of the Environment, 2022). The location of Inari hub is also good for tourism, since it is on the way when one is going to a popular destination in Norway; North cape. Apart from traditional livelihoods and tourism, other major sources of income in Inari are service industry, forestry and cold climate testing (mainly for tires).

7.1.2. Sami people in Sweden

Sapmi is the traditional area used by Sami ancestors for thousands of years spanning the nation boundaries of four countries. Even though no precise boundaries exist for the Sapmi area, about half of Sweden's land area is included. Neither are there precise numbers of Sami people in Sweden since ethnicity is not a factor included in the Swedish census. The number "about 20 000 Sami in Sweden" is frequently referred to, but leading scholars estimate that number to be more than three times as high. In 2021, 9226 persons were registered to vote in the Sami Parliament election (Kvarfordt et al. 2004).

Traditional Sámi livelihoods include hunting and fishing, handicrafts and reindeer husbandry. Especially reindeer husbandry is by many recognized as the cornerstones of the Sámi culture as the provider of food and material, as well as a carrier of the Sami languages and culture (Kvarfordt et al. 2004).

The reindeer husbandry area of Sweden covers 55 % of the total land area. Within this area reindeer husbandry coincides with all other land uses including forestry, mining, energy exploration and associated infrastructure developments. There are no lands exclusively set aside for reindeer husbandry. Ownership rights and grazing rights are considered equal by legal scholars and they overlap throughout the area. About 50% of the area is owned by small private owners, forest commons,

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municipalities and the church, 25 % is owned by the state and 25 % is owned by timber companies. As a consequence, these land uses are entangled in a complex mixture, continually challenging a functioning coexistence (Swedish Forest Agency 2015).

Figure 90. The reindeer husbandry area in Sweden is divided into 51 reindeer herding communities. In the western part of the area reindeer are allowed year–round and the eastern part during winter.

The reindeer husbandry area is divided into 51 reindeer herding communities (RHC, in Swedish samebyar) each organized and managed separately. As of the latest statistics produced by the Sami parliament in 2020, there are 280 000 reindeer divided among 4636 reindeer owners (1780 women owners). Of these 3149 operate within the 32 RHCs in Norrbotten and 324 in the seven RHCs in Västerbotten (Sami Parliament 2020). These reindeer owners are organize into 1360 reindeer husbandry based businesses usually with no other employed personnel. Of these reindeer husbandry businesses 37 % also have a subsidiary activity. The butchering prize have varried around 70 SEK/kg. The monetary turnover for reindeer husbandry in Sweden is 230 MSEK/year (Sami Parliament 2024, 2020).

Sami languages have been continually marginalized since about 1900 as there has been an intensified Swedishization process. The proportion of the Sami people speaking Sami languages is estimated to 40-45% and all those speaking Sami are also considered at least bilingual. Based on estimations there are 17 000 speaking North Sami, 800 speaking Lule Sami and 700 speaking South Sami languages. Other Sami languages include Ume Sami and Pite Sami (Sami Parliament 2024; Kvarfordt et al. 2004).

A chronological summary of significant political and legal decisions made regarding Sami and reindeer grazing rights include the 1756 border agreement between Sweden and Norway giving the Sami extended rights to move across the borders; the 1873 establishment of the so called “cultivation zone”, with the purpose to protect the reindeer herding area from colonization; the first Reindeer Grazing Act

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in 1886 and the new Reindeer Herding Act in 1971. In 1977, the Swedish Parliament declared that the Sami are an indigenous people in Sweden, in 1993 the Sami Parliament was inaugurated and in 2011 the Sami are acknowledged as an indigenous people in the Swedish Constitution with its cultural and political rights (Kvarfordt et al. 2004).

Some important international laws and conventions strengthening Sami rights include the UN adopted Declaration of the rights of Indigenous People (UNDRIP) in 2007 (United Nations 2007), which acknowledges indigenous peoples' rights to self-determination and the right to own, use and control land and natural resources. The UN World Conference on Indigenous Peoples (WCIP) 2014 (United Nations 2014) adopted a resolution on how the Declaration should be implemented in its member states. The Council of Europe has a Framework Convention for the Protection of National Minorities and a Minority Languages Charter. The international conventions signed by Sweden give ethnic, religious and language minorities the right to negotiation concerning questions of language, cultural life and traditional trades. Correct negotiations are necessary in order for the minorities' rights to be realized and open up for better solutions even for the majority population. In a democracy, the majority decides. Minorities seldom have the possibility to be heard in democratic assemblies. This is why the often-called "positive discrimination" is used to protect indigenous peoples and national minorities. The purpose is to reduce injustice between ethnic groups and to preserve languages and cultures that otherwise risk disappearing.

One of the main challenges faced by Sami reindeer herders in all the hubs is forestry. For a long time, the forest industry has played an important role in northern Sweden and constitutes an integral part of the national economy. Modern stand-oriented, even-aged, monoculture forestry has expanded in Sweden since the 1950s and has had a profound effect on forest and landscape configuration and conditions and consequently on reindeer husbandry. Commercial forestry affects reindeer husbandry in a number of ways. Negative impacts on the ground lichen resource have been documented over the last 60 years. Largescale logging, intensive reforestation efforts and fire suppression have resulted in a decline in old, open pine-dominated, post-fire successional stands on low productive sites which are important habitats for ground lichens. Such stands have instead been replaced by dense, managed forests that favour mosses at the expense of lichens. The introduction of lodge pole pine and fertilization has also have negative effect on ground lichens. Furthermore, damage by soil scarification cause substantially decreases both the cover and biomass of ground lichens. Clear-cut forestry also have negative consequences for arboreal lichen which are especially important to reindeer during winters with difficult snow conditions. Forest RHCs are also affected by forestry on summer grazing lands. Loss of shady old spruce forests are of major concern. These stands are becoming increasingly important during hot summer days at the same time as they are becoming increasing rare. Improved and innovative forest activities to reduce loss of landscape connectivity as well as ground and pendulous lichen rich forests is much needed. Such goals can be achieved through improved participatory dialogue between reindeer husbandry and forestry (Akujärvi et al. 2014; Fohringer et al. 2021; Forbes et al. 2019; Kivinen et al. 2010).

Other challenges, that are more specific in each hub, include hydropower and mining developments.

7.1.2.1. Jokkmokk hub

The small town of Jokkmokk, population of 2 700, is located in Jokkmokk municipality with a population of 4 766. The municipality covers 19 477 km^2 making it the second largest in Sweden but with a population density of only 0.25 p/km^2.

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Jokkmokk is one of Sweden's most prominent places for Sami culture. Thus, the hub is foremost defined by the indigenous traditional land use that includes reindeer husbandry, hunting and fishing. Young Sámi from the whole of Sapmi go to Jokkmokk for education, and here is also the principal museum of Sami culture Ájtte, which is both an arena for research and information center for mountain tourism. Ájtte is now identified as the Jokkmokk hub center (Ajjtte 2023; Sami Parliament 2024).

Jokkmokk is also the meeting place for several Sami reindeer herding communities and located in the heart of their wintering areas and near their all-year-lands. The three mountain RHCs are Sirges with 15 500 reindeer, Jåhkågasska with 4500 reindeer and Tuorpon with 9000 reindeer (tab. 10). In addition, the forest RHCs of Slakka and Udtja have grazing land nearby. The Jokkmokk RHCs have a special agreement of their common use of their winter grazing areas (Sami Parliament 2020).

Table 11. Reindeer herding communities (samebyar) operating in the Jokkmokk hub area

Sameby	Number of members	Max. reindeer number	Number of reindeer companies
Sirges	385	15500	96
Jåhkågassska	100	4500	45
Tuorpon	105	9000	59
Slakka	10	1000	2
Udtja	50	2800	14

Other land uses in Jokkmokk include forestry and tourism, while energy production from the river Luleälven may be the most pronounced and impacting land use form in Jokkmokk. This river system is heavily regulated for hydroelectricity with 6 of the 10 largest hydroelectric plants in Sweden producing. The river produces 16.7 TWh which is 25% of all hydropower produced in Sweden (Flood 2015). The damming of the rivers has long standing impacts on how reindeer husbandry can be carried out. Before the hydroelectric époque the lakes constituted the backbone of the reindeer migrations facilitating long range movements to and from winter grazing areas in the boreal forests all the way towards the coast of Bay of Bothnia. As these lakes now have turned to water reservoirs with unstable ice conditions the reindeer migration routes have been forced to adjacent forestlands. Consequently, hydro power development has made reindeer husbandry more dependent and affected by forestry activities (Larsen and Inga 2020). The hydro power époque lasted from 1910 when work begun in the Porjus area until about 1970 when the last lake was dammed. The impacts of these exploitation remain today.

Forestry has an even longer history in the Jokkmokk area and intensive activities are still ongoing today. There are some 5 000 km^2 of forest lands available for harvesting, while the 2 650 km^2 are formally protected making about 35% of the forests are formally protected (fig. 91). Yet, forestry is considered the most impending threat to reindeer husbandry by most reindeer herders. Commercial forestry is ongoing throughout the unprotected area. Productive forest lands (fig. 91) owned by Sveaskog AB, the National Property Board Sweden, SCA AB, Jokkmokk forest common and small private landowners provide jobs and income income (Swedish Forest Agency 2015; Sandström et al. 2016).

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Figure 91. The Jokkmokk hub area as defined by the Jokkmokk municipality boundaries. Forest lands managed for forestry are shown in dark green, forested nature reserves light green. The western part of the area consists of national parks mostly above tree line. The National Parks also define the UNESCO National Heritage area Laponia.

Today, there are no active mines in the Jokkmokk area. There is however, a long-time, ongoing dialogue and conflict around the establishment of the Kallak mine. Since the first exploration license was granted in 2006 by the Mining Inspectorate the conflict between opponents and proponents have divided Jokkmokk (Hassen 2016) (fig. 92).

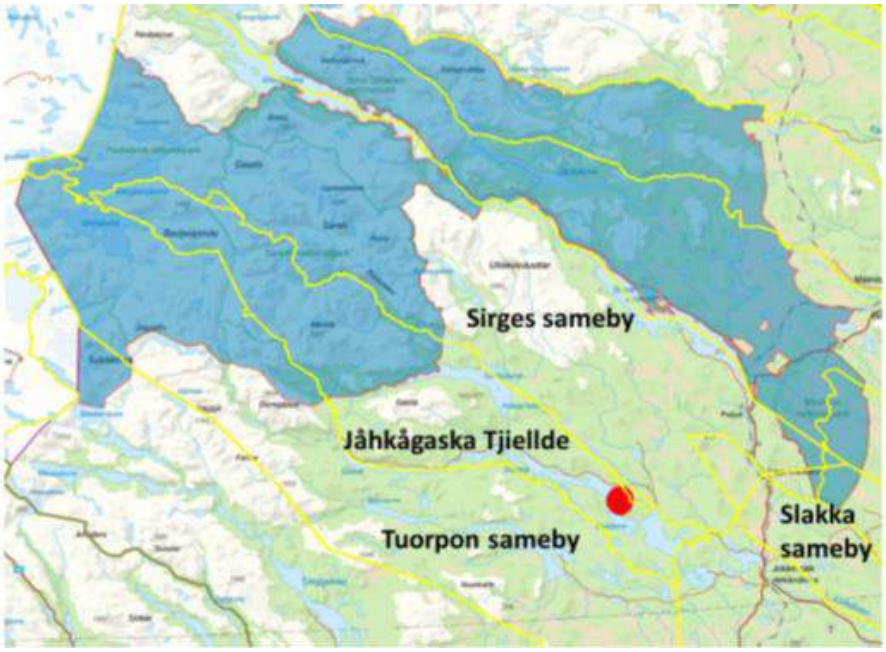

Figure 92. The town of Jokkmokk is the meeting point of several RHCs. The three mountain reindeer herding communities operating in the Jokkmokk hub include from the north Sirges, Jåhkågaska and Tuorpon, as well as

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the forest reindeer herding community of Slakka. Just west of Jokkmokk is the controversial and much debated proposed mine Kallak located (red dot). The National Parks Sarek, Padjelanta, Stora Sjöfallet and Muddus forms the UNESCO World Heritage site Laponia (in blue).

The conflict has gained significant international attention and is considered one of the most important environmental issues in Sweden today. The decision today sits at the hands of the government (Government Offices of Sweden 2022). In 2021, UNESCO stated that the mine would cause significant negative impacts on the Laponia Heritage site. The RHCs has been heavily engaged in the conflict. The proposed mining site is in Jåhkågasska Tjiellde and Sirges RHCs would have the major transportation corridor through its lands (fig. 92). The question of allowing this mine or not has been dividing and to some extent paralyzed the Jokkmokk community for long.

7.1.2.2. Gällivare

The Gällivare hub area defined by the municipality boundaries (fig. 93) is dominated by the mining industry. There are 10 500 people living in the town of Gällivare and 17 500 living in the municipality. With a municipality size of 16 800 km^2 the population density is 1 p/ km^2 (Statistics Sweden 2023).

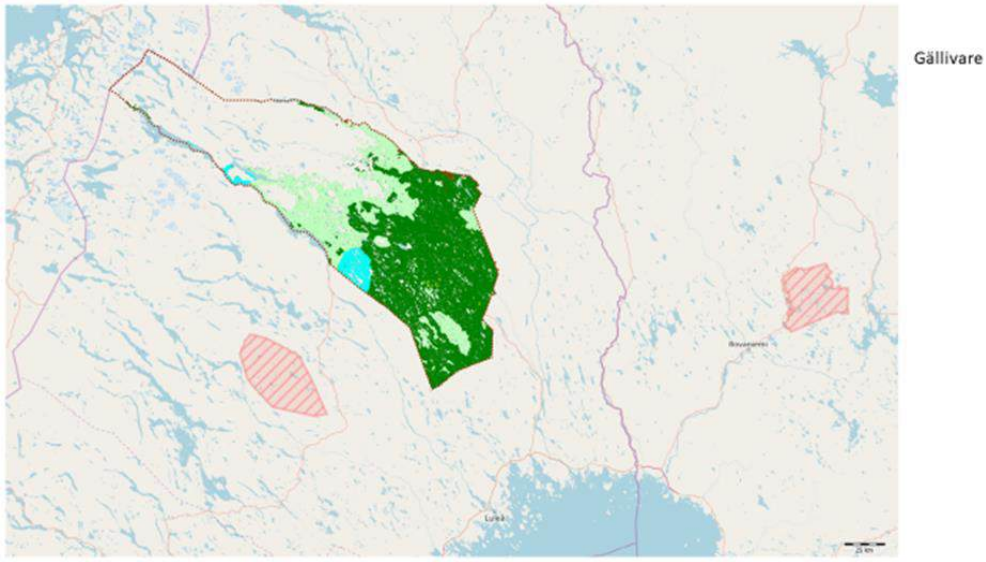

Figure 93. The Gällivare forest hub area as defined by the municipality border with forest land in dark green, nature reserves light green, national parks light blue.

Gällivare lays on the traditional lands of Sami people and the town of Gällivare is the meeting point of reindeer herding communities of Gällivare, Baste Cearru, Unna Tjerusj. The work carried out within ArcticHubs will focus on the forest reindeer herding community of Gällivare which cover 8321 km^2 spanning from the town of Gällivare in the north to the islands and coastline of the Bay of Bothnia in the south. Gällivare is part of the Lule Sami area. The highest allowable number of reindeer in winter herd is set to 7000. There are 35 active reindeer companies in the RHC. Gällivare RHC is more or less separately managed in six groups where our focus will be on the Raatukka group operating in and around the Aitik mine (Sami Parliament 2024).

Two major mines are located in or near the town of Gällivare also making the area a hub for mining activities. The Malmberget iron mine operated by LKAB (2020) is located directly in north end of Gällivare. Currently, this mine is expanding into urban areas. Whole neighbourhoods are being torn

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down and residents are forced to relocate. Part of the future plans for the Malmberget mine include the major establishment of the HYBRIT and the first fossil free steel production system in the world. This new production line calls for major increase in energy production with consequent environmental impacts far beyond the Gällivare hub area.

On the south side of Gällivare, Boliden Minerals AB (2022) operates the Aitik mine and processing plant, established in 1968. Today the Aitik mine has grown into the largest open pit copper mine in Europe covering an area of approximately 50 km^2. The Aitik mine is mainly producing copper, but also gold and silver. The Aitik mine employs 770 people and many more are employed in jobs related to the mine. Aitik is expected to be in operation until 2029 but a number of expansions of the existing mine are planned and proposed which is expected to prolong operations.

Of the forested land, i.e. 649,300 hectares, some 30% is formally protected, meaning that some 454,000 hectares may be used for commercial forestry (Swedish Forest Agency 2015). Thereby it is an important timber resource for neighboring areas but at the same time this land is also important grazing land for the reindeer herds. Commercial forestry is ongoing throughout the area. Productive forest lands owned by Sveaskog AB, SCA AB and small private landowners provide jobs and income.

7.1.2.3. Malå hub

Malå town and municipality is located in the county of Västerbotten. The population of the municipality is around 3000 with 2000 residing in the town. The size of the municipality is 1727 km2 making the population density 2 p/km2 (Statistics Sweden 2023).

The Malå hub represents a complex land-use situation where forestry, mining, wind power developments, and infrastructure projects all overlap with the land use needs of Sami reindeer husbandry. From the forest industry perspective, the hub is defined by the Setra (2022) sawmill located in the town of Malå and its timber procurement area. This area comprises the forest lands within a radius of 100 km from the sawmill. In this area, Sveaskog AB (2022) is the major forest owner (about 60% of the productive forest land) while 37% is owned by non-industrial private forest owners. These forestlands with subsequent forestry activities overlap and affect indigenous Sami reindeer husbandry in at least 14 RHC (Figure malå1). Of these RHC, seven of them are forest RHC where activities in the forests impact reindeer husbandry year around during all grazing seasons (Sami Parliament 2024). For the work in the Malå hub, Malå RHC constitutes our model indigenous hub case.

Reindeer husbandry in Malå RHC can be carried out in a 7713 km2 area. The year around grazing lands (åretruntmarker) in the west, are located in Malå, Sorsele and Lycksele municipalities. Winter grazing lands go all the way to the coast (Figur Malå2). The RHC has about 100 members and 11 reindeer herding companies. The maximum number of reindeer is set at 4500. This number has been reduced during the last 10 years as a consequence of the redrawing of RHC boundaries. The RHC is in general divided in a northern and a southern group and during winter usually further divided into smaller groups. Malå RHC is by some considered one of the most impacted RHC in Sweden with major industrial activities on all seasonal lands (Sami Parliament 2024).

Commercial forestry is ongoing throughout the area. Productive forest lands owned by Sveaskog AB, SCA AB and small private landowners provide jobs and income as discussed in the baseline report of Forestry hub.

Wind power energy production is a new and major land use form in the area (Figure 16). As the first industrial area was established in 2010, wind power expansion has become a major concern to

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reindeer herders. Several research projects carried out in Malå RHC has documented major negative impacts (Skarin et al. 2015, 2016, 2018, 2021).

Mining and prospecting have a long history in Malå RHC which has led to losses of grazing land from mining directly as well as related roads and mining related traffic. The RHC considers lands in and around the mines in Kristineberg, Storliden and Maurliden completely lost (Figure malå3). Herder's observations as well as GPS data points clearly at reindeer avoidance of areas around the Kristineberg mine. The recent closing of the Maurliden mine offers promising opportunities for restoration of lost grazing lands. The old, closed mines Näsbergfältet, Rakkejaur and Adakfältet have not yet been restored and still considered as lost grazing lands. The main mining project in the area is the Kristineberg mine operated by Boliden AB and established in 1940. The mine is a 1350 m deep underground mine containing zinc, copper, silver and gold. A considerable impact of the mine is that all ore is transported by truck to the processing plant at Rönnskärsverken on the coast. The Rävliden expansion of the Kristineberg mine has recently been given permission to proceed. Mining activities in the Kristineberg mine began in the late 1930s, where Boliden AB extracts zinc, copper, gold and silver. The ore is transported by truck from the mine site to the coastal processing plant in Rönnskär. This complex land-use situation calls for innovative participatory tools to provide an effective and inclusive dialogue in search of solutions (Boliden 2021).

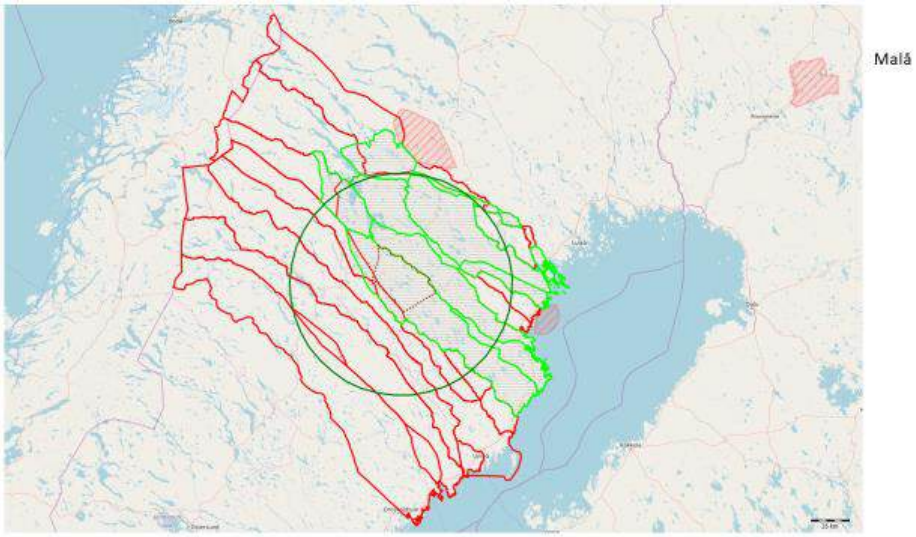

Figure 94. The reindeer herding communities residing/operating in greater Malå hub area include Ståkke, Östra Kikkejaure, Västra Kikkejaure, Mausjaur, Maskaure, Malå (Forest reindeer herding communities) and Luokta-Mavas, Semisjaur-Njarg, Svaipa, Gran, Ran, Ubmeje tjeälddie, Vapsten, Vilhelmina norra (mountain reindeer herding communities). Malå reindeer herding community lays in the center of the circle

7.1.2.4. Gran Sameby hub

Perspectives from reindeer herders

What is a reindeer herding community (RHC), a sameby? It is a legal entity and a territory, but from the inside it is mostly a group of people that are by legislation bound to cooperate with each other and coexist in certain prescribed ways with the rest of society. Everything that impacts reindeer will impact economy, family life, social life and status and also reindeer herding of the community and thus Sami culture as a whole.

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The Gran hub differs from the other hubs in the project in that the geographic delineation of the hub is the entire territory of the RHC that is also Gran (Grans sameby)[1]. It is a vast area stretching from the high mountains at the Norwegian border, along the Vindel River to Åmsele where it veers north, down to the Gulf of Bothnia. At the westernmost end of the hub we find the largest nature reserve in Europe (Vindelfjällens naturreservat) and in the easternmost we find the 11th largest city in Sweden with a thriving university/university hospital, airport and lively commerce. In between are large areas of sparsely populated but still quite intensively exploited land – from the viewpoint of a reindeer. Forestry and windmill parks[2]are right now the largest potential disruptions along with tourism.[3]

One very real change is the status of the ice on the Vindel river. It is relied on heavily for migration, without usable ice some stretches of the migration route is just gone. In the last 5 years the ice has not frozen with a proper core. So when thawing begins and water runs over the sheet of ice, it does not float up again as it used to. Rather, it thaws from both sides. Ice as thick as 80 cm can be gone in five days and bringing migration to a halt. If and when this happens, transport on trucks is necessary. Gran has a string of enclosures along the migration route, but has not had ones with loading facilities or in places that can carry large trucks on gravel roads in spring. The cost to build new ones is large and it is not always easy to find a good spot. Migrating on snow requires a crust and is done mostly in the very early morning hours. Trodding along on soft snow is too heavy for the reindeer.

Here is the background for choosing this somewhat hard to handle delineation. Gran is a so-called mountain reindeer herding community. These are characterized by long, seasonal migrations with the reindeer. The reindeer are all spread out on the mountains from April-May to November- December and this is where the calving and the tagging of the calves is done. During this time herding is done as a collective.[4]

In Sami" early winter" separation of the herds begin and the reindeer are separated into family/winter groups. The territory of Gran is very narrow in the middle, and so families have since very long ago separated as a string of pearls along the land, all in their own area. Some have a relatively short migration; some migrate very far. The longest yearly migration is done by the Jonsson/Myntti family, 400 km to the coast and the same back, every year. Any disturbances in any of these areas will reverberate through all of the RHC and have direct consequences for the economy, social status and

[1] Gran also has traditional grazing rights on a massive area inside Norway which is used every year as it has been since time immemorial. There is a dispute between the Swedish and Norwegian states about these cross border rights. Gran is in a position to defend their cross border rights in court in Norway successfully, but it has not come to that point yet. The details of this legal dispute is outside the boundaries of this report. It is mentioned since Gran would be seriously damaged if these rights were abandoned (as the Swedish government seems happy to do).

[2] Wind mill parks can have great social consequences. The companies allocate money for local residents, maybe a new playground in the village for their kids, and pay private forest/land owners good money for being on their land. Everyone is happy until the reindeer herders protest. Imagine your children going to daycare or school in those villages, small places where everyone knows "it's your fault" we don't get a new playground?

[3] The corona pandemic led to an upsurge in domestic tourism. Houses/cabins in the mountain villages have risen steeply in price. This seems to be no problem for the city folk who are now buying and building and demanding infrastructure, activities and access for the weeks they are actually there. Snow mobile traffic has intensified also inside the perimeters of the villages.

[4] Newcomers fail to observe the everyday lives of the villagers and respect boundaries of for instance private properties – anything covered with snow that has no fence around it is driven upon. There is a clash in the differing senses of privacy. Some families of reindeer herders from Gran live most of the time in Ammarnäs, the central village in the mountains in Gran. The road ends there. "Mountain time", which includes being in Ammarnäs, used to represent a time of relaxation in the sense that being a reindeer herder was not something exotic, even being the majority at times. This sanctuary is eroding. Gran cooperates with Svaipa RHC in Norrbotten during this time, due to the layout of the land.

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wellbeing of all.

This separation of customary winter areas in Gran is not prescribed in legislation, but by tradition. In principle, all land can be used by all reindeer herders. If there would be a true crisis in grazing, and no other options were available, this would be the case. But, you have to have somewhere to live in the winter, a house.[1]Maybe your children go to school there, maybe your spouse works there.[2] You make friends, you get to know people, the locals get to know you. The support of the surrounding community in winter is crucial. Above all; you learn your own land. Your reindeer learn where they belong which makes work easier on humans and animals alike. After decades you learn to handle your economy accordingly. Maybe staying near the sea has some advantages since snow falls a little later and thaws little sooner, but the cost of the transport is brutal. If you are furthest to the east you must wait for those closer to the mountains to migrate before you can start moving.[3] The grazing along the migration route might be all used up before the last group comes along – or maybe the ground has finally thawed enough for any grazing to be available.

Many reindeer herders are fiercely individualistic and want to test their own ideas and tend to their reindeer as they see best. Traditionally a person with a large herd had the respect and ear of the others when it came to collective decisions. He (in Gran it has been a ”he”) had proven his ideas to work as well as his stamina and talent. This said, everyone knows the importance of family. Still, you can have a wonderful family and not ever be successful with the reindeer.

This is vital to know when discussing the structure of today’s RHC and the effects it has on the collective of reindeer herders as well as all the members individually. The RHC is a specialized legal entity created exclusively to handle reindeer herding. It is not an association for cultural development or protection – even though the individuals in them going about their lives are central to Sami culture. A larger structural change in legislation was made in 1971[4] when the switch from reindeer grazing acts to a reindeer herding act was made. Focus shifted towards “herding” since the underlying intent was to make the business of reindeer herding more efficient and economically viable. The general areas and groups in them were kept, it was the structure of the administration, the rights and responsibilities of the individuals and the legal entity of the RHC that were regulated. As in most associations there are collective responsibilities and collectively owned resources that must be handled fairly. For the RHC these natural resources are grazing rights, fishing and hunting, but also actual money from calves that are not tagged come separation, compensations from exploitations and for predators.[5] This money is to be used for the collective needs of the reindeer herders work (enclosures, costs around separations, fencing, etc.). If there is money left, so to say, these can be payed out to the reindeer herders, and if there is a lack the herders have a duty to contribute out of their own pockets.

[1] And somewhere to park your truck, your trailers, your snowmobiles, and to store all other equipment. Also you have a lot of heavy – at times very dirty and smelly – clothes and shoes that don’t fit well in the context of apartments. You also have working dogs, most have more than one. Reindeer herders in Gran need two houses; one for winter time and one in the mountains.

[2] Families have two choices. Either “the rest of the family” live in the mountains or in the mountain area and are apart from the reindeer herder for extended periods of time, or all migrate together. Migrating together is not so simple due to schooling and the need for a second income. Migrating together was the norm just one or two generations back for the families in Gran, now it it a mix.

[3] Migrations are financed by each group and there are many ways of handling it with quite different price tags and working hours. Sometimes a choice comes down to something as close to the ground as” do I have a good enough dog for this?”.

[4] Which created the ”samebyar”, RHC:s, we have now, as Gran.

[5] For certain female predators that can be proven to raise offspring on the territory, that is

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Most of the rules pertaining to voting in economic and practical issues are based on rules in registered co-operative societies and some from the law on limited companies. Every reindeer herder has to state how many reindeer he or she owns, and this is registered with the Sami parliament in the so called renlängd.[1] When it comes to voting in the RHC, any issue that will have economic or other consequences for those working as reindeer herders is voted among those according to the renlängd.[2] 1 vote per commenced 100 reindeer on the renlängd (120 reindeer= 2 votes).

The law states that for these voting purposes, all of the reindeer of ”the house” belong to the actual reindeer herder (husbonde). Some complaints have been raised about the fairness of this, based on a western ”rights mentality” that has crept in as fewer and fewer have taken on the heavy task of actually making a living out of reindeer husbandry. As fewer carry the burden with the reindeer and more have some reindeer on the side whilst making a nice living on something else, this majority seems to think they are owed more and more of the natural resources connected exclusively to reindeer herding.[3]

This is a reflection of a disconnect at a fundamental level among the Sami themselves.[4] Most admire reindeer husbandry, even those whose families left generations ago to live somewhere else. It is only natural that they might want to re-connect in some way, many now pursue their Sami ancestry. But they do not understand enough to be able to evaluate their own impact on the group (some believe their individual rights to be of greater importance) they seek connection with. They might argue ”hunting and fishing used to be a way of Sami life, my ancestors did that and it is not going to hurt anyone if I come in the autumn to fish and hunt, the mountains are big and fish and game are plenty and by the way it should be my right”[5].

The easy on is the latter: fish and game might not be all that plenty. The is already a division of natural resources among the families, already a limitation. All resources, whether fish and game are sold or eaten, are sorely needed. Moreover, here you find the reciprocity, here lies a responsibility. Inside the RHC:s, counting in Gran, it is not unusual to share these rights among all those who actually participate, all who contribute to the wellbeing of the community. A grandmother who bakes cinnamon buns in the far out Vindelkroken and hands it out to everyone’s kids, a retired reindeer herder who comes along every now and then to share his knowledge or just company.

This practice might not be to the letter of the law, but it is an expression of humanity and should be left so.

The second goes much deeper and is not often spoken out. Reindeer herders are under immense pressure from the outside world, it comes from everywhere and is unpredictable at times. Many are mentally and physically pretty run down. To demand that you have to welcome complete strangers, who might not have an inkling about your way of life, demand to be let into the very core of your life, the place where you can find peace and relax among your fellows, where you can have those intimate conversations about the future of your children, is at tall order. Put plainly – the future of reindeer

[1] Reindeer herders run their own, separate companies. You pay tax for your inventory of reindeer.
[2] Some own reindeer but work mainly in other occupations, or not at all: wives, children, elderly people, relatives. It can be from one or two animals to a hundred.
[3] Like fishing, hunting and building cabins in the mountains.
[4] The large majority of Sami in Sweden are not reindeer herders and many (maybe most) have never seen a reindeer let alone worked for a day in reindeer herding.
[5] A problem fueled by the Swedish legislators choice to go with blood lines (as opposed to ILO169).

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herding and Sami culture depends on human beings wanting to dedicate their lives to reindeer. This means full time focus on reindeer herding.

Can the possible impact be so great, though? How come? Actual reindeer herding really is learning by doing. The loss of knowledge from the last one or two generations is massive and pretty much irretrievable, even if today's herders know things they did not. Even if you do nothing else in your life you will still be learning when you are in your 40ies and 50ies. The surroundings change with great speed, the weather conditions, the structure of your herd, you will never know everything. If you lose the core of people, make their lives miserable enough, who are willing to dedicate their lives to the reindeer, reindeer herding as we know it will die.[1]That would be a massive cultural loss – the Ethnosphere[2] would lose yet one colorful participant.

The loss of knowledge alone is already undermining reindeer husbandry as a whole. This way of life is a practice, not a theory, and it has to be taught by doing. There is no more room for so called temporary measures (as feeding in enclosures caused by disturbances from windmills) that disrupt the way of the reindeer, or one more generation the knowledge, the courage, the self- esteem, is lost. Then, reindeer herding as we know it, will be extinct.

Since reindeer herding has been badly hit economically by the changing climate, by exploitations and by the raise in living costs and now the massive increase in costs for fuel, many actual reindeer herders have been forced to take other jobs on the side. Adult reindeer herders have been forced to work extra, many turning to the mining industry up north that pays well for short periods. While this might give a short monetary relief, it bears heavy on heart and soul. Some, join together and have a try at the hospitality industry sharing different aspects of Sami way of life.[3] This has led to discussions on "who is actually a full time reindeer herder", where the herders find themselves defending their livelihood also against other members of the RHC.[4] Said straightforwardly, wanting to be classified as a reindeer herder (husbonde) is always connected to a wish of receiving a right (to shoot a moose, to build a cabin) and never to carrying a responsibility (all help is received gratefully). And if you have no or few reindeer, you will never be asked to personally carry the consequences of (your) bad decisions. So, in old times you had a lot to say if you were "big". Today, you have more votes and more deciding power if you are "big" – but you also run the risk of facing greater consequences.

One more note about the fact that the law states that the actual reindeer herder, the full time reindeer herder ("husbonde" in the law) votes for all the reindeer of his "house". This system has been challenged as unfair/gender biased, since it is almost always the case that it is a man, the husband, father, brother, cousin, that is the husbonde. This is said to unfairly affect women in the RHC since they

[1] Reindeer herding is so much more than a job, but laws concerning reindeer herding take almost no regard to the fact that it regulates family issues, personal issues. Legislation in Sweden pertaining to workplace issues and workers' rights are very strong. One noticeable exception is if you work inside of someone's home – you can then be fired just because you don't fit with your employer since we need to respect a person's private sphere. This is acceptable to the absolute majority, this makes total sense. But there seems to be little or no understanding of how the law affects reindeer herders and their families.

[2]The term Ethnosphere was coined by anthropologist Wade Davis. He states, "You might think of the ethnosphere as the sum total of all thoughts and dreams, myths, ideas, inspirations, intuitions brought into being by the human imagination since the dawn of consciousness. The ethnosphere is humanity's great legacy

[3] The RHC itself, the legal entity, is forbidden by law to engage in any other business than reindeer herding.

[4] A personal note from the author: I find this question easy to solve. You are a full time reindeer herder (husbonde) if you can do other work if and when the reindeer don't need you. If you can participate in reindeer herding when you job permits, you are not. Many times the RHC:s decide on their own, as they wish or as they are forced to by collective will or strong-minded individuals.

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then do not get to vote ”with their own reindeer”. This might bear some theoretical value as a discussion point, but, if someone else it taking care of your reindeer since you are not fit or able to do so, would you vote against them? Some protest against the system where the more reindeer you have, the more votes. This shows a disconnection in understanding. Sami people who are not reindeer herders, many not be even members of an RHC, think it is their right to decide over resources for their leisure time and enjoyment, no matter the impact on the reindeer herders.[1]Even some reindeer herders protest that the vote is decided by numbers. But the reason is of course that the bigger you are the more you can and will be hurt by bad decisions. There is a parallel to shareholding underlying the legislation, and there are also minority rules for the voting. A reindeer herder has his property and fortune running wild outdoors. Of course it must make a difference if you have 1000 or 100 reindeer. Like in the old times; if you have many reindeer you are doing something right. And, if the RHC decides to tax the community, you have to pay a lot more. Keep in mind that the individual, even though he or she is running their own business, they are forced to work within the RHC, by law. Since the RHC:s were created to make reindeer herding economically viable, the rules make business sense.

The members in Gran consist of two somewhat culturally diverse groups: one group that has always lived here and have Ume-sami as their language[2] and one group that were forcibly moved by the Swedish state to the area and who speak North-sami. This coexistence has now been the case for almost a hundred years. The families work alongside each other but there still is a visible divide. Some has to do with language, some with old family- and friendship ties. What cultural differences might still be there are alleviated by the fact that you are allowed to choose companions for yourself during the most work-intense periods. You do as you like and want.

Mostly the differences bring richness to the customs, by extending the scope of handicraft, traditional clothes, ways to preserve all parts of the reindeer, language and different ”joijks” (traditional song). The plight of the forcibly moved North Sami is being highlighted and discussed, books are being written and recognized. Many travel back north to find their roots and personal seek reconciliation with their family history. The impact on the local Ume-Sami is not so much discussed. They were not told someone was coming, suddenly newcomers appeared and the state had assigned them areas inside Gran. The groups could not understand each other’s language. Even if there were grudges, basically humanity took over. Once you get close enough to someone, you will find similarities, you will find compassion for someone in need. The two groups did not herd in the same fashion and it was more commonplace for Ume-Sami women to work abreast the men. Traces of preferences dating back to those days can still be found, but now herding in Gran is more homogenous, on the whole.

[1] There are constant investigations into ”new reindeer herding acts” that all seek to include more people in order to distribute the natural resources to more ”Sami people”. These investigations rarely discuss the impact on the reindeer herders and their families, that is, the future of reindeer herding.

[2] In fact, all active reindeer herders in Gran that spring from Gran can be traced down to one man: Jon Sjulsson (1840-1912), and his second wife Maria (who was from the neighbouring community of Ran). All other families have gone on to other ways of life. The Jonsson (son of Jon) family (as in research partners in Gran Tobias Jonsson and his som Niklas) can be traced to the territory as far as the records go back.

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7.1.3. Sámi People in Norway

The Sámi are recognized as an Indigenous people in Norway following the ILO Convention No. 169 (International Labour Organization 1989). The parliament is the democratically elected body of the Sámi people in Norway. The main Task is to strengthen the political position of the Sámi people and promote Sámi interests in Norway. A consultation agreement between the Government of Norway and the Sámi Parliament is in place as a way of fulfilling Norway's commitment of consulting indigenous people.

The rights of Indigenous Peoples to participate in and influence decision-making is emphasized in numerous international conventions ratified by Norway, such as article 27 of UN's International Covenant on Civil and Political Rights (ICCPR), ILO Convention 169 articles, 6, 7, 14 and 15 and the Convention on Biological Diversity (CBD) article 8j.

Norway was the first country to ratify the ILO Convention no. 169. (Indigenous and Tribal Peoples Convention). Sámi rights are also stipulated in the Norwegian Constitution: "*The authorities of the state shall create conditions enabling the Sámi people to preserve and develop its language, culture and way of life*" (§ 108). Securing natural resources for Sámi livelihoods and culture is a goal of two of the main acts governing land use in Norway, namely the Planning and Building Act (2008) and the Nature Diversity Act (2009).

The Sámi have an exclusive right to reindeer herding (with a few exceptions) (Reindeer herding Act §§ 9 & 32). The Norwegian Sámi reindeer herders have the right of immemorial usage ("alders tids bruk") to practice reindeer husbandry. Following the Norwegian Reindeer Herding Act (2007), access to seasonal pastures is an important material basis for Sámi reindeer herders' culture and livelihoods and should be preserved.

The management of Sámi reindeer herding in Norway is divided into six reindeer herding areas. Reindeer herding is further organized into reindeer herding districts and within each district, herders belong to siidas that collectively herd reindeer.

The County Governor has administrative and professional responsibility for carrying out reindeer policy at the regional level. They also manage legal and economic measures and give advice to the industry.

Prior to 2014, regional councils oversaw the management of reindeer herding. Regional councils were appointed by the Sámi Parliament and the county municipality. Among the members of these councils were active reindeer herders and the secretary was a reindeer herding agronomist.

Reindeer herding is the main industry in Kautokeino and is the main focus of a strong public sector that includes Sámi institutions and the Sámi University College. The reindeer movement/trekking patterns to the coast and other municipalities implies that land use changes in these areas touch Sámi reindeer herding. The basic unit within reindeer husbandry in Norway has been the husbandry unit, the head of which is usually the concession holder, a model that dates back to 1978 (Eanandoallodirektoráhtta 2021a).

The Reindeer Herding Act of 2007 seeks to re-establish the siida as an important management unit or tool for reindeer husbandry. The siida is a community-based working group within reindeer husbandry which forms the central basis of decisions made related to grazing grounds and yearly movements and circulation. The members are often related, and the composition of the siida may change from summer to winter with larger siidas during summer and autumn. The new law has changed the term "husbandry unit" to "siida share" and slightly changed the content of this term. Following the Norwegian Reindeer Herding Act (2007) unlimited access to seasonal pastures is an important material basis for Sámi

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reindeer herders' culture and livelihoods and should be preserved. Together with other land uses and encroachments like tourism and mining, severe winter season conditions seem to be an ongoing and future threat to the reindeer husbandry (Vikhamar-Schuler et al. 2016).

For the following sections, Finnmark and Troms counties were merged in 2020 into a single county named Troms and Finnmark. Thus, official statistics for Finnmark as a separate administrative unit are only available until 2019.

7.1.3.1. Kautokeino-Kvalsund hub

Guovdageaidnu (Sámi spelling) is a municipality in the heart of the Sámi area of Norway. 95 % of the municipality's population are indigenous Sámi, being one of only two municipalities where the Sámi people are in majority; the other one being Kárášjohka, which is the neighbouring municipality, where the Norwegian Sámi Parliament is located. Guovdageaidnu is the largest municipality in Norway covering 9 707 km^2 of land, including lakes and rivers. A large part of this area is suitable for reindeer grazing. Sámi is the primary language in the municipality and nearly all inhabitants speak Sámi. Exact ratios of Sámi-speaking inhabitants are not available.

Kvalsund was a separate municipality until 1 January 2020 when it was merged with the Hammerfest Municipality. The former Kvalsund Municipality covered ca. 2 000 km^2, of which 1 739 km^2 was on land, while the remaining part was fiords and sounds. Reindeer siidas with winter grazing areas in Kautokeino, migrate to Kvalsund for summer grazing. This is the major reason why these two separate areas are treated together in one hub, and why the hub is called "Kautokeino-Kvalsund". Kvalsund is traditionally a Sea Sámi community, where a large proportion speak Sámi or are descendants of Sámi-speaking people. An unknown ratio of the inhabitants speak Kven (a Finnish-derived language), while nearly all inhabitants also speak Norwegian either as first or second language.

The importance of the reindeer husbandry for the community in Guovdageaidnu-Kautokeino (West Finnmark) is illustrated by the fact that in 2021 there are 25 pasture districts, 36 summer siidas, 53 winter siidas, 213 siida shares, 1 507 reindeer owners, and 76 335 reindeer (Eanandoallodirektoráhtta 2021a). With a total population of ca. 2 900, this means that slightly more than 50 % of the population in Kautokeino are reindeer owners. A high proportion of the remaining population are family members of reindeer owners. Thus, nearly the whole population of the municipality is in one way, or another involved in reindeer husbandry.

Inaugurated in 1989 in Guovdageaidnu-Kautokeino, The Sámi University of Applied Sciences (Sámi allaskuvla) has slightly more than 100 employees and receives ca. 120 million NOK (ca. 12 million EUR) annually in governmental and other financial support (Anon. 2022). The University is a cornerstone in the Guovdageaidnu-Kautokeino municipality and for the entire Sámi community. The tax revenues from the University's employees are an important contribution to the economy for the municipality. Moreover, the university secures competence development in all aspects related to Sámi way of life, influencing positively all Norwegian Sámi societies, even Sámi societies in neighbouring countries, as many of the students are international. Sámi allskuvla has, at least in recent years, had more female than male students. In 2021, 81.7 % of students were females.

Biedjovággi is an abandoned open mine in the south-western part of Guovdageaidnu-Kautokeino. Copper ore with traces of gold were extracted in two periods, first between 1970 and 1975 and later between 1985 and 1991. In the last of these two periods, the mining company in the area (the Finnish company Outokumpu) was the largest employer in Guovdageaidnu-Kautokeino.

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Recently (August 2022), it has been publicly announced that a Swedish mining company (Arctic Minerals AB) has applied for permission to re-open the mining activities in the area to extract cobalt, tellurium, gold, and copper from an extended area surrounding the existing mining pit. A similar proposal from the same company (then named "Arctic Gold AB") was in 2013 voted down by the majority of the Municipality Board. The current Municipality Board is also against new mining activities in Biedjovággi due to the large negative effects it will have on reindeer husbandry in the area, according to a recent interview with Deputy Mayor Ole Hætta published by the Norwegian Broadcasting Corporation (NRK).

Regarding the reeinder hearding in the Kvalsund part of the hub, there are 3 pasture districts, 3 summer siidas, 5 winter siidas, 28 siida shares, 166 reindeer owners and 9 544 reindeer (Eanandoallodirektoráhtta 2021a).

Kvalsund is a traditional sea Sámi community and is used as spring, summer, and autumn pastures for reindeer husbandry, some of them with winter pastures in Kautokeino. Mining has taken place in the area of Kvalsund for shorter periods, last time in the 1970s. Kvalsund needs new employment and a more diversified industrial structure as young people leave the area for more opportunities in the cities. Nussir ASA, a new Norwegian mining company, dependent on foreign investments. For 10 years, an opening of a copper mine has been under planning. Nussir received an operating license from the Government in 2019, supported by the local council but plans for a sea deposit in the fjord caused protests from environmental NGOs, Sámi organizations and other user groups. Another development is a planned facility for green energy at Markoppneset not far from the Nussir mine.

Kvalsund is affected by industrial development such as mining and other land use changes. The physical barriers and pasture fragmentation resulting from cabin resorts in Kvalsund-Repparfjord as well as infrastructure development (e.g., roads, power lines) have adversely affected the distribution and movements of reindeer from the 1990s and onwards (Bradshaw et al. 1997, Nellemann and Cameron 1998, Vistnes et al. 2008, Skarin & Alam 2017). However, unemployment rates in this municipality reveal a need to find alternative employment and business development. The table below provides relevant data on district level within the Kvalsund-Kautokeino area.

Table 12. Income of siidas in Kvalsund-Kautokeino area

District	Siida units	Persons involved	Production per reindeer (kg)	Total meat income (MNOK)	Other income (MNOK)[1]	Compen-sation (MNOK)[2]
Fiettar[3]	14	107	5.4	2.1	n.a.	n.a.
Fálá/Kvaløy	6	26	3.2	0.6	n.a.	n.a.
Gearretnjárga	8	35	2.7	0.5	n.a.	n.a.
Guovdageaidnu-East	53	364	5.9	9.2	11.3	6.7

[1] Subsidies from the Ministry of Agriculture, hunting and fishing + other types of income
[2] Compensation for predators and loss of area
[3] Fiettar, Fálá and Gearretnjárga are reindeer herding districts within the former Kvalsund Municipality, now part of Hammerfest Municipality

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District	Siida units	Persons involved	Production per reindeer (kg)	Total meat income (MNOK)	Other income (MNOK)[1]	Compen-sation (MNOK)[2]
The whole of Guovdageaidnu[1]	212	1 535	5.7	39.14	39.91	29.0

n.a. = data not available
Data are from 2019 and retrieved from Eanandoallodirektoráhtta 2021 a, 2021b.

For the separate zones, meat production between years varied between 187 and 298 %, rendering an overall variation of 196 %. This means, for the total area, that in the best year within this period, the production was nearly the double of the worst year. Regarding the separate zones, we see that variation is highest in the central zone, with nearly three times higher production in the best year compared to the worst year. The main reasons for the large year-to-year fluctuations are high mortality caused by challenging winter grazing conditions, which are covered in several of the other work packages of ArcticHubs, and loss to predators. The monetary value of meat sold via slaughterhouses show that from 2019 to 2020 there was a 32 % reduction in monetary value of the total meat produced.

Nearly any economic activity in Kvalsund-Kautokeino beyond the direct income from reindeer husbandry is of relevance from an indigenous perspective. The Guovdageaidnu-Kautokeino municipality administration's annual income per inhabitant was 88 789 NOK in 2021 and 82 305 NOK in 2020. These values do not provide much information without comparing them to other municipalities. The national average was 65 717 NOK in 2021 and 60 867 NOK in 2020, meaning that Guovdageaidnu-Kautokeino has a 20 % higher income per inhabitant than the national average. This is positive. On the other hand, in 2021 Guovdageaidnu-Kautokeino municipality spent 45.5 % of its revenue on gross investment costs. This is much larger than the national average, which is 14.5 %. In 2020 the investment costs in Guovdageaidnu-Kautokeino were only 4.6 %. Overall, the official statistics on the income and costs draw a picture of a municipality that performs above the national average.

Kvalsund Muncipality had a mean income per year per inhabitant of 93 087 NOK for the years 2015-2018, thus much larger than the national average for these years. Its gross investment costs in the same period varied between 12.3 and 19.1 % of the gross income.

There was no commercial forestry in these two municipalities in the period 2018-2021. Statistics on agriculture is not available on municipality level. Data available on county level shows that agriculture is in decline in Finnmark. For example, from 2007 to 2019, the number of properties defined as agriculture with buildings and settlement declined by 20.6 %.

There is no available data on the revenue from tourism on municipality level. There are numerous tourists, both domestic and international, visiting Guovdageaidnu-Kautokeino during a year. In the municipality, there are several tourist-related businesses offering activities in all seasons. Near the centre there is a large, modern hotel. The hotel is probably much used by tourist buses during summertime. activities (some of which are strongly connected to the Sámi culture) that attract domestic and international tourists are, among others, history, handicraft, nature, reindeer,

[1] This includes three zones, of which Guovdageaidnu-East is one of these zones. The siidas with winter-grazing areas in Guovdageaidnu-East are the ones who migrate to Kvalsund for summer grazing. The siidas in the other two other zones migrate to summer grazing areas in the west (Kvænangen, Alta, etc.). Data for the whole of Guovdageaidnu is provided to show the situation for the municipality as a whole.

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birdwatching, fishing, hunting, cross-country skiing, dog sledging, and last, but not least northern lights spotting. Numerous airborne tourists arrive at Alta and take shorter trips to Guovdageaidnu-Kautokeino on guided day trips, and some international tourists also stay overnight in Guovdageaidnu-Kautokeino.

Kvalsund receives fewer tourists, but numerous tourists drive through Kvalsund en route to North Cape or Hammerfest. The village Skaidi is a popular destination for domestic tourism. The village hosts a large village of leisure houses (cottages) and a hotel. Salmon angling attracts some tourists.

Overall, much of the tourism is, at least in part, related to Sámi culture, but it is nearly impossible to put a monetary value on this. See, for example, Olsen (2016) for more information on Sámi-related tourism in Guovdageaidnu-Kautokeino. A report from 2017 (Iversen et al. 2017) estimated the tax income from tourism to be 2.3 mill. NOK for Guovdageaidnu-Kautokeino. For Finnmark as a whole, the economic productivity from tourism increased by 230 % from 2004 to 2017.

Number of people with employment is here first described on county level. Corrected for population changes, the employment rate for inhabitants in Finnmark (i.e., people with postal address in the county) decreased by 1.3 % from 2008 to 2019. In 2008, 52.0 % of the inhabitants in Finnmark were employed, while in 2019, this number was 50.8 %. However, the total number of people with employment in Finnmark increased by 4.4 % during the same period. This suggests that Finnmark provides jobs to people who have a home address elsewhere in Norway or abroad, and that this type of employment has increased. This is typical for people working in petroleum, mining or fishery industries, which are not typical jobs in Guovdageaidnu-Kautokeino or former Kvalsund municipality. Thus, county-level employment time series are not much informative for this hub.

The total number of inhabitants in Guovdageaidnu-Kautokeino Municipality with employments is given in the tables below. Data on employment are available for the period 1986-2022, while industry-specific data are available for the period 2008-2021. The first table includes inhabitants between 20 and 64 years old, reflecting the potential working force.

Table 13. Total number of inhabitants in Guovdageaidnu-Kautokeino Municipality with employments

Year	Male (*n*)	Females (*n*)	Total (*n*)	Ratio (%)[1]
1986	835	743	1578	88.55
1987	843	748	1591	89.28
1988	861	754	1615	90.63
1989	862	771	1633	91.64
1990	895	789	1684	94.50
1991	907	803	1710	95.96
1992	934	812	1746	97.98
1993	944	847	1791	100.50
1994	954	873	1827	102.52
1995	971	899	1870	104.94
1996	985	900	1885	105.78
1997	993	906	1899	106.56
1998	993	901	1894	106.28
1999	985	906	1891	106.12

[1] Total number of employed inhabitants of a specific year as a function of the long-term average.

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Year	Male (*n*)	Females (*n*)	Total (*n*)	Ratio (%)[1]
2000	983	892	1875	105.22
2001	990	892	1882	105.61
2002	1 004	878	1882	105.61
2003	984	870	1854	104.04
2004	992	871	1863	104.54
2005	990	875	1865	104.66
2006	985	868	1853	103.98
2007	991	845	1836	103.03
2008	979	848	1827	102.52
2009	981	858	1839	103.20
2010	968	842	1810	101.57
2011	959	854	1813	101.74
2012	946	840	1786	100.22
2013	957	833	1790	100.45
2014	951	813	1764	98.99
2015	939	813	1752	98.32
2016	943	832	1775	99.61
2017	911	822	1733	97.25
2018	932	807	1739	97.59
2019	934	789	1723	96.69
2020	921	776	1697	95.23
2021	924	781	1705	95.68
2022	901	757	1658	93.04
Mean	947	835	1 782	100.00

Declining trend in the number of people working in agriculture is observed, i.e., for this municipality this means reindeer husbandry. However, caution must be taken, given that information on type of work is not available for the total potential workforce. For example, in Year 2021, information is lacking for 250 (15 %) of the potential workforce (difference between 1 455 and 1 705; see values in the two tables). However, it may also mean that of the 1 705 inhabitants between 20 and 64 years in 2021, only 1 455 had jobs. It is likely that a relatively high number of the 250 inhabitants between 20 and 64 years were students or unemployed. Kvalsund (2008-2019) shows a declining trend in the number of employed inhabitants, from 507 in 2008 to 427 in 2019 (i.e., the last year with data, before Kvalsund became part of the larger Hammerfest Municipality). Only between 3 and 7 persons within Kvalsund worked in agriculture (reindeer husbandry or as farmers), according to this dataset. It reflects that reindeer herding within Kvalsund is largely undertaken by inhabitants of neighbouring municipalities, including Guovdageaidnu-Kautokeino. Tables for Kvalsund are not provided here.

The state of biodiversity in nature, as measured by the Norwegian Nature Index (2020), is considered as good (quantitatively evaluated on a scale from 0 to 1) for the Kvalsund-Kautokeino area. The only exception is the state of forests, which is moderate in most of the country, including the whole of Finnmark. A main reason for this is a general decline in abundance of old-growth forest trees (especially aspen, rowan and large willows), small rodents and several bird species. Forest state in K-K increased from 2014 to 2019 – from below moderate (0.35) to moderate (0.45) and, this improvement was concomitant with a similar improvement in most of the country. Data on state of nature from Kautokeino-Kvalsund are mostly indirect, meaning that rather few datasets are retrieved within the hub, but time series collected elsewhere are given validity on regional level.

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7.2. Inuit People in Greenland

The Historical immigration of Greenland has occurred over two major rounds. The first group of settlers were the Paleo-Eskimos and then the Neo-Eskimos (see detailed Indigenous Activities report: Annex 5).

DNA studies show that the first people - the Paleo-Eskimos - inhabited the Arctic for about 4,000 years without contact and exchange with other populations. The Paleo-Eskimos migrated from Siberia via the Bering Strait to the Arctic. 700 years ago, around the 1100s, a new population group came to the Arctic - Thule Inuit - who are the ancestors of the living Inuit in Greenland. At this time, the Paleo-Eskimos disappear from the Arctic region.

The majority of the population in Greenland is descended from the Thule Inuit group also called the Neo-Eskimos, who immigrated from the Aleutians, across Siberia, Alaska and Canada to the Thule area and continue down West Greenland. Thule-inuit are the oldest population group in Greenland and genetic testing shows that the Greenlandic people are descended from this people.

Norse and Vikings immigrated South Greenland in the 980s. The Vikings came to Greenland in the year 985 and settled in small settlements in southern Greenland. Here they lived for about 500 years. This means that the Vikings overlapped temporally with both the Paleo-Eskimos (Late Dorset) and the Thule culture in Greenland. The Vikings lived in Greenland during a climatic warm period, and unlike the other cultures in Greenland, were peasants. There was both forest and the opportunity to grow different crops in southern Greenland, and the Vikings also had farm animals with them."

"Greenlanders called themselves Inuit until the beginning of the last century. The contemporary term Kalaaleq (plural: kalaallit) derives from the "peeling" of the Norse. ...Kalaallit is also used as an expression of a common nationality designation for everyone in Greenland regardless of the grouping or background the individual may belong to or have.

Greenland was colonized in 1721 by Denmark. In the period 1945-54, Greenland was on the list of non-self-governing territories under Chapter XI of the UN Charter. During this period, Denmark had to regularly submit regular reports on the situation to the UN. With the Constitutional Amendment in 1953, Greenland became an integral part of the Kingdom, and reporting to the UN ceased. Thus, the Constitution also applied to Greenland. In 1979, Greenland was granted home rule within the framework of the Commonwealth,3 but where a number of matters were gradually to be transferred to Greenland.

Today, Kalaallit Nunaat/Greenland is inhabited by Kalaallit/the Greenlandic people and few newcomers primarily from Denmark. The population has been relatively stable in recent decades at around 56,000 and is 56,562 in 2022.

Indigenous peoples may need to use the term Indigenous Peoples as a platform with its far-reaching microphone from which the group's needs and interests are heard, recognized and included in decision-making processes around the use of territory and the area's natural resources. One way to do it is to appeal to the documents and treaties presented in the introduction.

In relation to ILO Convention 169, it should be noted that the Self-Government of Greenland has repatriated certain matters from the Danish state and thus has both legislative and executive powers within these areas. The Self-Government is therefore the subject of obligations in relation to compliance with the Convention nationally, but not the international subject of duty, as it is Denmark that ratifies the international conventions. In 1996, the Danish government ratified ILO Convention

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No. 169. In this connection, the Danish government declared the people of Greenland the indigenous population – Inuit – in the sense of the Convention. A special folk society within the Danish kingdom.

In relation to UN´s declaration of Indigenous People, subjective criteria for the Indigenous People definition, the kalaallit population in Greenland has the right to self-identify as an indigenous people. In relation to the objective criteria, the Greenlandic people are descendants of the first immigrant Thule-Inuit. The Greenlandic language is part of the Eskimo-Aleutian language tribe. Greenland is a former colony of Denmark. The Danish state has implemented modernization processes in Greenland, the so-called G-50 and G-60 policies. A modernization process for better or worse, with assimilation processes in which parts of the traditional Greenlandic culture have been lost, but with improved infrastructure and housing conditions.

According to the Danish state's ratification of ILO Convention 169, the Greenlandic people are an indigenous people. Both the Danish state and the Government of Greenland are obliged to protect the Greenlanders' culture, language and use of natural resources.

In 1979, Greenland was granted home rule within the framework of the Commonwealth, but where a number of areas of affairs were to be gradually transferred to Greenland. The Home Rule Act entailed the establishment of the Greenlandic Landsting (the legislative authority) and the national government Landsstyre (the executive authority). Among the areas of responsibility transferred to Home Rule were the internal system of governance, taxes and duties, fishing within the territory, hunting, agriculture, national planning, nutritional and competition law, social conditions, labor and occupational conditions (except for the working environment), education and culture, and health care. In 1982, Greenland voted out of the European Communities and from 1985 was granted the status of an overseas country in relation to the EU.

On 19 May 2009, the Act on Greenland's Self-Government (Self-Government Act) was passed and entered into force on Greenland's National Day on 21 June 2009. The Self-Government Act replaces the Home Rule Act of 1979.

With the adoption of the Self-Government Act in 2009, the people of Greenland were given the right to designate themselves as the Greenlandic People under international law. A significant change from the Home Rule Act, which used the terms "a special people's society" and "the resident population". The Home Rule Act was introduced in 1979 and had some inherent assimilation elements. An example is section 9, which stipulated that the Greenlandic language is the main language, but the Danish language had to be thoroughly taught, and both languages can be used in public matters. The Self-Government Act does not contain this element of assimilation in the same way and merely prescribes in section 7 that "The Greenlandic language is the official language". We therefore see that official Greenland prioritizes a Greenlandinizing process, according to the language use and distance taking to assimilation processes to a greater extent than before.

With the Self-Government Scheme, the raw material area was taken home. Inatsisartutlov no. 7 of 7 November 2009 on mineral raw materials and activities of significance for this (the Mineral Resources Act) stipulates that the Government of Greenland has the right of ownership to dispose of and utilize mineral raw materials in the underground.

In Inatsisartutlov no. 17 of 17 November 2010 on planning and land use, it is prescribed in § 1 that the purpose of the Inatsisartutloven is to ensure that the country's land is used on the grounds of a societal overall assessment. And that (as stated in paragraph 4) the population should be involved in the planning of land use. It is clear from § 5 that Naalakkersuisut must prepare a spatial planning and

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overview of the essential societal interests in spatial planning, and in section 7 it is stated that Naalakkersuisut must initiate an information effort and public debate on the national land use planning objectives.

The National Land Use Act (Lov om arealanvendelse) provides for the involvement of the population in the planning through information and public debate. Whether the law is adequately implemented in practice and whether the public feels heard is another side of the issue.

And in Landstingslov no. 12 of 29 October 1999 on hunting, it is prescribed in § 4 that: Hunting may only be carried out by persons with permission to do so. The permit is granted in the form of a commercial hunting certificate or a recreational hunting certificate, cf. however, section 7.(2). Permission for commercial hunting and recreational hunting can only be granted to persons who 1) have permanent ties to the Greenlandic society; 2) are registered in a population register in Greenland and have had a population register address in Greenland for the past 2 years.

In the same Landstingslov no. 12 of 29 October 1999 on hunting, it is prescribed in section 2, paragraph 3 that: In connection with the administration of hunting conditions, emphasis must be placed on the involvement of hunter- and user knowledge implemented, among other things, via relevant main organizations as well as the Catch Council.

The Self-government legislation in the field of hunting does not use the term indigenous people and is open to granting licenses to applicants who have permanent ties to the Greenlandic society and have had a registered address in Greenland for the past 2 years.

This means that it is the Greenlandic authorities who decide the use and procedure for the use of the land and the underground/subsoil, with the involvement of the residents.

The rights of property of Greenland and the Greenlandic underground/subsoil have been definitively established in the Self-Government Act as belonging to the Greenlandic people. The Greenlandic people thus have, through the Self-Government, a collective right to the Greenlandic territory and its exploitation. Regardless of whether they are Greenlandic or newcomer, cannot own land in Greenland, but can, on the contrary, get a right to use an area for the purpose of the inventory of physical installations. It is therefore assumed that the starting point for access to and use of the Greenlandic territory is a collective right to all Greenlanders. Outsiders which settle Greenland will also be able to access and use the territory". And this particular aspect is causing concern among some stakeholders.

According to the Self-Government´s legislation on the use of land areas and natural resources, the population must be involved in the planning of utility activities and public debate must be held about land-use planning. Nevertheless, the elected Greenlandic politicians do not always succeed in pursuing a policy that has the support or acceptance of the population. Disputes arise about wishes for the use of lands and natural resources.

Raw material extraction companies, tourism companies and ordinary citizens can thus apply to the Self-Government/Municipality to use an area to install a business or leisure activity.

Anyone with a registered address in Greenland can apply for a license for hunting, use of land and exploitation of natural resources. All regardless of whether you have historical ties to the country or are newer newcomers. A law that often creates disputes.

Whether ILO Convention 169 and the UN Declaration on the Rights of Indigenous Peoples should remedy these disputes between Naalakkersuisut, affected citizens, and international project companies is an important question. The Greenlandic government is a democratically elected

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government that must develop the country based on a societal overall assessment and which must take everyone into account. All population groups, both those who cherish the traditional way of life and the residents who want a new modern and international way of life. Living modes there can have very different forms and purpose of use of land and use of natural resources.

Population

Greenland´s population lives exclusively at the coast; in towns and settlements. About 60 per cent live in the five largest towns – Nuuk, Sisimiut, Ilulissat, Aasiaat and Qaqortoq. Most of the population is born in Greenland. The Nuuk-hub host 19,261 residents out of a total at 56,562 in year 2022.

After the 1960´s, the populations in the towns grew rapidly, as they absorbed the net population growth as well as the migration from the settlements. This trend has been continuing for the last 50 years.

Compared to the population size in Greenland, the internal migrations are significant, and have a big impact on the populace composition. An internal migration from outer districts to towns, primarily to Nuuk, has been going on for the last 50 years.

The majority of migrants are citizens of the Danish Kingdom, who move from Denmark to Greenland or vice versa. Greenland´s constant need for a summoned workforce requires the net emigration of foreign nationals to be continuously countered by immigration. Over time, the foreign net immigration is at a balance, but is not the case for the Greenlandic-born population segment. Greenland´s international twist is growing, now representing 2.7 per cent of population total. The largest immigrant groups are Philippines, Thai and Icelanders.

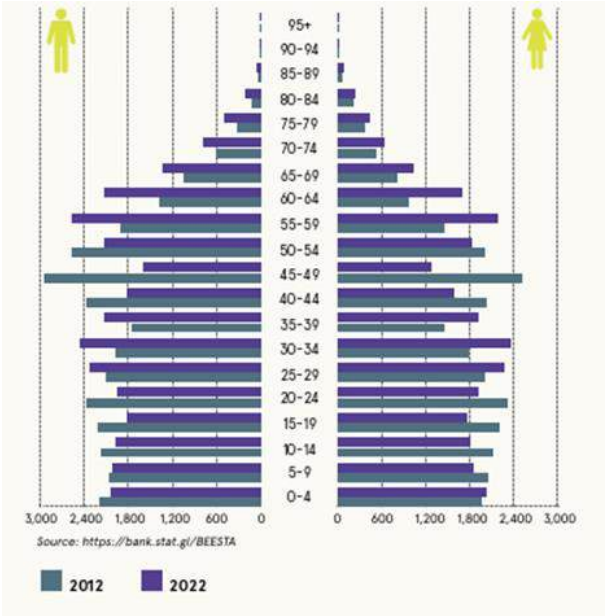

Figure 95. Population by Gender and Age

Men and women born in Greenland have a shorter life expectancy than the average of the western world. This is primarily due to a high mortality rate caused by accidents and suicide. In Greenland, men live to the age of 69.2 years on average, while women live to the age of 74.0 years. In 2011, 14,718 Greenlandic born lived in Denmark. In 2022, the number has risen to 16,801 (fig. 95).

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Education

Ten years of primary and lower secondary education is mandatory in Greenland. Children start primary school at the age of six. Children from small settlements need to leave their home and move to the nearest town in order to attend 8th-10th grade. Danish is taught as a second language from the first grade and English is taught from the lowest grades. After finishing elementary school, about half of the children do one year at a continuation school in Greenland or Denmark. Only 1 in 7 pupils proceed directly to upper secondary education.

Many young people have to move to bigger town to pursue an upper secondary education. Only four towns have high schools, and most vocational educations are offered at ten main vocational colleges. Many young people in Greenland do not attain an upper secondary education. Among the 18-25 years old, nearly 6 out of 10 have yet to complete, or are still active in, high school or vocational educations.

Greenland´s University, Ilisimatusarfik, is located in the capital Nuuk. It offers 11 bachelor programs and 3 master programs. Short-cycle higher educations are also offered at some vocational schools. As only a few higher educations are offered in Greenland, around 30 per cent of the students study abroad, the majority in Denmark. Education is free, and students receive a monthly student grant. Apprentices usually receive salary from the apprenticeship. Students that need to move to another town for studies are entitled to a dormitory room.

Though increasing, the education level in Greenland remains the lowest in the Nordic. Over half of the population of all 25-64 years old has no education above the lower-secondary level, compared to about ¼ in other Nordic countries.

Women attain an education above lower-secondary level more often than men. 1 out of 10 men choose to start a higher education, while the number for women is 1 out of 5. Women primarily choose educations within welfare, business or higher education. Men primarily choose educations in engineering, construction, and transport services.

Labour market

A large proportion of the Greenlandic labour market is public jobs in municipalities or the Government of Greenland. In towns, most people work as employees. In settlements, a large proportion are mainly huntsmen and fishermen. In general, the Greenlandic labour market follow the Scandinavian model having employee- and employer organizations, wage agreements and an extensive legislation for worker protection, arbitration, vacation and worker´s compensation. Persons without Danish or Nordic citizenship can have a residence and work permit. The unemployed part of the work force has a high proportion of unskilled workers. Around 82 per cent have no education, apart from primary school. For the highly educated, the unemployment rate is very low.

Income

Over 40 per cent of all jobs are found in the public sector. More than 60 per cent of employed women are working in the public sector. For men, fishing, hunting, agriculture and public administration and service are the most popular choices.

In settlements, income level is considerably lower than in towns (fig. 96). However, the size of this difference depends on the municipality. The difference in average gross income between settlements and towns is most significant in Kommuneqarfik Sermersooq. Here, the average income of a Nuuk resident is more than twice the average income of a settlement resident. The income inequality in Greenland is higher than the Nordic average.

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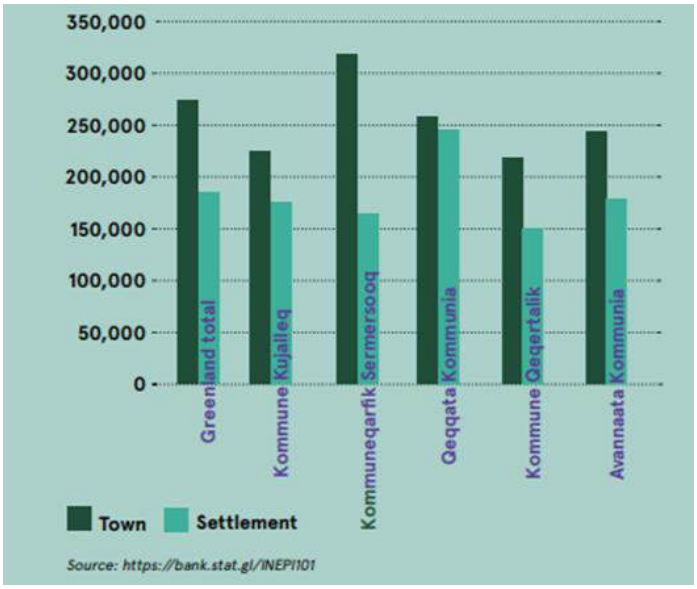

Figure 96. Average gross income by place of residence and municipality, 2020 Gross Income, DKK

Fishing

Fishing is Greenland's single most important trade. Fishing for prawns and Greenlandic halibut and some other species is regulated by quota and license regulations decided by the government. Fishing comes in two breeds; coastal - and offshore fishing. Coastal fishing supplies land-based seafood buyers, while the offshore fishing fleet primarily consists of factory vessels with on-board production. The land based fishing industry is dominated by two companies; the government-owned Royal Greenland, and the private owned Polar Seafood. Royal Greenland is Greenland's largest company. In recent years, a number of private seafood enterprises have appeared on the scene.

In 2021, Greenland´s fishing fleet consists of 282 vessels, 1,716 dinghy boats, 256 dog sleds and 549 snow mobiles licensed for fishing.

Hunting

Hunting has been a way of life in Greenland for generations. Even today, hunting provides an important supplement to household economy. Hunting is regulated by means of seasons and permissions (fig. 95). A general hunting license is mandatory for anyone, who wants to hunt. The general license comes in two categories: professional and recreational. In addition, a specific license is needed when hunting species limited by quota. The quota system regulates the number of animals available for hunting. Professional hunting license holders usually do not make a full living from hunting. In addition, they will often do dinghy fishing in summer and ice fishing in winter.

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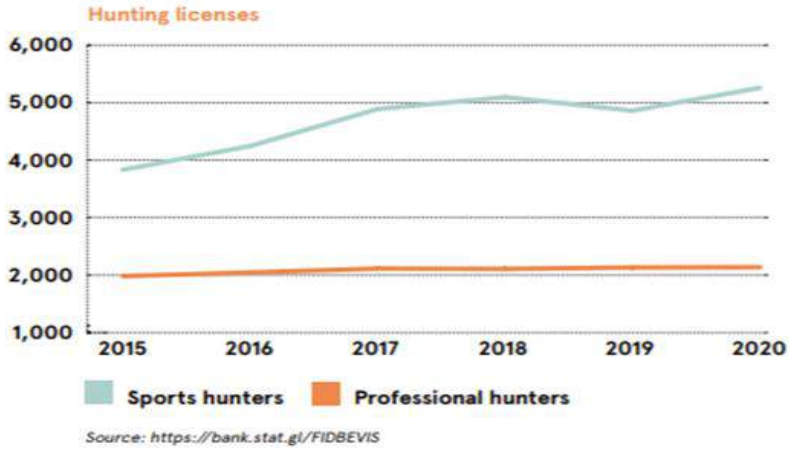

Figure 97. Number of Issued Hunting Licenses

The number of sports or recreational hunters is increasing and is more than twice as many as professional hunters.

Seal still plays an important role. The sealskin is usually traded, while the meat is consumed or used for dog fodder in sled dog districts. About 50 per cent of traded sealskin is tanned by Great Greenland, the country´s only tannery.

A number of whale species have hunting quota. The meat and the skin are consumed in Greenland only.

Reindeer and musk ox are the most important land species. Sheep and lamb are butchered at Neqi A/S. Skin of land mammals are traded as well. Bird hunting is regulated by means of quota. A number of species are not quota-regulated. In general, the police enforce the hunting regulations.

7.2.1.1. Nuuk Kangerlua Hub

It is not easy or it is rather complicated to choose topics to present in this paragraf about indigenous in Nuup Kangerlua – Nuuk the capital of Greenland. One of the reasons is that the Danish government, in consultation with the Greenlandic government, has ratified ILO-169 and therefore defines the Greenlandic population as an indigenous people. In addition, the Act on Greenland's Self-Government stipulates that the people of Greenland are the Greenlandic people. Therefore, it is difficult to mention only fishermen and hunters in this section, as other populations are also defined as indigenous peoples or Kalaallit. As mentioned in the above section on international declarations on Indigenous, it is difficult to define who can use the title Indigenous. Therefore, it has also been difficult to select population groups and topics to write about in this paragraph. Only to write about fishermen and hunters in Nuuk will be to exclude important groups that carry on important elements from the original culture such as Greenlandic women who sew national costumes, cook traditional food, and teach their children to speak Greenlandic. A third important group is linguists and other language actors who make an effort to preserve and promote the original Greenlandic language and terminology, both through language legislation, value policy and in educational contexts. All mentioned groups apply and pass on various traditional elements and values to their descendants. Just as we could have chosen to write about local Greenlanders' (newcomers as well as locals with Inuit as ancestors') participation in tourism

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development and their use of land and natural resources and how it creates conflicts between other resource users in the area.

Another objective of the Declarations on Indigenous Peoples is to ensure involvement in decision-making processes regarding the use of land and natural resources. The Greenland Government's Hunting and Fishing Acts, the Land Use Act and the Mineral Resources Act prescribe the involvement of locals in decision-making processes. However, describing how legislation is put into practice is not the purpose of this report.

In addition, there are no statistics that specifically look at indigenous peoples in Nuuk. However, we have tried to include some relevant statistics that deal with locals in Nuuk.

Nuuk is the capital and largest city of Greenland and contains a third of Greenland's population and has doubled since 1977 (fig. 98).

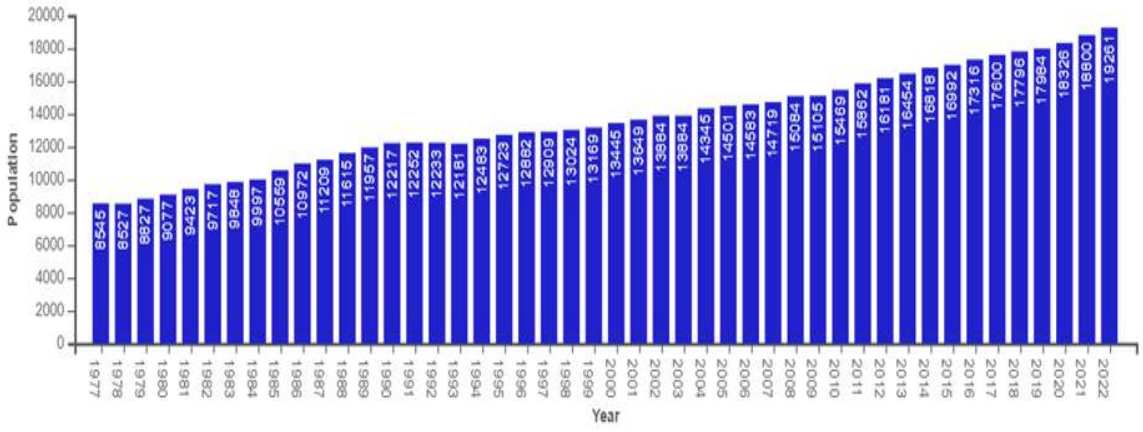

Figure 98. Population in Nuuk

Nuuk is Greenland's center of politic, economic, culture and education. Nuuk is the seat of the parliament and government and containing all of the important government buildings and institutions. All of Greenland's major political parties have their headquarters in Nuuk.

The public sector bodies are also the town's largest employer with high wages. Danes have continued to settle in the town. Today, Nuuk has the highest proportion of Danes of any town in Greenland. Half of Greenland's immigrants live in Nuuk, which also accounts for a quarter of the country's native population.

Nuuk has developed trade, business, shipping and other industries. It began as a small fishing settlement with a harbor, but as the economy developed rapidly during the 1970s but during 1980s, the fishing industry in the capital declined. The port is nevertheless still home to almost half of Greenland's fishing fleet. The local Royal Greenland processing plant absorbs landed seafood amounting to over DKK 50 million (US$7 million) per annum, mainly (80%) shrimp, but also cod, lumpfish and halibut. Reindeer and seal is also sold in Nuuk's local fish markets.

The catch statistics for fish and shellfish is predominantly for the offshore fishery, which does not affect the Nuuk region – except providing a great income to the town. The commercial spices are prawns, monkfish roe, halibut and cod.

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Nuuk host the National Library of Greenland and have several educational institutions of higher learning. The University of Greenland, several vocational education institutions. Most courses are taught in Danish, although a few are in Kalaallisut as well. In connection to the educational institutions there are several dormitory buildings.

Nuuk also hosts the National Hospital, which receives patients from the rest of the country in addition to citizens from Nuuk.

Katuaq is National cultural center used for concerts, films, art exhibitions, and conferences. Katuaq contains two auditoria, the larger seating 1,008 people and the smaller, 508. The complex also contains meeting facilities, administrative offices and a café.

The Nuuk Art Museum is the only private art and crafts museum in Greenland. The museum contains a notable collection of local paintings, watercolours, drawings, and graphics, some by Andy Warhol; and figures in soapstone, ivory, and wood, with many items collected by archaeologists.

Nuuk as Greenland's capital consists of a mix of traditional ways of life with fishermen and hunters, in the middle of a rapidly developing welfare city strongly influenced by Danish conditions that characterizes the citizens' way of life and identity

7.3. Discussion and conclusion

This report emphasizes the diversity and likewise the complexity characterising the indigenous societies and cultures are in the Arctic. The selected ArcticHub areas reflect well this characteristic of the region. In this mosaic is hard to compare one tile to the other: each one has to be primarily understood within its own context to face specific challenges and develop unique opportunities. This is not only true when we consider, on a macro level, Inuit and Sami, but also when we look at different Sami communities in Sweden, Finland and Norway, and when we consider different understandings of the indigenous term in Greenland. However, indigenous people share some common elements, first of all the fact that they are generally perceived as vulnerable minority groups, whose cultures, livelihoods and traditions are threatened by colonization, neo-colonial land exploitation, outmigration, language loss etc. We will therefore try to summarize similarities and differences according to the features that have proven to be crucial in our analysis.

Legal status and political autonomy

There are a few important international treaties to which indigenous people can appeal to try to enforce their right over land and resources or to protect their cultures and languages. However, the definition of “indigenous” is far from being straightforward and the treaties themselves do not provide a specific one, relying instead on different sets of criteria. The definition of indigenous, beside being contextual and potentially based on different elements (language, descendance…) is deeply political: as we saw, in the Greenlandic context the use of the term indigenous is highly contested, Greenlanders have strong and different opinion about it and it’s often used in the wider political debate about the relationship with Denmark, in relation to administrative and political independence and to process of cultural and linguistic decolonization. the “legal status” of indigenous people coincides, in this case, with the political status of a whole country, making the “indigenous issues” at least partially overlapping with the “national issues”. Sami case is different: in all the three countries considered here, Sami people have a special status granted in the country’s Constitution and some kind of political

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and administrative autonomy, enforced through a Parliament. They also have cultural institutions, educational programmes and language programmes to keep their traditions and languages alive. However, their general status is that of a minority group included in a nation with a different culture, language and tradition, where the state authority is, on one hand, legally acknowledging and financially supporting initiatives to allow indigenous people to preserve their cultures but, on the other, often implementing national policies that generate conflict with indigenous livelihoods, such as major mining, energy and infrastructure developments.

Language, traditional knowledge and cultural institution

Languages are a crucial element of indigenous cultures, since they allow for the transmission of the traditional knowledge, its preservation and innovation along generations. At the same time, indigenous languages are struggling to survive after long colonial dominations, where the dominant language was the only one taught in school, used in administration and work etc. Again, we can notice important differences between Greenlandic Inuit and Sami people: in the first case, even if Danish is still strongly dominant in politics, education and administration, the vast majority of people speak Greenlandic as their first language and the language seems to not be vulnerable or in danger of extinction. Quite the opposite, despite the official status granted to Sami languages in the areas with widespread indigenous population and their introduction in different educational programmes and institutions, Sami people in Finland, Norway and Sweden struggle to keep their languages alive. however, the situation is very different along the hubs and between different languages: indeed, there are languages with just a handful of native speakers who are close to extinctions, and other that thrive much better. Significant is the fact that many of the selected Sami hubs (Jokkmokk in Sweden, Inari in Finland and Kautokeino-Kvalsund in Norway) are indigenous capitals of their country and host schools, universities and cultural centres through which languages, traditional knowledges and livelihoods are taught, preserved and innovated. It's interesting to note how these institutions represent a solution to merge the need to enhance formal education for indigenous people and, at the same time, develop culturally relevant programs: traditional cultural elements are therefore "institutionalized", to be transmitted and thrive in a compromise with the dominant, western understanding of "education".

Population

Estimating the number of indigenous people is another challenge. Not only the lack of a universal definition makes precise count and comparison impossible, but no one of the considered countries include ethnicity in the census. Examples of different approaches that can be used to estimate the indigenous population have been already discussed in the introduction. However, again, we can underly a significant difference between Greenlandic Inuit and Sami: in the first case, even if the people born in Denmark from Greenlandic parents are excluded from the count and, vice versa, people from Danish families born in Greenland are counted as Greenlandic, the vast majority of people is of Inuit descendant and can speak Greenlandic. Sami communities are, on the other hand, often small, composed by few thousands or even hundreds of people, and many of them migrate to cities.

Indigenous livelihoods and conflicts

When it comes to economic and/or subsistence activities, we see that they include mostly hunting, whaling and fishing for Greenlandic Inuit and hunting, fishing and reindeer herding in the case of Sami people. In both cases there are people who are practicing hunting and fishing on a recreational level, combining a traditional activity with a job in the mainstream wage market, and people who are

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professional and full-time hunter, fishers and herders. It must be noted that, especially in the case of Sami people, there are many jobs that are not “traditional” per se, but are still directly related to the Sami communities: this is the case, for example, of administrative jobs in Sami institutions, jobs related to culture and teaching, cultural tourism and handicraft etc. On the other side, traditional livelihoods, for example reindeer herding, are today carried out in accordance with modern industrial practices: as we already mentioned in the introduction, the focus on meat production for example has modifies the structure of herds, and the conflict with predators has pushed many herders to adopt farming practices during winter.

According to what we saw in the report, traditional livelihoods share two main features: first of all, they are the crucial material basis for a culture and identity to survive: traditional livelihoods shape social relations, cultural practices, traditional knowledge and the very language itself, and for this reason have to be preserved and supported. Second, they have a complex relation with mainstream market economy: on one hand, they are entangled and co-dependent (for example, reindeer and game meat is sold on the market, to restaurants etc), on the other they are threatened by the expansion of a different use of natural resources that is functional for the global economy and has almost no link at all with the local livelihoods themselves: this is not only the case of the already mentioned mining expansion, but also of conservation measures that restrict or ban some of the traditional activities such as whaling.

Furthermore, traditional livelihoods are still administrated through formal regulation, such as hunting and fishing licences and quota, herding district and registered companies, maximum number of reindeer allowed per area, ban or strong limitation in predators hunting etc. Not all the regulations are managed by indigenous authorities, and they can generate conflict with state authority when they are not consistent with indigenous knowledge: a better inclusion of it through participative policy design and implementation appears to be urgent.

At this regard, it’s important to go through the main source of threat to indigenous livelihoods, and therefore, indigenous cultures and societies: the large-scale exploitation of the lands and resources upon which they rely by other (often globally driven) industrial sectors: mining, tourism, renewable energy production (hydroelectric and wind fields), transports and forestry. These sectors often coexist in the same area and make indigenous livelihoods exposed to multiple pressures. in addition, climate change is also negatively affecting natural resources and creating unpredictable and unsecure conditions. However, these sectors could offer potential benefits to local and indigenous communities and, if properly planned with meaningful inclusion of indigenous group, their impacts could be mitigated or at last properly compensated. The positive example of Sami cultural and educational institution could serve as a metaphor and practical case of merging of different (“indigenous” and “global”) needs: this shows that, through participation, inclusion and support of indigenous autonomy and self-determination is possible to produce innovative and sustainable solutions.

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8. DISCUSSION and CONCLUSION

Until now many reports have been written looking at the socio-economic conditions in the Arctic region such as the Arctic Human Development Report (AHDR) (Arctic Council 2004), Arctic Social Indicators (ASI) report (Nordic Council of Ministers 2014), and the the Economy of the North (ECONOR) (Glomsrød et al. 2021). However, they were mostly focusing on global and national levels so far. This report goes a bit further and its main purpose is to present local influences and analyse how existing and potential new economic activities influence on local communities, including indigenous societies and cultures, in different hubs identified in the ArcticHub project. The first thing that can be observed is that selected hubs are very diverse and that even though they are facing similar challenges, in this mosaic is hard to compare hubs. It is rather possible to identify commonalities and then analyse each one within its own context to understand specific challenges and develop unique opportunities. This report is an initial step in this process and it provides a background socio-economic data on a regional and hub level, which will, together with other data that will be collected in the frame of WP3, be used for assessment of socioeconomic and cultural impacts in hubs (taking into account the local people and stakeholder perceptions). We will therefore try to summarize similarities and differences according to the features that have proven to be crucial in our analysis.

Analysed industries produce both positive and negative effects on a local level. We can observe a complex effect of the industries on rural outmigration. Some examples (e.g., Kittilä for mining; Westfjords and Suðuroy for fish farming) show that a growth in industrial activity can help mitigate or invert the outmigration trend, stabilizing the local population and attracting young people in the area. But we can notice that gender imbalance issue is often not addressed, since these industries are male-oriented. Kittilä is better because there is the tourism sector which is also strong and is more female-oriented. But this is not a straight forward issue, in case of the Varangerfjord a slight population decline is observed. Outmigration could also increase in specific groups, for example indigenous communities, if their traditional livelihoods become unsustainable due to the excessive pressure of other industries on their resources and land.

All analysed industries are providing new jobs and business opportunities for local people and are good opportunity to mitigate unemployment. They provide opportunity to increase income that can be used to support traditional livelihood (interdependence between subsistence and wage economy). But these aspects have also opposite side. If indigenous people join the company to work as employees because it is more profitable, their traditional livelihood is no more sustainable and other economic activities will be lost, as there will be no time to practice them or no time to teach them to younger generations. When we look for example at tourism, beside income, good opportunity for indigenous people is to raise awareness, share and strengthen their cultures and prevent cultural appropriation through tourism services. Same is for local, non-indigenous communities that can create local products, for example food or experiences. However, in tourism jobs are often not well-paid and seasonal. Furthermore, if not locally owned and managed, tourism could become mass tourism with negative effects on local communities. This is reflected through higher accommodation prices, crowds, environmental degradation, zero income generated locally (ex-cruise/charters). Looking at the fisheries and workforce, it can be noted that if there is not enough or not properly qualified workforce available locally, little jobs opportunities could be created. Furthermore, there are negative impacts over local population, such as housing shortages/high prices, pressure over services by people who do not pay taxes in the municipality (fly-in-fly-out). Seasonality issue is common issue to many of these

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industries, and could be a challenge for employees because of income instability. Combination of activities, e.g. mining and geotourism activities can counteract seasonality issues.

Even though these industries can generate and increase income to the municipality there is always the risk that little money will stay locally as in some cases these industries are run by foreign companies and their interests are not the same as those of local municipalities and population.

Looking further, these industries provide new services and infrastructures, they need good connectivity (new roads and transport options) that can be useful for local population too. We could also observe new education opportunities or that companies (especially mining) are providing support through agreements with municipalities and the local population to provide cultural initiatives, sports opportunities and facilities. In many cases these developments also bring improved healthcare. However, the downside is that for operating these industries assume intensive use of existing infrastructures (e.g. heavy traffic on roads, pressure on housing) and services, which induce inequalities and as well put further pressure on the environment (new roads, wind park, hydropower plants, etc.). Environmental impacts on the hub level are analysed more in detail in the work package two of this project (deliverables D2.3, D2.4).

In general, big and resource-intensive industries are going to have major impacts on landscapes, with negative consequences on ecosystem services, recreational and emotional places (important for identity building and transmission), quality of the environment and livelihoods. Beside material impacts, this means that there will be strong cultural and identity changes and losses: indigenous languages and practices are connected to livelihoods and could disappear. This is as well identified in Arctic resilience report (Arctic Council 2016). In this report we could also see that even though indigenous societies and cultures are various and differ between themselves in the Arctic region, they share some common elements, first of all the fact that they are vulnerable minority groups, whose cultures, livelihoods and traditions are threatened by colonization, neo-colonial land exploitation, outmigration, language loss etc. That is why it is important to always analyse pros and cons of some industrial developments in Arctic region, in a way to balance and integrate indigenous communities' interest. Focus should be on developing suitable transition activities for local communities and utilising possible synergies. For indigenous communities more synergies could be found with tourism, when higher value can be created by combining traditional activities and tourism offer. Italian learning case offers good example of transitioning process from one to another industry.

What become obvious is that the participation is the key to avoid or, at least, to reduce negative impacts the stakeholders should be involved in a meaningful participative process since the very beginning, so the new activities do not have major negative impacts on the local context and can, on the other side, bring benefits to the community. Power imbalances should be thoughtfully considered when design and implement participative processes, to avoid that local people will be only formally included and heard without real decision power. This is in the interest of the industry itself: in tourism, arctic travellers are often environmentally and socially aware and could be willing to pay more for a product that is ethical and responsible; in mining (as shown in Norway cases) protests have the power to stop projects and to make client withdraw their proposal; in forestry, strong values are attached to the multiple uses of resources by forest owners too, so the industry should behave coherently. There is a need for creation of common platforms for local communities to exchange information, data and better communicate (ppgis could be one possible platform, when developed along specific interests and needs). For this public private partnerships or bottom-up initiatives would be needed, to avoid

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imposing a tool or a mode of communication to locals. Rather it should originate from within communities themselves.

In this report we could see that policies that regulate analysed industries are decided on different levels, e.g. allocation of space for fishing is decided in some cases on local level, while mining is mostly in state responsibility. Forestry is also influenced to much extent by EU policies. Different actors decide on different issues, and is different to what extent state is active in these industries. Improvement of existing policies and assuring cross sectoral communication and activities is thus also crucial. Current developments are predominantly focused on economic growth, and biophysical, or planetary boundary perspectives are insufficiently addressed in existing strategies (Ramcilovic-Suominen et al., 2022). In the Arctic, regional economies often prioritize the development of the extractive industries (Glomsrød et al., 2021). However, this should be questioned, how high and for whom are benefits of such industries, how these activities influence nature and human development, especially considering the volatility of world markets and the fairness in distribution of natural wealth (Glomsrød et al., 2021). Thus, alternatives to existing activities and focus on more balanced development, in line with indigenous community's needs, deserves more attention. Possible new development should consider the 'postgrowth' paradigms, such as degrowth and doughnut economics (EEA, 2021; Raworth, 2012), as well as postcolonial (Schoneberg, 2019) and decolonial justice approaches (Ramcilovic-Suominen, 2022). Existing power relations and existing modes of operating that are embedded in nowadays global political setting, governance and economic structure (as explained in D1.2, D1.3 of this project), could be transformed. This transformation requires questioning of existing development strategies, and should be oriented toward more balanced, nature oriented, socially inclusive and more just future.

As already described in the report "Economy of the North", "Arctic regions belong to different national regimes, and information on social and economic issues has been dispersed and not been easily available at the circumpolar level" (Glomsrød et al., 2021). Some of the limitations of this report are related to this issue. We faced challenge with data availability on a local/hub level and difference in the quantity and quality of available data between hubs. This is primarily related to the quantitative data, which are collected in different time periods and for different purposes, therefore it is very hard to use them for comparison purposes. Qualitative data as well differ, some of them were possible to extract from national reports, strategies and plans, while other were obtained through scientific literature. In some instances, we also rely on the information provided by our partners, especially in terms of the indigenous communities, as some members are as well project partners. This allows us to understand better the issues, and learn and coproduce knowledge together with them.

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[1] ***Deliverable Type:***
R: Document, report (excluding the periodic and final reports)
DEM: Demonstrator, pilot, prototype, plan designs
ORDP: Open Research Data Pilot
DEC: Websites, patents filing, press & media actions, videos, etc.
OTHER: Software, technical diagram, etc.

[2] ***Dissemination Level:***
PU: Public, fully open, e.g. web
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EU-CON: Classified Information: CONFIDENTIEL UE (Commission Decision 2015/444/EC)
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1. Background and introduction – the Arctic hubs project and forestry

Forests provide various goods and services including pulp, paper and timber. The forestry sector is significant in the national economy of Finland and Sweden which are primarily dominated by forests. Specifically, in 2018, the forest sector's GDP contribution in Sweden is 3.5%. In terms of Finnish forestry sector, it contributes 4.3% which is considered one of the leading country all over the world. It constitutes the wood products industry (1.9%), pulp (0.6%) and paper industry (1.8%). Finland is known as Europe's most densely forested country covering more than 20 million hectares which is 14 % of Europe's total forest area. The forest area in Sweden is around 69% of the 28 million hectares total land area (Widmark, et.al 2020: p. 13). Forests have multiple functions and provides goods and services to locals and businesses in the European Arctic. The forestry sector also provides employment in forest industries (Primmer, et.al. 2016: p.6).

Finland and Sweden implement programs focusing on the role of forests in its economy and the social and environmental related issues. Finland has the National Forest Strategy 2025 which was adopted last 2015 and revised in 2019. It includes the operational environment of forest-based industries and on how to adopt with the recent trends. This includes megatrends on population growth, urbanization and shifts in consumer behavior that will increase pressures on forest-related products to identify policies for sustainable wood use. Further, consideration of investments on wood processing industries, emerging competition for biomass across different sectors and sustainable forest management to respond to climate change and the need for innovative solutions to improve forestry sector's competitiveness.

Based on the National Forest Strategy, "sustainable forest management is a source of growing welfare". It aims to make Finland competitive in forest-based industry through diversification of activities and structures which considers social, ecological and cultural sustainability. The national strategy is complimented with regional forest programs, a development plan formulated at the regional forestry centers and cascaded into provincial forest program. The programs also promote nature tourism, formulate ownership structure of the private forests to enhance forest use, improve utilization of forest ecosystem services, and contribute to biodiversity and water protection.

Relative to the Swedish forest program, it is anchored with SDG 17 towards sustainable society and bioeconomy. The strategies contribute to the vision that "[f]orests—our "green gold". Meanwhile, forests will help in generating employment, promoting sustainable growth across the nation, and contributing to bioeconomy. The program focuses on the thematic areas including sustainable management towards climate change mitigation and adaptation, multiple use forestry to generate jobs thereby, contributing to sustainable economic growth, competitive world class forest products, and forest conservation. The national forest program is also cascaded into regional forest programs to develop local policies and strategies. It aims to identify synergies and promote collaboration among stakeholders. Further, to determine strategies to resolve conflicts (Widmark, et.al 2020: p. 21-27).

Aside from the provisioning services, the forest ecosystem services include carbon sequestration and habitats of species such as for traditional reindeer herding. Both livelihoods' reindeer husbandry and forestry are significant sources of income in the boreal forest. In Finland, around 36% of the land area are reindeer management areas with 54 reindeer herding districts. About 91% of the total reindeer management area is forest, and 62% of it is productive forest land. Around 58% of the productive forest land is state owned. Sami homeland which includes 13 herding districts are located in state

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owned forests. In Sweden, there are around 52 reindeer herding districts which is also managed by indigenous Sami people. Reindeer herding is important in their local indigenous culture and is significant economically through providing livelihood Widmark, et.al 2020: p. 19). However, in Northern Finland, the conflicts between the two livelihoods exist for more than a century due to overlapping land use practices. Similarly, in Sweden, there is a conflict between the two livelihoods. The forestry measures cause damage to reindeer herding areas while reindeers cause damage to forests (Turunena, et,al. 2019:p.1). This calls for research to identify appropriate silvicultural measures for sustainable multiple use of forest resources such as maintenance of the reindeer herding areas.

Six of the Artic hubs are, to a varying extent, impacted and defined by forestry as a major land use form. Two of them are located in Finnish Lapland[3], two in the county of Norrbotten and two in the county of Västerbotten in Sweden. While the specific definition and system boundary of each depends on what is considered as the core activity/industry of the hub, the forest and forestry context of the entire region i.e. the three counties, is essential for the development, historically as well as the forthcoming.

[3] Malå, Västerbotten, Sweden is also added as a forestry hub. The Russian partner withdraw from the project in December 2021, and data on the Russian mining HUB will be excluded from this report.

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2. Overview of the forest hubs in the Arctic European countries (regional level)

The first part of this report aims to give an overview of the basic socio-economic data and forestry industry and its importance in the two Arctic countries Sweden and Finland. The regional data consists of socio-economic variables such as population, employment, gross regional product (GDP) per inhabitant, and the overall quality of life. Relative to forestry industry, it consists of the forest cover, annual growth rate (productive forest land), cuttings, protected area, ownership, total industry revenue, employment and number of enterprises.

2.1 Overview of Socio-economic

2.1.1 Sweden

In Norrbotten County there are 251,000 inhabitants which imply a population density of 2.6 inh/km2. Similar to Västerbotten, with a total population of a 275,000 and population density of 5.0 inh/km2, the population, is concentrated to the costal municipalities. The administrative centers and university towns (Luleå respectively Umeå), has both experienced a population growth and have a comparatively

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favorable population structure. Norrbotten County has previously had a clearly higher unemployment rate than the average for Sweden. Since 2010, however, unemployment in Norrbotten County has decreased and in 2021 was among the lowest in the country. The employment rate is increasing, but is still slightly below the national average. The gross regional product (GDP) per inhabitant in Norrbotten County is the second highest in the country after Stockholm County. The willingness to grow in small businesses in the county is slightly above the national average. More than twice as many small companies in Norrbotten compared to the rest of the country see access to infrastructure as a major obstacle to growth. The total export value of goods from Norrbotten in 2022 was 47.4 Billion SEK meaning that Norbotten had the highest export value of goods per inhabitant (SEK 190,000.) Also, the value of goods exports has increased from 2016 to 2020 by as much as 50 percent compared with 20 percent for the country as a whole. In comparison, the export value of goods from Västerbotten 27.4 was Billion SEK in 2020 implying a value per inhabitant of 100.000 SEK, and the increase by 26%. Unemployment is 5.7 percent, which is clearly below the national average. [4]

The inhabitants of **Västerbotten County** have a high level of education in relation to other counties. In 2020, 30 percent of the inhabitants had a post-secondary education. The level of education in the county is thus the third highest in the country. The business community is responsible for a relatively small proportion of production in the county. In 2020, the business sector's share of the gross regional product (GDP) was only 73 percent, which is well below the national average of 78 percent. The willingness to grow in small companies is higher than the national average. Unemployment is 5.7 percent, which is clearly below the national average.

To describe and compare the overall quality of life (between regions) The Swedish Agency for Economic and Regional Growth together with Reglab have developed an enhanced measure of sustainable development and quality of life called “BRP +” , using the conceptual framework from the OECD's Better Life Initiative. It shows the outcome for quality of life here and now based on a number of thematic areas, and shows the conditions for sustainable quality of life based on the three sustainability dimensions. Norrbotten county generally performs better compared with the national average regarding Västerbotten County oon natural capital is worse.[5]

2.1.2 Finland

In Lapland County there are 176,000 inhabitants which imply a population density of 1.9 inh/km^2. The administrative center is Rovaniemi, with a population of 64 000 inhabitants and a university. The population in Rovaniemi has grown, whereas the total amount of inhabitants in the Lapland County has decreased over the last three decades – from 203 000 at year 1993 to 176 000 at year 2021. Unemployment in Lapland County has decreased 24 % in relation to April 2021, and in April 2022 it was 10.5 % of the available labour. This is slightly above the national average (9.1 %). Also, the amount of open positions has increased 65 % from April 2021 to April 2022. [6]

2. Overview of forest industry

[4] https://tillvaxtverket.se/statistik/regional-utveckling/lansuppdelad-statistik.html
[5]https://tillvaxtverket.se/download/18.4f25c81636c7e330b925df/1527237507398/BRP+%2024%20V%C3%A4sterborttens%20l%C3%A4n%20bilaga.pdf;
https://tillvaxtverket.se/download/18.4f25c81636c7e330b9265f/1527237529485/BRP+%2025%20Norrbottens%20l%C3%A4n%20bilaga.pdf
[6] http://urn.fi/URN:NBN:fi-fe2022012510099;
https://julkaisut.valtioneuvosto.fi/bitstream/handle/10024/164161/TKAT_Huhti_2022.pdf?sequence=1&isAllowed=y)

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Forest is an essential landscape element of the region (73% of the land area of Västerbotten and 59% of the land area in Norrbotten% of), and with a total forest coverage of 18.7 M hectares it also represents a variety of goods and services local people and industries operating in the European Artic. The so-called productive forest land, i.e. where forestry is considered possible according to Finnish and Swedish forestry legislation, comprises 12 M hectares or 64% of the forested area. However, some 1.6 M hectare, or 13%, are formally protected, and another 0.3 M hectare are voluntary set-asides. Overall, this means that 10.5 million hectares are currently available for forestry operations (56% of the forest cover area, and 85% of the productive forest land). The annual timber growth on the entire productive forestland is estimated to some 34 M cu.m., whereof 19 M cu.m. or 56% is currently harvested. However, there are significant differences in harvesting intensity within the region. In Finnish Lapland only 40% of the annual timber growth is harvested, and the cuttings are currently at the same level as previously. In contrast the harvestings in Västerbotten (Sweden) are rising from an already comparatively high level, meaning that the current situation corresponds to the Forest Impact Assessment 2015 (SKA2015) scenario Business As Usual + 110%. The situation in Norrbotten is somewhat in-between, with about 50% of annual timber growth, which is even less that the assessment for the scenario of "Double nature conservation provisions".

As part of the bioeconomy, about two thirds of the total value added came from the value chain that begin with forestry. The timber provides sawmills and pulp and paper mills with raw material for their main products and at the same time, by products and residuals become inputs for other industrial production such as fiber board, gas, liquids and source for electricity and heat production. The products that are created from sawmills are in turn important for the wood industry and in the manufacture of furniture, infrastructure and buildings.

In Norrbotten and Lapland public ownership dominates while in Västerbotten non-industrial private ownership (NIPF) and private companies are the major landowners. In total there are some 41, 000 NIPF owners in Västerbotten and Norrbotten and about 50, 300 in Lapland.

Table 1. Regional overview of forest industry in Lapland, Norrbotten and Västerbotten

	Lapland (FI)******	**Norrbotten (SE)**	**Västerbotten (SE)**
Forest area cover	9.1 M ha, whereof 4.9 M ha productive forest land	5.7 M ha, 59% of land area. Whereof 3.9 productive forest land*	4.0 M ha, 73% whereof 3.2 M ha productive forest land *
Annual growth rate (productive forest land)	1.7 cu.m./ha/year. Total 11.4 M cu.m./year	2.5 cu.m.sk/ha (11 M cu.m.sk)**	3.5 cu.m.sk/ha. Total 12 M cu.m.sk**
Cuttings	4.5 M cu.m./year in year 2020 to be compared with 4.9 M cu.m./year as an average for 1985-2020	5.5 M cu.m.sk/year as an average for 2017-2019 to be compared with 4.7 M cu.m.sk/yr as an average for 2009-2007.***	9.0 M cu.m.sk/yrs as a mean for 2017-2019 which increas of 2.7 M cu.m.sk/yr since 2007-2009. ***
Protected area	1.8 M ha on productive and poorly productive forest land, i.e. 27,6%. Respectively 17.1% of productive forest land protected.	1.1 M ha whereof 0.6 M ha on productive forest land, i.e. 23.2% respectively 16.5%. Additionally 163.000 ha voluntary set asides***	0.4 M ha whereof 0.2 on productive forest land i.e 10.5% respectively 6.3%. Additionally 146.000 ha voluntary set asides***
Ownership	Public 70%, NIPF 25%, Private companies 2%, others 4%	Public 54%, NIPF 29%, Private companies 9% , others 8%***	40% NIPF, 31% Public, 23% Private Companies, 5% Others ***
Total industry revenue	1.3 Billion EUR. Value added 0.2 Billion EUR.	Total net turn over 23.2 Billion SEK whereof	Export value of forestry and wood processing is estimated to

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	Lapland (FI)******	Norrbotten (SE)	Västerbotten (SE)
		4.0 Billion from forestry, 6.4 Billion SEK from 6.4 from wood processing (sawmills etc) and 12.8 Billion from pulp and paper industry. Total value added 7.8 Billion SEK (~ 5% of the GRP) 2.1 Billion SEK from forestry and 1.5 from wood processing, and 4.2 Billion SEK from pulp and paper industry.**	12 Billion SEK *****Wood processing industries - Turn over 8.5 Billion SEK
Employment	In total 3500, whereof forestry 1800 persons, industry 1000 persons and saw wood industry 700	Forestry; 2717 persons, whereof 78% men. Industry: 2905 persons whereof 84% men **	Forestry 1140 annual work. Industry 2550 whereof 79% men
Number of enterprises	10 wood processing companies whereof 1 pulp- and papermill and 5 major saw wood companies	173 forestry companies ****, 62 wood processing industries wherof 2 papermill	244 forestry companies ****, 230 wood processing companies in total wherof 116 joint-stock-companies (AB), incl 1 papermill *

* Statistics Sweden, Land use in Sweden, seventh edition. ISBN 978-91-618-1660-6 (Print)
** Eriksson, V & Lundmark, R. 2020. Skogsnäringen i Norrbotten fram till och med 2030 – Definition och kartläggning, | Rapportserie inom Regional förnyelse | 2020 | | Luleå tekniska universitet |
***http://pxweb.skogsstyrelsen.se/pxweb/sv/Skogsstyrelsens%20statistikdatabas/Skogsstyrelsens%20statistikdatabas /
****https://www.statistikdatabasen.scb.se/pxweb/sv/ssd/START__NV__NV0109__NV0109O/BNT04/table/tableViewLayout1/
***** Skogsprogrammet Västerbotten. Temaområde skogsbruk Version 3 februari 2020.
****** Finnish Statistical Yearbook of Forestry 2021. Luonnonvarakeskus, Helsinki 2021.

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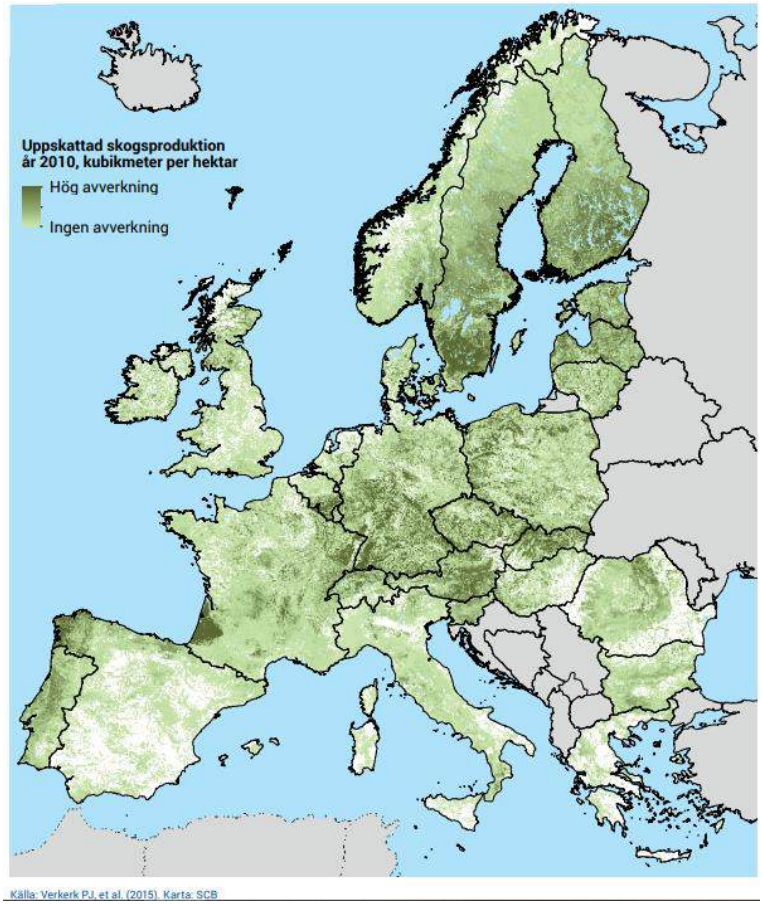

Figure 1. Forest production cu.m./hectare, the darker green the higher production, 2010

Of the Västerbotten 281 limited companies in forestry/forest industry, 119 have harvesting as the main business, 77 have silvicultural operations as main business, 44 forest management and 37 other services. Of the other operations, 2 conduct other forestry activities, a collection and a timber measurement. In total, these limited companies report 795 employees. Approximately 400 guest workers work in the forests each year, mainly with planting and cleaning. Domestic labor is also used, but to a much lesser extent. It is estimated that around 60 domestic seasonal workers work with forestry in the county. All of these are employed by subcontractors. For the sake of simplicity, generalize this group and state that the 460 people work eight hours a day for three months we end up with 115 annual jobs. Assuming that 115 of the 795 are seasonal workers, 680 full-time employees remain. If we add seasonal workers in the form of jobs, we arrive at an estimate of a total of 1140 jobs in forestry annually. (Barsk, 2020). [7]

For a long time, the forest industry has played an important role in northern Sweden and constitutes an integral part of the national economy. Modern stand-oriented, even-aged, monoculture forestry has expanded in Sweden since the 1950s and has had a profound effect on forest and landscape configuration and conditions and consequently on reindeer husbandry. Commercial forestry affects reindeer husbandry in a number of ways. Negative impacts on the ground lichen resource have been documented over the last 60 years. Largescale logging, intensive reforestation efforts and fire

[7] https://www.skogsprogramvasterbotten.se/media/uumislpc/sysselsattning-skogsnaringarna_final.pdf

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suppression have resulted in a decline in old, open pine-dominated, post-fire successional stands on low productive sites which are important habitats for ground lichens. Such stands have instead been replaced by dense, managed forests that favor mosses at the expense of lichens. The introduction of lodgepole pine and fertilization has also had a negative effect on ground lichens. Furthermore, damage by soil scarification causes substantial decreases in both the cover and biomass of ground lichens. Clear-cut forestry also has negative consequences for arboreal lichen which are especially important to reindeer during winters with difficult snow conditions

Table 2. Forestry/Forest industry in Lapland, Norrbotten and Västerbotten

	Lapland (FI)******	**Norrbotten (SE)**	**Västerbotten (SE)**
Forest land used for timber production, hectars	4.0 million hectares	3.1 M hectars	2.8 million hectars*
Income/sales		330 SEK/cu.m.fub (Gross value) **	330 SEK/cu.m.fub (Gross value) **
Production output		5.5 M cu.m.sk	9,0 M cu.m.sk, wherof 63% in final felling and 25% in thinning ***
production input (silviculture)		soil prep+planting +cleaning 10041 SEK/ha **	soil prep+planting +cleaning 10041 SEK/ha **
Operating costs		Final felling 110 SEK/cu.m., thinning 203 SEK/cu.m., Road transport 85 SEK/cu.m.**	Final felling 110 SEK/cu.m., thinning 203 SEK/cu.m., Road transport 85 SEK/cu.m.**
Products		sawlogs, pulpwood, fuelwood (GROT)	sawlogs, pulpwood, fuelwood (GROT)
Production output	4.5 M cu.m., whereof 1,2 M cu.m. of sawlogs, 3.1 M cu.m. pulpwood and 0.3 M cu.m. energy wood	3.5 M cu.m. sawlogs *****	3.7 million cu.m. sawlogs, 3.1 million cu.m. pulpwood, 0.5 cu.m. biofuel**
Production input (wood)		4.5 M cu.m.fub	7.4 million cu.m.fub*
Products			1.75 million cu.m. planks and boards *
No of mills	The major production units are 5 sawmills, 1 pulp mill		The major production units are 8 sawmills, 1 pole factory, 1 pulp mill *
Climate impact			
Employment structure (age, sex, etc)		Forestry; 2717 persons ,wherof 78% men. Industry: 2905 persons wherof 84% men *****	In total 4900 whereof 1140 in forestry operations, 1200 in forest technology and 2,550 in wood-based manufacturing industry is 2,550. The largest the proportion of these, 1,305 people, work at sawmills and planers. 742 work in the carpentry industry, 371 in the wooden house industry, and 132 in the furniture industry. The largest employers in the county is Martinsons with

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	Lapland (FI)******	Norrbotten (SE)	Västerbotten (SE)
			467 employees and SCA's saw in Rundvik with 120 employees ***
Income , saw mills			3, 000 - 4,000 million SEK*
Income, other processing industris			3,000 million SEK *

* Walberg Roslund, C. 2022.Från skog till träförädling. Träindustrins värdekedja I Västerbotten. Skogsprogrammet Västerbotten.

**http://pxweb.skogsstyrelsen.se/pxweb/sv/Skogsstyrelsens%20statistikdatabas/Skogsstyrelsens%20statistikdatabas

*** Barsk, E. 2020. Sysselsättning inom skogsnäringarna i Västerbotten. Västerbottens regionala skogsprogram.

**** https://www.skogsprogramvasterbotten.se/nyheter/avverkning-i-vasterbotten-nu-lika-stor-som-tillganglig-tillvaxt/

***** Eriksson, V & Lundmark, R. 2020. Skogsnäringen i Norrbotten fram till och med 2030 – Definition och kartläggning, | Rapportserie inom Regional förnyelse | 2020 | | Luleå tekniska universitet |*** Länsstyrelsen Norrbotten. Strategi för Norrbottens regionala skogsprogram.

3. Overview of Austria as a Learning Case

This part of the report will highlight information about Austria specifically on socio-economic and on forest industry. The learning cases in Austria are located in the provinces Lower Austria (Forestry hub Mariensee) and Styria (Forestry hub Liezen).

3.1 Socio-economic

With an annual average population of 1 681 748 inhabitants in 2019, Lower Austria has the second highest number of inhabitants of all Austrian provinces after the capital Vienna. Thus, Lower Austria is home to 18,9% of the population in Austria. This is equivalent to a population density of 87,68 inhabitants per km², which is only the fourth highest population density of the Austrian provinces, with the provinces Vorarlberg and Upper Austria having higher population density, and Vienna itself having the highest population density of the Austrian provinces (Statistik Austria, 2021).

Tourism contributed with 3% to the Gross Value Added (GVA) of Lower Austria in 2018 (Amt der Landesregierung NÖ, 2018). The community Aspangberg St. Peter is not one of the most important for overnight stays, as the following map shows (the red lines indicate the community Aspangberg St Peter, the red dot the location of Mariensee); however, day-trips and local recreation play an important role there. Note that the statistics origin from 2018 and will have been influenced by the Covid-19 pandemic. Losses in overnight stays because of the pandemic have been among the highest of the Austrian provinces in Lower Austria with a value of-32,2% in 2020 compared to the previous year. Most tourists in Lower Austria are Austrian themselves, tourists from other countries contribute to a lesser share. (Das Land Steiermark, 2020).

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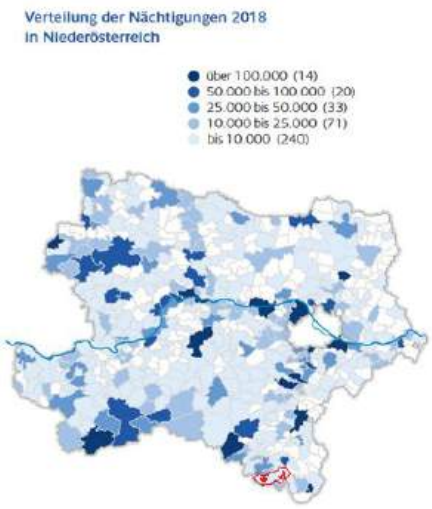

Figure 2. Overnight stays in Lower Austria in 2018. The darker the blue, the more overnight stays. Modified from Amt der NÖ Landesregierung, 2018

In 2019, 50 475 people were unemployed in Lower Austria, the unemployment rate was 7,5% (Arbeitsmarktservice Niederösterreich, C. Bliem et al).

The sector "wooden goods and basketry" in the region consists of 450 enterprises with 5 905 jobholders (employed as well as self-employed), 22 enterprises with 2 638 jobholders belong to paper & cardboard industry. There are 6 767 construction enterprises with 54 551 jobholders. The wooden goods and basketry enterprises produce a total revenue of 1,647 billion €, paper and cardboard industries produce 869 million € revenue, and construction 8,123 billion €. All of these industries with a total of 63 094 jobholders rely at least partly on wooden products. The 5 905 jobs in the sector "wooden goods and basketry" make up 1,1% of the total 515 943 jobs in the region Lower Austria.

Styria is a smaller province than Lower Austria, both in area as well as population, with an annual average population of 1 104 612 in 2019. The area of the province is 16 388 km², and the population density is with 67,40 inhabitants/km² for 2019 also a bit lower than in Lower Austria (Statistik Austria).

The unemployment rate in 2019 was at 6,3%, which was 0,3% lower than the year before and also lower than the Austrian average of 7,4%. This amounts to a total of 34 038 unemployed in Styria. (M. Mayer, Amt der Steiermärkischen Landesregierung, 2020).

The whole provice Styria has a strong tourism sector, generating 2,305 billion € revenue and employing 42 194 jobholders in the year 2021. Most tourists are Austrian; only about 30% of the visitors come from other countries, mostly from Germany. Summer tourism prevails, though 2000 cross-country ski trails and a total of 717 kilometres of Ski slopes also attract winter sports enthusiasts. Just as in almost all tourism areas, the Covid-19 pandemic hit hard, resulting in a decrease of 26,3% compared to normal years because of the pandemic. (Das Land Steiermark, 2021). The capital of the provice Styria, Graz, is an important tourism centre as well, and is located not even an hour drive away from the forestry hub Liezen.

In the region, 384 enterprises with 6 157 jobholders belong to the sector "wooden goods and basketry". Total revenue earned by those enterprises is 1,611 billion €. Twenty-seven paper- and

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cardboard enterprises provide 4 392 jobs, and another 43 387 jobs come from 5 241 construction enterprises, which are generating a revenue of 7,284 billion €.

3.2 Overview of the forest industry

Relative to Austria, both hubs are located in areas that have rather high standing volumes compared to the Austrian average, and both hubs are in areas that are touristically important.

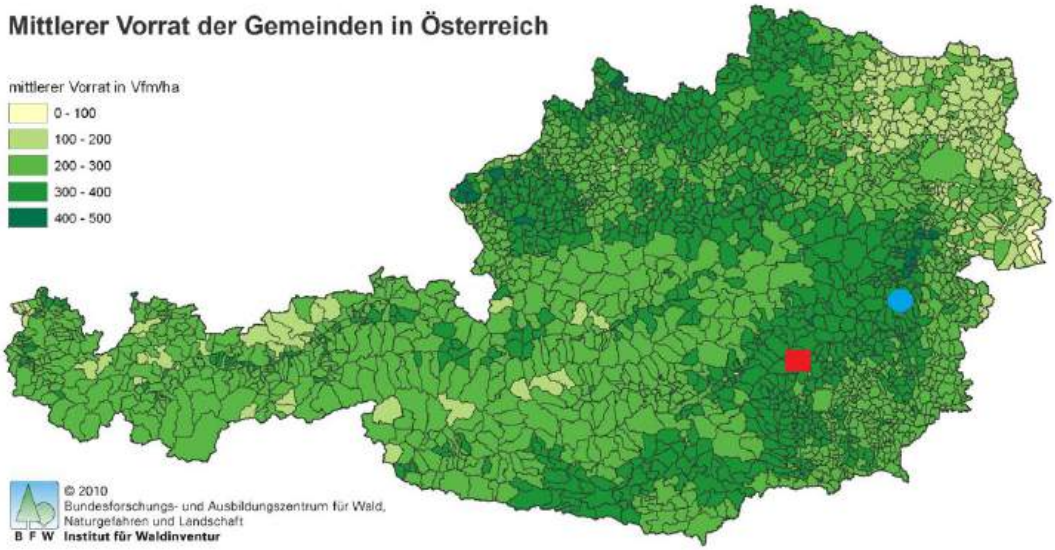

Figure 3. Average standing volume of the Austrian communities, modified from BFW, 2010. The blue point marks Mariensee, the red rectangle marks Frohnleiten, were the management of the forestry hub Liezen is located.

Lower Austria is well known for its warm summer, mild climate, that allows vine growing, as well as its oak forests and the Danube wetlands. Those Danube floodplains also form the National Park Donauauen with a size of 9600 ha, one of the biggest still-intact riparian wetlands of Middle Europe, which is also a huge visitor magnet – every year, tens of thousands of paying visitors participate in guided tours, and many more value the national park for its hiking and biking routes and recreational value (Nationalpark Donauauen, 2022). Similarly important is the 1630 ha big National Park Thayatal at the border to the Czech Republic – Austrias smallest national park, which is regardless home to 40% of all species occurring in Austria (Nationalpark Thayatal, 2022). Another well-known visitor magnet are the Vienna forests, which belongs partly to the province of Vienna, partly to the province of Lower Austria. This Biosphere Reserve is an important recreational area for Vienna's inhabitants. However, Lower Austria is not only characterized by valleys, riparian areas and pannonic climate; in the west are the Alpine foothills, and further to the west and south, the Northern Limestone Alps, with peaks as high as the 2076 m high Schneeberg mountain massif.

There are 7 677 km² forested land in Lower Austria, which means 40% of Lower Austria are forested. 14,4% of it (2 769 km²) are protected forests (B. Schwarzl & P. Aubrecht, 2004).

With a share of 52,1% coniferous forests, Lower Austria has less coniferous forests than the Austrian average of 65,8%. In the community Aspangberg St. Peter, in which the forestry hub Mariensee is located, the share of coniferous wood is with a value of 60-80% however a bit higher than the Lower

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Austrian average, as shown in the map below (again, the red lines show the border of the community Aspangberg St. Peter, the red dot shows the location of Mariensee).

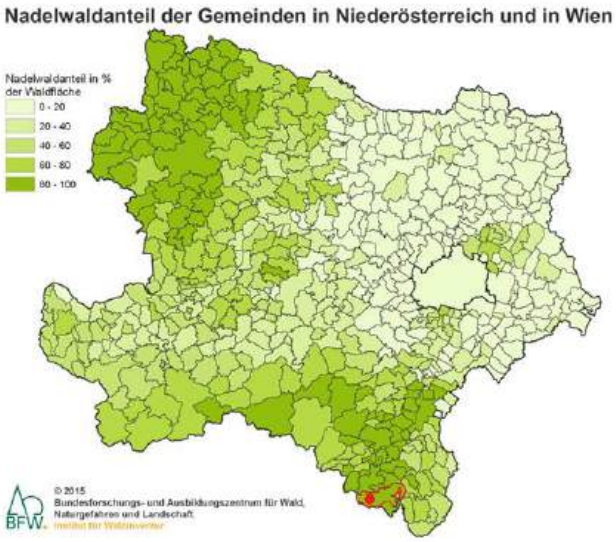

Figure 4. Share of coniferous forests in the communities of Lower Austria and Vienna, modified from BFW 2015. Darker green values show higher coniferous percentages.

The Lower Austrian forests have a total standing stock of 0,22 billion m³, equivalent to 301 m³/ ha. Annual increment is 5,99 million m³, or 8,2 m³/ha. Annual cuttings are 5,5 million m³ or 7,6m³/ha, which is equivalent to 91,9% of the annual increment (BFW, 2022).

The community Aspangberg St. Peter is one of communities richer in standing volume than the more northern communities in Lower Austria, as shown in the map below.

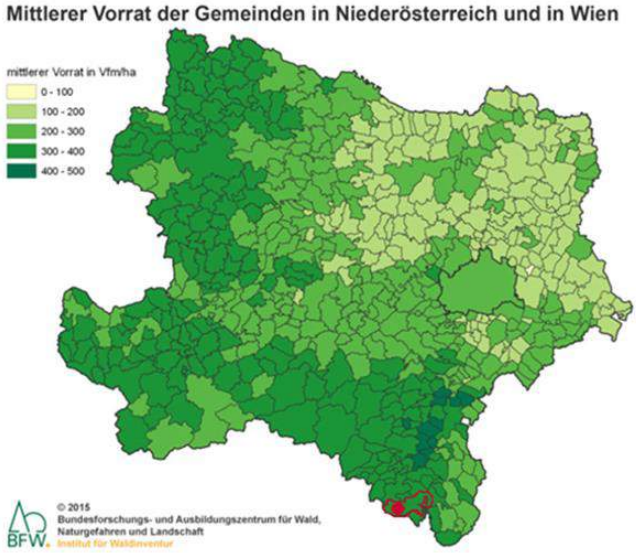

Figure 5. Average standing volume of the Communities of Lower Austria and Vienna, modified from BFW 2015. Darker green colours indicate higher standing volume

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Gross value added at production price (GVA) of the forest sector was 236,91 mio € in 2019. This value has decreased compared to the previous two years: in 2018, it had been 257,95 mio € and in 2017 it had been 240,45 mio €.

Production of the forest sector at production price had been 563,14 mio €. There was no substantial increasing or decreasing trend compared to the previous years; production of the forest sector seemed rather fluctuating over the years. Most of the production was “forest goods”, raw wood came in second. Notable was the increase in production of raw wood for energy use, which was at a value of 95,4 mio € - the highest it had ever been.

While the share of spruce forests in Lower Austria is smaller than in the other Austrian provinces, spruce wood still makes up 48,9% of the harvest (BFW, 2019). With climate change impending, this tree species is especially threatened, not only by a lack of water supply, but by an increase in bark-beetle damages as well.

Large parts of Styria are covered in forest - there are 9 940 km² of forest area, which means that 60,7% of the province are forested. Of those forests, 28,9% or 4 735 km² are protected (B. Schwarzl & P. Aubrecht, 2004). 70,3% of these areas are coniferous forests (BFW, 2009).

Total standing wood volume of these forests is 0,303 billion m³, which equals 352 m³/ha. Annual increment is 8,21 million m³, or 9,4 m³/ha and annual harvest is 7,42 million m³ or 8,5 m³/ha. That means, which means, 90,4% of annual increment are harvested (BFW, 2022).

Most of Mayr-Melnhofs forests lie in the districts of Leoben, Bruck-Mürzzuschlag, and Graz-Umgebung (with the management being located in Frohnleiten, marked by a red dot in the map); as the following map shows, these areas are some of the richest in standing volume in Styria.

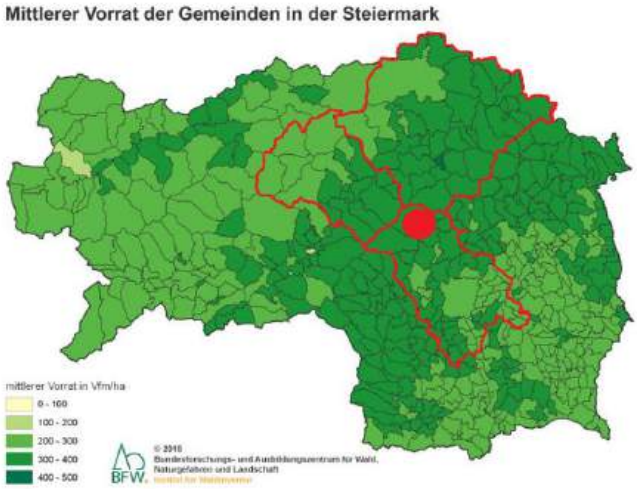

Figure 6. Average standing volume of the communities in Styria, modified from BFW, 2015. The red lines indicate the three districts Leoben (in the West), Bruck-Mürzzuschlag (in the North) and Graz-Umgebung (in the South).

GVA of the forest sector in Styria was 224,86 mio € in 2019. This value was the lowest the GVA of the forest sector in Styria had been since 2003; only then had it been lower with a value of 215,78 mio €.

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Production of the forest sector at production price had been 496,17 mio €. Again, this value had been the lowest since more than ten years. Most of the production was “forest goods”, raw wood came in second (Statistik Austria).

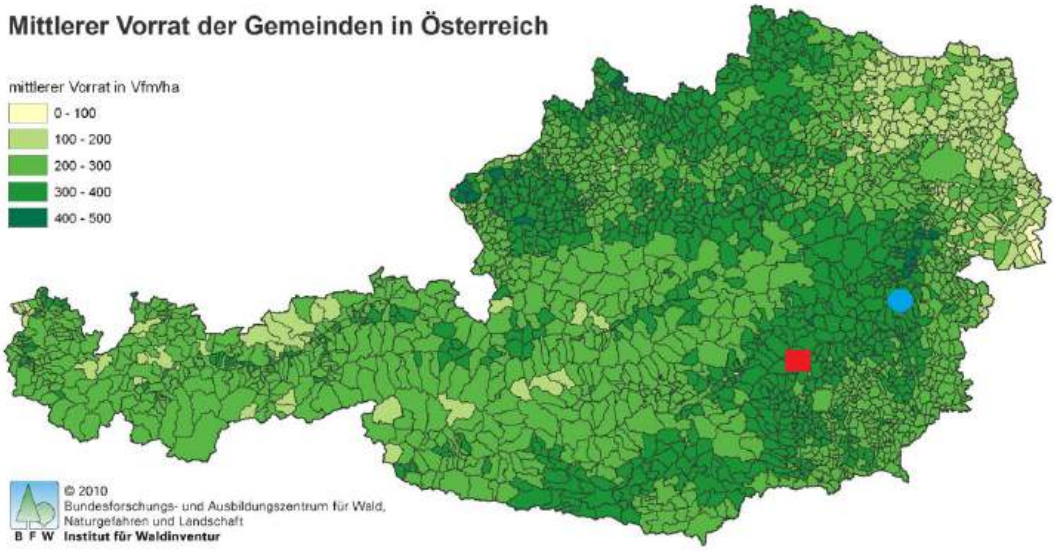

Figure 7. Average standing volume of the Austrian communities, modified from BFW, 2010. The blue point marks Mariensee, the red rectangle marks Frohnleiten, were the management of the forestry hub Liezen is located.

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4. Forestry hubs

This will provide a detailed overview of the forestry hubs. It will cover the definitions of the hub area (system boundaries), the current forest/ forestry within the hubs and some of the overlapping and competing land use interest and its mutual impact.

4.1 Kemi, Lapland, Finland

4.1.1 Definitions of the hub area (system boundaries) and context

Kemi is a small town that had two large pulp mills until the year 2021, when Stora Enso company closed its pulp mill. Metsä Group cooperative is building a new pulp mill in Kemi that is going to be one of the largest in Europe. It will replace the old Metsä Group mill during year 2023. At the same time Chinese company Camce is planning a pulp mill in Kemijärvi about 200km away from Kemi. These new pulp mills added together with the existing pulp mills and sawmills have raised concerns about sustainability of the wood use in Northern Finland. This will lead to demand of wood from nearby areas, mainly Sweden and Russia, but also import from overseas areas, mainly Southern America.

4.1.2 Comprehensive descriptions of the current forestry/forest industry within the hubs

Metsä Group pulp- or bioproduct mill is the main operator in the Kemi forestry hub. At present it uses approximately 3,1 million cubic meters of wood, but during year 2023 the enlargement of the mill will add 4,5 million cubic meters to its wood-use. After the change, the total amount of wood-use will be 7,6 million cubic meters per year, mainly pine.

At year 2021 Stora Enso pulp- and papermill was closed. Stora Enso's Veitsiluoto sawmill continues the production. In the sawmill 50 workers are employed and it produces annually about 180 000 cu.m. of sawn timber. The estimate of amount of used saw logs is about 400 000 cu.m./year. The closing of pulp- and papermill reduced the annual wood-use in Kemi hub about 2 million cubic meters. The total wood-use will, however, increase about 2,5 million cubic meters as a sum of the abovementioned changes.

The timber procurement area of Metsä Group mill is large, and wood is already delivered there from whole Finnish Lapland. A share of wood comes from Sweden, and a smaller proportion of wood is shipped to Kemi from the Baltic Sea area. It has been estimated that about 1-1,2 million cubic meters of wood would in future be purchased from Sweden. In general, after the changes (+4,5 and – 2 million cubic meters per year) the wood supply in Lapland will be close to the maximum availability after the the new mill starts since the latest estimate of annual growth was 12,2 million cubic meters, which is about 4,1 million cubic meters larger than the sum of loggings and natural removal between years 2015-2018 (Korhonen 2020).

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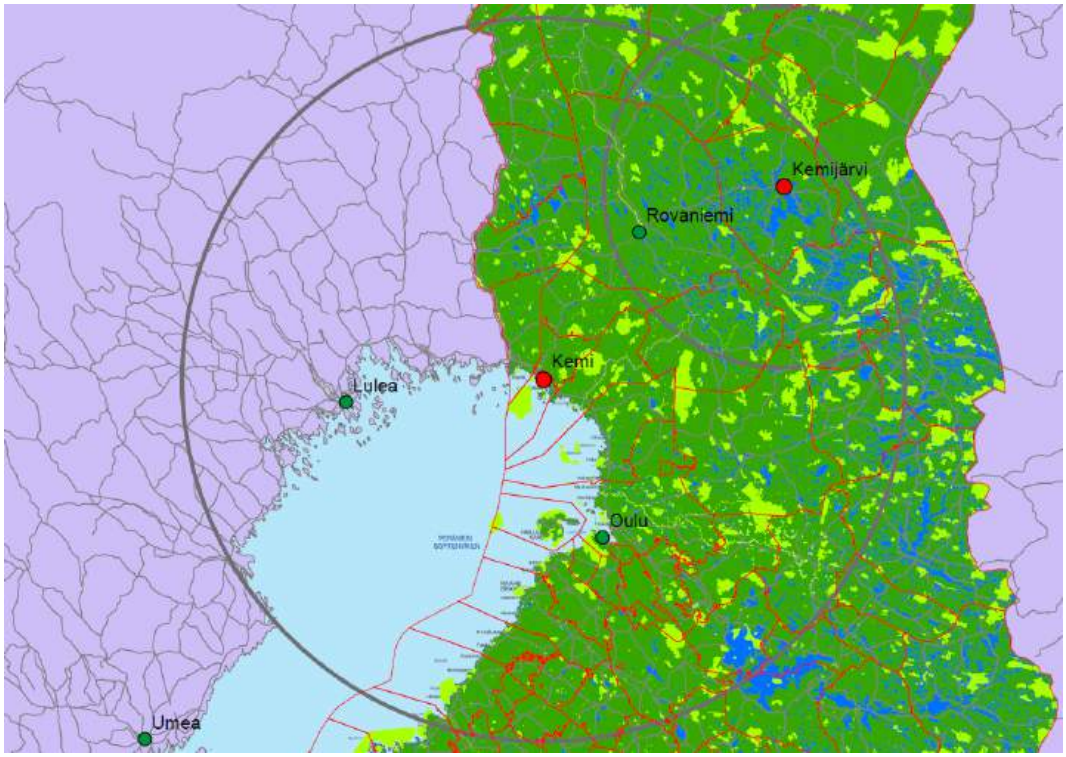

Figure 8. The Kemi and Kemijärvi hub areas with forest land or forestry land in dark green, protected areas (nature reserves, national parks etc.) light green and water areas blue. Municipality borders indicated with red line.

The Metsä Group Kemi mill's timber procurement area overlaps with Stora Enso Oulu board mill procurement area. Oulu mill was shifted from pulp and paper as a board mill at year 2021. At that shift the capacity of wood-use increased by 0,5 million cubic meters per year to 2,4 million cubic meters. Furthermore, the company is planning to construct also second unit to Oulu. The unit would start at year 2025. The effect on the annual wood-use is not yet published, but some estimates are brought up of approximately 1 million cubic meters increase in the annual wood-use. Also, the sawmill company Junnikkala has made an investment decision to Oulu. Their new sawmill unit would start at year 2023, and it would use annually 0,8 million cubic meters of pine and spruce sawlogs. This may have effect on the timber procurement area of Stora Enso Veitsiluoto sawmill, which has other competing sawlog users e.g. in Tervola (Tervolan Saha ja Höyläämö and Veljekset Vaara).

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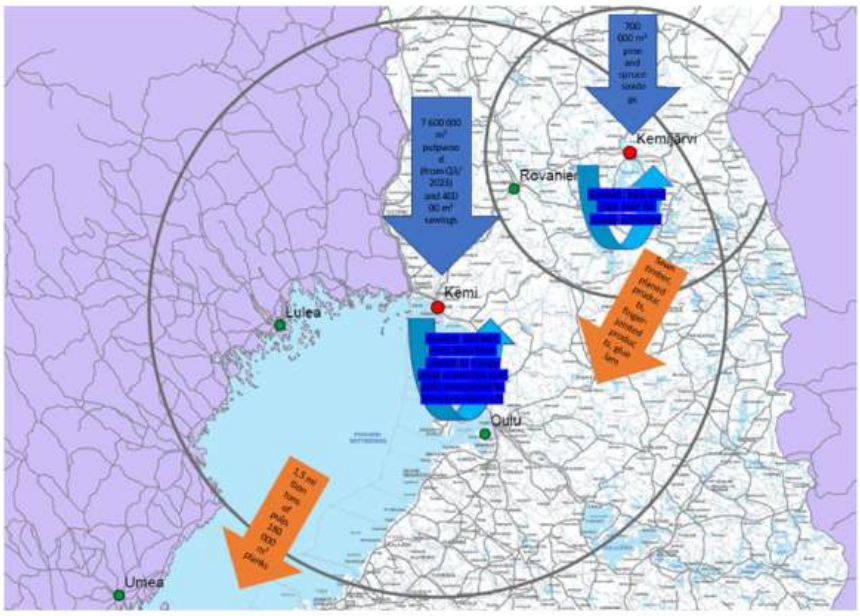

Figure 9. Comprehensive description of the current timber resource flow in the Kemi hub (July 2022)

4.1.3 Overlapping and competing land use interest and its mutual impact

Forestry has several competing interests with other land-use forms within the Kemi hub area. The majority of wood procurement area overlaps with reindeer herding area. In Lapland also the role of tourism, hunting and gathering of natural products is more pronounced than in other parts of Finland. Forestry has competing interests with all of those.

Reindeer husbandry and forestry have several types of interactions. Reindeer obviously affects regeneration of Scots pine all over the reindeer herding area (e.g. Helle and Moilanen 1993). In contrast, also negative interactions between forestry and reindeer herding have been noticed. An intensive scarification may reduce reindeer foraging, and their digging in snow, with its negative effects on seedling establishment (Roturier and Bergsten 2006). Also, outdoor recreation and tourism have a tendency to restrict soil scarification (e.g. Hallikainen et al. 2006, 2010).

Also, tourism and recreational use of forests have interactions with forestry in Kemi hub area. For example, the scenic beauty of a tree stand is found to be higher in seed-tree cuttings than in clear-cut with artificial regeneration (Silvennoinen et al. 2002). Recreational use, such as hunting and berry picking may also be affected since the soil scarification may reduce the abundance of many dwarf-shrub species, such as blueberry (*Vacciniun myrtillus*) and lingonberry (*Vaccinium Vitis-idaea*) since it breaks their rhizome (Tolvanen 1994). Furthermore, blueberry is known as a highy important for the capercaillie (*Tetrao urogallus*, e.g. Storch 1993, Kvasnes and Storaas 2007) and other grouse species such as black grouse (*Lyrurus Tetrix*), hazel grouse (*Bonasa Bonasia*) and willow grouse (*Lagopus lagopus*). Those, in turn, are traditional and highly valued game species in Finland – and specifically in Lapland.

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4.2 Kemijärvi, Lapland, Finland

4.2.1 Definitions of the hub area (system boundaries) and context

Kemijärvi is the northernmost town in Lapland that has during the past 15 years faced large socio-economical changes due globalisation. In 2003 Nokia moved production of mobile phone charges to China from Kemijärvi. In 2008 Stora Enso closed a large pulp mill in Kemijärvi and sold the factory to Canada. At the moment Chinese company Camce is planning a pulp mill to the place where Stora Enso closed its pulp mill 10 years ago. Like for the Kemi hubs, the pulp mill in Kemijärvi has raised concerns about the sustainability of wood use in Lapland.

4.2.2 Comprehensive descriptions of the current forestry/forest industry within the hubs

In Kemijärvi forestry hub the main operator is Keitele Group, which started there at year 2014. The annual wood-use in Keitele Group sawmill is about 700 000 cubic meters of pine and spruce sawlogs and the mill employs about 120 workers. Their products consist of sawn timber, planed products, finger-jointed structural products, gluelam and side products. Earlier there was a Stora Enso pulp mill in Kemijärvi, which was opened at year 1965 and employed about 250 workers at the beginning of 2000's, but it was closed at year 2008.

4.2.3 Overlapping and competing land use interest and its mutual impact

Forestry has remarkable competing interests with reindeer herding, tourism, hunting and gathering of natural products also in Kemijärvi forestry hub and its wood procurement area. The amount of used wood is smaller in the Kemijärvi hub than in the Kemi hub, but the wood procurement area overlaps completely with the reindeer herding area. Also, the role of tourism, hunting and gathering of is even more pronounced in Kemijärvi hub area since it can be characterized as more rural area than Kemi hub area

4.3 Jokkmokk, Norrbotten, Sweden

4.3.1 Definitions of the hub area (system boundaries) and context

The small town of Jokkmokk, and the entire municipality, is one of the most prominent places for Sámi culture. Thus, the hub is foremost defined by the indigenous traditional land use, that includes reindeer husbandry, hunting and fishing, which largely take place in the forested landscape of 765,000 hectares. Young Sámi from the whole of Sápmi go to Jokkmokk for education, and here is also the principal museum of Sami culture Ájtte, that is an information centre for mountain tourism. Jokkmokk is also the meeting place for several Sami reindeer herding communities (RHC, sameby in Swedish) and located in the heart of their wintering areas.

Forestry has a long history in the area and today some 500 000 hectares are available for harvesting, while the remaining 265 000 are formally protected, i.e. 35% of the forests are formally protected. Yet, forestry is by most reindeer herding communities considered as the most impending threat to reindeer husbandry. Improved and innovative forest activities to reduce loss of landscape connectivity as well as ground and pendulous lichen rich forests is much needed. Such goals can be achieved through improved participatory dialogue between reindeer husbandry and forestry. Today there are no active mines in the Jokkmokk area. There is however, a long-time, ongoing dialogue and conflict around the establishment of the Kallak mine.

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Figure 10. The Jokkmokk hub area with forest land in dark green, nature reserves light green, national parks light blue and biotope protection yellow. Municipality border in red

Figure 11. The reindeer herding communities residing/operating in Jokkmokk hub; from top to bottom, Sirges, Jåhkågaska and Tuorpon.

4.3.2 Comprehensive descriptions of the current forestry/forest industry within the hubs

In the Jokkmokk hub (the same as Jokkmokk miúnicipaliy/municipality) there is no wood processing industry, meaning that most of the harvested timber is transported out of the municipality. Based on final felling assessment data from the Swedish Forestry Agency, the total area of final felling has been assessed to 4722 hectares (0.95% of the area for timber harvesting) during 2021 and the volume has been estimated to 587,000 cu.m.sk in final felling. In addition, it may be assumed that another 113,000 cu.m.sk is harvested in thinning and other cuttings. The annual harvesting on any forest land in Jokkmokk then sum up to some 700,000 cu.m.sk. In Sweden, about 6% of the harvested volume is used

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for fuelwood [8]and we may then assume that 42,000 cu.m.sk are used locally for this purpose, while 658,000 cu.m.sk (548,000 cu.m.fub) is transported out of the hub. To carry out this forestry work 96 persons are employed (82% men) according to Eriksson & Lundmark (2020). In comparison 92 persons are employed in reindeer husbandry (85% men) (ibid).

Thus, from a hub perspective it is the forest land/forest properties that represent the main value locally. In total there are 532 management units whereof 314 are owned by 454 individuals living in Jokkmokk. Their land sums up to 36,300 hectares. In addition, there are another 15 large private owned properties with some 163,000 hectares, whereof Jokkmokk Allmänning is one of the largest, and 7 management units owned by public owners with 405,000 hectares. [9] The value of these properties is made up by different assessment criteria and components of which the most common is the market value. The most current statistics on market prices (Ludvig &Co shows that in the north of Sweden, the prices per hectare is increasing more that price per kubicmeter. If we apply the 2021-hectare prices on all the forestland available for forestry in Jokkmokk municipality (495835hectares) it sums up to 17,850 million SEK, whereof 1,307 million SEK is the potential market value of the forestland owned by private individuals (families). To what extent the market prices also covers the other values that forest owners put on their forestland it's hard to tell. However, research shows that in the timber production values are only a part of the total value assessment that forest owners put on their land and ownership (see e.g. Lidestav and Nordfjell 2005, Westin et al 2017 to most Swedish forest owners, the economic values of the property and the ownership (timber, leasing hunting rights, capital assets) are considered less important than the social values (recreation, health, cultural values, etc.) while environmental values (preserving plants and animals, good water quality, carbon storage falls in-between (Lidestav and Westin, forthcoming).

A major local management unit is the Jokkmokks Allmännig, a forest common established in 1889, which currently amounts to 82,000 ha, of which about 65,000 ha are productive forest land. Jokkmokk hub). Because of the local anchoring, a professional management and the availability of business data, we use Jokkmokk Allmänning as a proxy for describing the impact of forestry on the hub area. The taxation value of the common is 605 million SEK or 9308 SEK/hectare. Among the nearly 900 shareholders, the forest company SCA is the largest owner, meanwhile the majority of shareholders are small-scale forest owners. About half of those are living in Jokkmokk municipality (Lidestav et al 2013). The forest is management is carried out by a team of professionals, on average 7 persons on a yearly basis, and a dividend of some 5.5 - 6.0 million SEK is paid annually to the co-owners and for rural owners and municipal residents interesting rural projects. During 2020 the timber sales amounted to 75,000 cu.m.fub (90,000 cu.m.sk), whereof 20% from thinning and 80% from final felling. The income from the timber sold for industrial use was 18 million SEK, whereof, fuel wood for private consumption 89,000 SEK. Thus, the income of the sales can be estimated to 240 SEK/ cu.m.fub, whereas the net result of was 6,6 Million SEK can be estimated to 88 SEK/cu.m.fub. Silviculture has been carried out in the form of cleaning on 370ha (SEK 1700 / ha), land preparation on 333 ha (SEK 2100 / ha), planting on 335 ha (SEK 4966 SEK/ha) clearing 161 hectares (SEK 2228 / ha).

[8]http://pxweb.skogsstyrelsen.se/pxweb/sv/Skogsstyrelsens%20statistikdatabas/Skogsstyrelsens%20statistikdatabas__Bruttoavverkning/JO0312_01.px/table/tableViewLayout2/?rxid=03eb67a3-87d7-486d-acce-92fc8082735d

[9] (Norra skog https://www.norraskog.se/-/media/norra-skog/files/skogen-och-manniskorna/skogen-och-manniskorna-i-norrbotten.pdf

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4.3.3 Overlapping and competing land use interest and its mutual impact

The forest landscape in Jokkmokk has for several years been the scene for controversies between different land use interests, primarily forestry, reindeer husbandry and conservation. These interests are to a varying extent supported by policies at different levels and strength, and the local advocates for the various interests have also been more or less successful in networking with organizations beyond the municipality. One way to describe and understand both how the involved actors view the forest and its use and how they pursue their interests, is through the study of Beland Lindahl (2009) of the implementation of a government assignment on forests worthy of protection. She identified six different groups (or positions) in relation to enhanced protection of forest land; 1) Forestry for work and welfare 2) Forest protection for biodiversity 3) Forest protection for reindeer husbandry 4) Forest protection for local benefit 5) Enough protection 6) Proper management and governance. Much of the overall the differences between the groups depends on their idea about what defines Jokkmokk as a place, and their view of the forest landscape and how it changes. Those who perceive the remaining old-growth forest like any older forest, they consider it as renewable and possible to recreate by forest management. In contrast, the other way of looking at the landscape, the old forest can be seen as something qualitatively different from the managed forest, meaning that it is not perceived at all as renewable and possible to recreate within reasonable time, and therefore should not be used for forestry.

Table 3. Excerpts from Beland Lundahl (2009, p 38) illustrating the basic themes, perceptions of place and the forest by identified groups in Jokkmokk.

Frames of understandig	**1) Forestry for work and welfare**	**2)Forest protection for biodiversity**	**3) Forest protection for reindeer husbandry**	**4) Forest protection for local benefit**	**5) Enough protection**	**6) Proper management and governance**
Basic themes	Efficiency, growth & well-being, politically set goals	Protection of diversity, nature sets boundaries	Protection of reindeer husbandry, reindeer husbandry needs	Protection of recreation, livelihood & survival, local needs	Maintain social relations, enough with reserve	Protection according to set goals & regulations, manage conflicts of interest
Perceptions of the place; Jokkmokk	Forestry and water vigorous slope	Wilderness and nature conservation paradise	Sami center with a long history	Former forestry and hydropower society	(Former?) Forestry and hydropower community	Location in the periphery with conflicts over natural resources
The forest ….	Renewable forests, sustainable forestry	Old forest finite and button, unsustainable forestry	Part of shrinking “land”, unsustainable forestry	Part of “home” and local lifestyle, unsustainable forestry	Varies between actors and over time	Varies between actors in the group

However, there are also perceptions and understandings that all different actors in the local community of Jokkmokk shares.

All locally anchored frames of understanding there is a care about it in common inhabited the place and its future. Everyone wants to use the forest so that develops the local community in the long term. Increased local processing of the wood and more jobs in the locality are examples of common wishes. /…./All locally based actors are also united in the vision of some kind multi-use. All seem to agree quite that the future the forest must accommodate a mixture of forestry, reindeer husbandry, nature

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conservation, hunting, fishing and other recreation. Sentences diverge when we come to the question of how this should be implemented, but there is no actor questioning the very basic idea. Most actors at the local level also agree that more local influence in the natural resource sector would be desirable. More information and greater opportunities to influence both forestry and nature conservation is asked for. They also want the people affected to be done more participate as new regulations and action programs are developed. These the wishes actually unite all locally anchored actors except them who are professionally linked to forestry, i. e. actors with understanding frameworks that deal with "Forestry for jobs and welfare". Among the latter, reasoning about local influence is rarer. (Beland Lindahl 2009, p.57).

4.4 Malå, Västerbotten, Sweden

4.4.1 Definitions of the hub area (system boundaries) and context

Malå forestry hub, represents a complex land-use situation where mining, wind power developments, and infrastructure projects overlap with the land use needs of Sami reindeer husbandry. From the forest industry perspective, the hub is defined by the sawmill situated in the town of Malå and its timber procurement area. At present, the timber procurement area comprised the forest land within a radius of 100 km from the core, i.e. the sawmill, meaning that the forestry hub stretches beyond the municipality boarders. In the area Sveaskog AB is the major forest owner (about 60% of the productive forest land) while 37% is owned by non-industrial private forest owners.

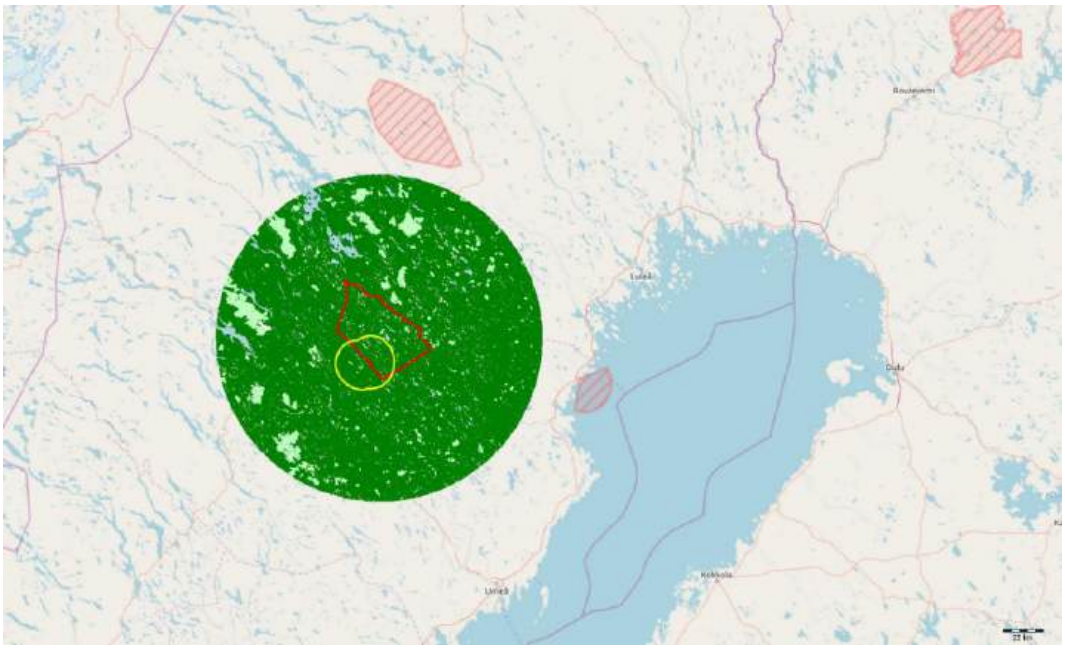

Figure 12. The Malå hub area with forest land in dark green, nature reservs light green, national parks light blue and biotope protection yellow. Malå municipality borders indicated with red line and the Kristineberg mine impact area with yellow line.

Since the establishment in 1946, the sawmill has been an important employer in Malå municipality, and as one of the larger and prospering industries in Malå, also an important actor and partner in the local business network. The owners of the sawmill Setra AB, are planning for major investments in this industrial unit, which will imply that the production will double from 170,000 cu.m. sawn goods

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340,000 cu.m., which requires that the volume saw logs increases from about 340,000 cu.m.fub (about 410,000 cu.m.sk) to 680,000 cu.m.fub saw logs (820, 000 cu.m.sk).

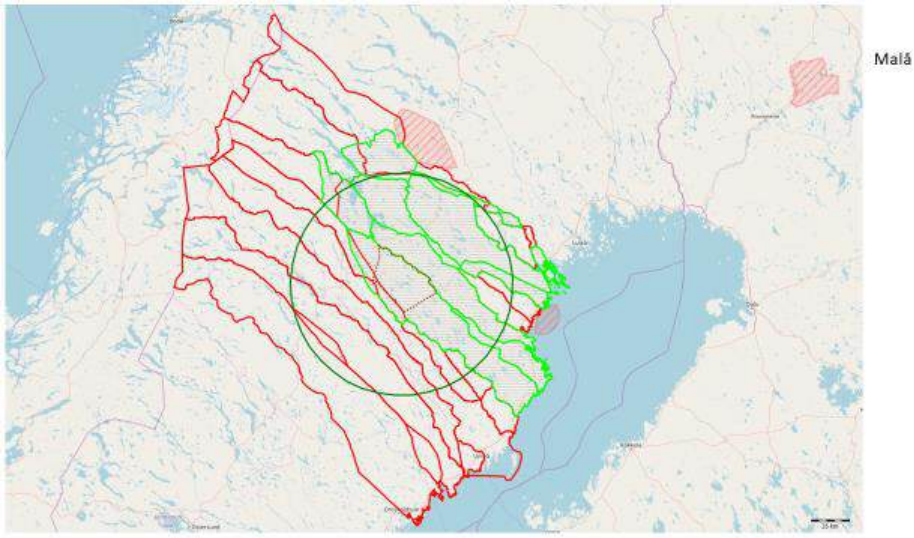

Figure 13. The reindeer herding communities residing/operating in Malå hub; Ståkke, Östra Kikkejaure, Västra Kikkejaure, Mausjaur, Maskaure, Malå (forest RHCs, green) and Luokta-Mávas, Semisjaur-Njarg, Svaipa, Gran, Ran, Ubmeje tjeälddie, Vapsten, Vilhelmina norra (mountain RHCs, red)

Mining activities in the Kristineberg mine began in the late 1930s, where Boliden AB extracts zinc, copper, gold and silver. The ore is transported by truck from the mine site to the coastal processing plant in Rönnskär. Malå RHC (Sami reindeer herding community) use the area all year, but also in direct connection with winter lands of Gran RHC. None of the RHCs are "completely" within the timber procurement area, but all the forest RHCs are for the most part within this, with the exception of Ståkke in the far north. Gran, Ran, Ubmeje and Vapsten cross the timber procurement area, the other mountain Sami RHCs only overlap with this. This complex land-use situation calls for innovative participatory tools to provide an effective and inclusive dialogue in search of solutions.

4.4.2 Comprehensive descriptions of the current forestry/forest industry within the hubs

The forestry value chain in the Malå hub consists of timber production (i.e. silviculture and harvesting operations within the 100 km radius of the Setra Maå sawmill meaning that the procurement area stretches beyond Malå municipality and into the municipalities of Norsjö, Lycksele, Storuman, Sorsele, Arvidsjaur and Arjeplog. Roughly speaking, it can be said that 1/3 of the circle falls into the Västerbotten coastal area (ACK), 1/3 in Västerbotten Lapland (ACL) and 1/3 in Norrbotten Lapland (BDL). Out of the total hub area of 3,14 million hectares, 69% is forest land, whereof 5% is formally protected. The area available for forestry in the hub is estimated to 2 073 000 hectares, while the area of forest land available for forestry in the ACL/ACK/BDL region is assessed to 3 913 000 hectares (Source SKA 2015). Estimates on the current use of the timber resource will thus departs from assumption that the Malå hub represent 53% of the timber production of the growth and production areas of ACK, ACL and BDL). Furthermore, it is assumed that each of the sub-areas contributes 1/3 each to the timber supply of the sawmill.

By applying data from the Forest Impact Assessment 2015 (SKA2015) scenario Business As Usual the potential timber harvest by assortments has been estimated for the Malå hub area at present and for

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several decades ahead. For the current period (2020-2029) almost 4.7 M cu.m.fub can potentially be harvested whereof 1,400 thousand cu.m.fub as sawlogs of pine, i.e. the principal assortment for the sawmill in Malå. Most of these sawlogs (84%) originates from final felling according to our estimates, compared to 20% for the harvested volumes in total.

Table 4. The potential timber harvest by assortments for the Malå hub area, 1000 cu.m.fub/year based on data from the Forest Impact Assessment 2015 (SKA2015) scenario Business As Usual

		2010-	2020-	2030-	2040-	2050-	2060-	2070-	2080-	2090-	2100-2110
Pine	Sawlogs	1185	1399	1495	1957	1972	2093	2014	1973	2004	2196
Pine	Pulpwood	810	1098	1154	1310	1314	1403	1532	1902	2056	1872
Spruce	Sawlogs	793	704	573	482	499	453	400	333	330	359
Spruce	Pulpwood	953	811	619	537	497	458	624	770	991	1068
Contorta	Sawlogs	2	16	135	158	239	301	221	126	52	82
Contorta	Pulpwood	10	52	152	117	133	148	94	98	42	60
Broadleav	Pulpwood	656	590	606	546	735	817	971	905	1002	949
TOTAL		4410	4670	4734	5108	5390	5673	5855	6106	6476	6585

However, the actual final fellings in the hub area has been assessed with support from the Swedish Forest Agency, showing that the amount of final felling during 2021 was 12,300 hectars with an estimated volume of 1.950.000 cu.m.sk or 1.619.000 cu.m.fub. In relation to the total area available for harvesting, the final felling area amounts to 0.59%. The volumes generated from thinning and other cuttings is harder to assess, but based on general statistics for northern Sweden (Skogsdata 2019 table 4.6) we may another 400.000 cu.m.sk (330,000 cu.m.fub) to the harvested volume.

The timber supply to Setra Malå sawmill involves 340.000 cu.m.fub (410.000 cu.m.sk) pinewood logs that are harvested and transported to the sawmill, while a similar amount of pulpwood logs from pine trees are sold and transported to the pulp mills along the coast. Other assortments (spruce logs and broadleaf logs that harvested in the same operations as the pine logs are delivered to other industries in the region. The harvesting operation involves approximately 8 employees at the local office in Malå, 6 own harvesting teams (24 employees) + 6 contractor teams (20 employees?). For silviculture some 24 employees (contractors), and for road transportation 11 trucks with 2 drivers each. In total 80 persons.

At the sawmill 75 people are employed, whereof 74 % men and 26% women (mean age 44 yrs) The turnover in 2021 was 430 million SEK. the logs are processed to 170,000 cu.m. planks and boards wherof 20-25% is planed. 32.200 cu.m. planks and boards, and 9 200 cu.m. further refined products goes to Swedish costomers, whereof 21.000 cu.m. respectively 9.200 cu.m. to customers in Västerbotten. 91.000 cu.m. pulpwood chips, 70.000 cu.m. sawdust and 8.000cu.m. bark.

The sawdust and bark are then sold to the nearby heat and powerplant owned by Skellefte kraft, who produces 72 000 MWh, wherof 75% delivered to Malå sawmill and 25% to the district heating grid (32.2 km) with 239 connections.

Considering the Malå municipality only, there are 555 management units whereof 546 are owned by 435 individuals living in Malå. Their land sums up to 26,600 hectars. In addition, there are another 5 large private owned properties with some 3,900 hectares and 4 management units owned by public owners with 62,900 hectars.[10] The value of these properties is made up by different assessment criteria and components of which the most common is the market value. The most current statistics on market prices (Ludvig &Co shows that in the north of Sweden, the prices per hectare is increasing more that price per kubicmeter. If we apply the 2021-hectare prices on all the forestland in Malå

[10] Norra skog https://www.norraskog.se/-/media/norra-skog/files/skogen-och-manniskorna/skogen-och-manniskorna-i-vasterbotten.pdf).

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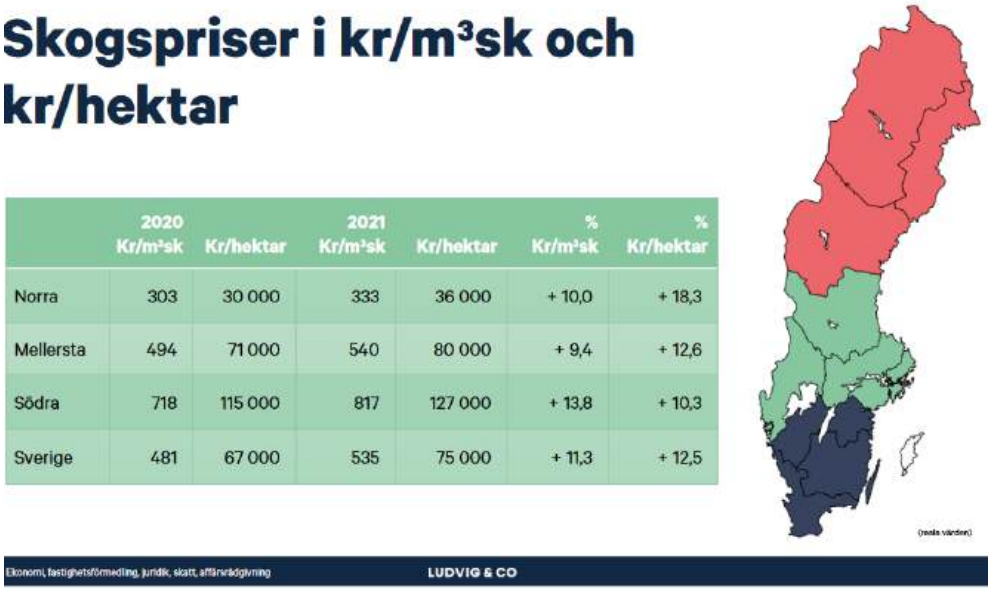
municipality (93,400 hectares) it sum up to 3,362 Million SEK, whereof 958 Million SEK is the potential market value of the forestland owned by private individuals (families). To what extent the market prices also covers the other values that forest owners put on their forestland it's hard to tell. However, research shows that in the timber production values are only a part of the total value assessment that forest owners put on their land and ownership (see e.g. Lidestav and Nordfjell 2005, Westin et al 2017 to most Swedish forest owners, the economic values of the property and the ownership (timber, leasing hunting rights, capital assets) are considered less important than the social values (recreation, health, cultural values, etc.) while environmental values (preserving plants and animals, good water quality, carbon storage falls in-between (Lidestav and Westin, forthcoming).



	2020 Kr/m³sk	Kr/hektar	2021 Kr/m³sk	Kr/hektar	% Kr/m³sk	% Kr/hektar
Norra	303	30 000	333	36 000	+ 10,0	+ 18,3
Mellersta	494	71 000	540	80 000	+ 9,4	+ 12,6
Södra	718	115 000	817	127 000	+ 13,8	+ 10,3
Sverige	481	67 000	535	75 000	+ 11,3	+ 12,5

Figure 14. Price statistics on forest in hectares and cubic meters (cu.m.sk) in Sweden 2020 and 2021. *Source: Ludvig & Co 2022*[11]

Of the residents in Malå municipality 100 persons are employed in forestry and 108 persons in wood manufacturing. (Norra skog https://www.norraskog.se/-/media/norra-skog/files/skogen-och-manniskorna/skogen-och-manniskorna-i-vasterbotten.pdf)

The wood industry company Setra plans to apply for a new operating license for its production at the unit in Malå. The expanded permit enables a doubled production of wood products as well as an expansion of the existing processing operations and production of biofuel products. Setra has now started work on a new permit application for Malå sawmill and an initial meeting with the County Administrative Board has been carried out. The permit applied for applies to a production volume of 500,000 cu.m.. This means a doubling against the current volume of approximately 210,000 cu.m.. Setra is also investigating increasing the processing operations of wood products and further developing biofuel fractions. All in all, this means that the energy supply and storage possibilities also need to be reviewed.

[11] https://kunskap.ludvig.se/hubfs/Rapporter-Ludvig-o-Co/Skogsmarkspriser/Skogsprisrapporten-helar-2021.pdf?hsCtaTracking=27a74721-45b1-496c-88ec-6790029fc73d%7C0fa469fe-014c-4dc2-bd3f-fc303b6bdfa8

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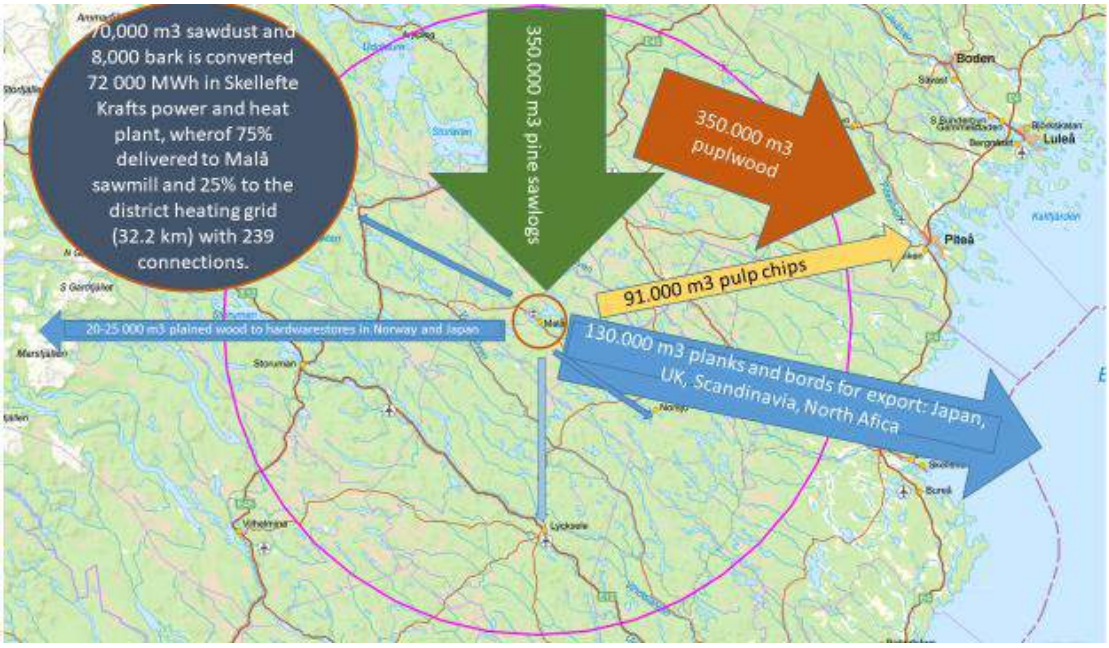

Figure 15. Comprehensive description of the current flow of timber resource flow in the Malå hub (May 2022)

4.4.3 Overlapping and competing land use interest and its mutual impact

Within the procurement area of the Malå hub, there are 15 reindeer herding communities facing similar experiences as Gran Sameby in terms of balancing competing land use interests with ongoing and expanding forestry interests. For a detailed description, see section 4.5.3. Considering the expansion of the Setra sawmill, in combination to other planned and commenced expansions of processing industries in the surrounding region (Holmen sawmills in Bygdsiljum and Kroksjön, and the SCA papermill in Obbola), calls for increses in harvesting volumes and impacted areas. Further, there is also another sawmill within the Setra mill procurement area, Glommers Timber AB, also specialized on pine timber. At present they process some 140,000 cu.m.. Thus, it can be assumed that they represent a competing interest. This will likely impact not only on the competition of timber assortments and the timer price, but also on the conditions for reindeer husbandry. For Malå forest RHC this expansion and intensification of forestry will have especially significant impacts.

4.5 Gran Sameby, Västerbotten, Sweden

4.5.1 Definitions of the hub area (system boundaries) and context

Gran sameby is the name of the reindeer herding community (RHC) which territory stretches from the Bothnia Bay all the way into Norway (Figure 16) based on rights laid down in Lappecodicillen in 1751. A RHC is a special legal entity specific for the purpose of managing the rights and obligations involved with reindeer husbandry. Gran is a mountain reindeer herding community which is characterised by long seasonal migrations. Summers are spent in the high mountains in Norway and Sweden and winters in the forests all the way to the Gulf of Botnia. The all year around land is located in Vindelfjällens Nature reserve and are thus protected from exploitation by forestry and mining. However, most of the forest land is also used for commercial forestry. In total, the forest cover of the Gran territory sums up to 256,600 hectares whereof 10% is formally protected (nature reserves etc).

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On this land, seven reindeer herding families with approximately 50 members and a maximum of 7000 reindeer in the culled herd makes a living.

Very few tourists venture far out from Ammarnäs in Gran since there are few cabins and they are far between. Most lakes in Gran are for sole use of the reindeer herders, many are family lakes, only a few can be fished with a license. Thus, there is a striking difference between the summer and winter territories) as well as the territory itself.

Gran is an amalgamation of local Ume-Sámi and the North-Sámi that were forcefully moved by the Swedish state, so two distinct languages are spoken. In June of 2019 Vindelälven-Juhttátahkka, which covers vast areas of Gran territory, received the designation as a UNESCO Biosphere Reserve. Gran is an active member on the board, and has since 2013 worked in building knowledge and interacting with other Biosphere Regions and participating in projects with great and useful results. Gran has created close bonds with the Innu First Nation in Pessamit, Manicouagan-Uapishka Biosphere Region, Quebec, Canada.

Figure 16. Gran Sameby hub (red line) with forestland in dark green, nature reserves light green, national parks light blue and biotope protection yellow.

4.5.2 Comprehensive descriptions of the current forestry/forest industry within the hubs

Even though Gran is a mountain RHC, the importance of the forest can be found in the word used for being/working with the reindeer – you are in ”renskogen”, which literally translates to ”reindeer forest”. The forest surrounding the high mountains consists mainly of birch, small and very crooked trees. These bent trees are used to build the frame of the traditional *kåta (*traditional sami dwelling*)*, which are then covered with bark from the birch and peat. These *kåta* are still in use in Vindelkroken, which is said to be on of the oldest – if not the oldest – visten still in use. While the floor of the kåta is covered with twigs of a krypande björk, the fire is of course fed with birch. Vrilar from birch are used to make cups for drinking and traditionally for bigger bowls for milking the reindeer. Just letting the eye feast on the bent trunks stimulates the imagination of what they could be used for and it is not uncommon for reindeer herders to compare themselves with these trees – bent by the forces of nature

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but not broken. The high mountain birch forest is a stellar playground for the children. Birchbark is harvested with great care for handicraft and larger pieces are carried along for making fires, since it burns even when it is wet. Reindeer feed on birch leaves often before there is anything to eat on the ground out west. So when a reindeer herder says" there are now leaves on the birches", that signals relief. Starvation is avoided. Since Gran is very narrow in some parts of the winter land, the herd is separated into family groups that graze their reindeer in separate parts of the territory. Migration can for one group be almost nothing some years and 400 km one way every year for some. Gran has large territories on protected land for their grazing during the time when the ground is bare or has little snow. The "bottle neck" is winter. The grazing possible in the forests cap the size of the herd for Gran. Reindeer do not really put on weight during winter, they are in survival mode. They have to build up their reserves during autumn. A crucial part for this is that they feed on mushrooms in the forests close to high mountains. If they have low reserves when winter sets in, they are likely not to survive a tough winter. It is shown that females that drop under a certain weight will not produce a viable calf. It can be almost impossible to reverse this come January-February, no matter how much or what you feed them. Gran are forced by nature to migrate with the reindeer. Sufficient winter grazing depends on access to different types of grazing in the forested areas. The needs of the reindeer are more complex than most are aware of. They need peace and quiet. Reindeer are prey animals and females with calves are the most alert. Remember, they cannot afford to use any of their reserves unnecessarily and there might not be a lot to begin with. Winter is long and cold and most are gestating. But there are roads, railroads, windmills, hunters, dogs, snowmobiles, skiers, in short, lots of other people getting on with their lives and earning their living. Reindeer also migrate between areas in the winter, since they of course step on the snow as they walk and harden it. Areas once used cannot be used again that winter, they will not find peace on trampled snow. We still don't have all the answers to reindeer behaviour.

4.5.3 Overlapping and competing land use interest and its mutual impact

Different forestry methods and different phases of forestry strongly affect the behaviour and the well-being of the reindeer. Here it must be pointed out that for a reindeer herder this is almost equivalent to his or her own well-being. Reindeer herding is not a job. It is a culture; it is a way of living and a quite heavy responsibility of the few that stay on. Suffering reindeer means suffering communities, at a core level. Working every day for months on end in a forest that is destroyed from the perspective of a reindeer (perhaps for the rest of that reindeer herder's lifetime) takes a heavy toll. Much attention has been on old forests and lichens, which have been the backbone of winter grazing for a very long time. Now, in Gran, we face new circumstances. We have sudden bouts plus degrees and rain in winter and then freezing again. This means ground lichens can be covered with ice (unattainable) or filled with frozen water which makes the reindeer sick (skvalpmage). At the very least you need the lichen to grow high. The old, reliable lavhed is not as reliable anymore, even if you have it. Crust on the snow also becomes a huge problem. Reindeer travel long and fast if there is no grazing and loose what reserves they had. For those weather conditions a hilly landscape, perhaps studded with large lichen covered rocks, can save you. Sometimes a fresh clearcut can be a saviour for a period of time. Wind and snow can affect the top of the snow in a way that a plantation that has reached 1.5 m height gives the best conditions for a while. This is if the ground was not processed in a way during preparation after cutting in a way that obliterated all lichen. Reindeer herding is not monetarily very prosperous. You need natural grazing. You need usable forest land. Reindeer herders can apply for funds in case of catastrophically bad grazing in winter, according to certain criteria. Applying for these funds was not so commonplace 20 years ago, now Gran applies almost every year. The funds are used for feed, pellets and hay. Feeding reindeer disrupts Sami culture. Reindeer herding is learned mouth-to-mouth and by

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experience, which is all ripped away when just feeding inside an enclosure. Feeding is not healthy for the reindeer. Feeding is still so expensive it hollows out what little economy is left. Finding new collaborative ways with forestry is indispensable if Sami culture is to survive and thrive. Fluctuations in the weather and forestry combined is what must be closely studied for reindeer herding in Gran to survive. There is not one save-all measure anymore.

4.6 Gällivare, Norrbotten, Sweden

4.6.1 Definitions of the hub area (system boundaries) and context

The Gällivare hub area (same as the municipality) is dominated by the mining industry. The Malmberget iron mine operated by LKAB is located directly north of Gällivare. Part of the future plans for the Malmberget mine is the establishment of the HYBRIT – fossil free steal production system. On the south side of Gällivare, Boliden Minerals AB operates the Aitik mine and processing plant, established in 1968. Today the Aitik mine has grown into the largest open pit copper mine in Europe covering an area of approximately 50 km2. The Aitik mine is mainly producing copper, but also gold and silver. The Aitik mine employs 770 people and many more are employed in jobs related to the mine. Aitik is expected to be in operation until 2029 but a number of expansions of existing mine are planned and proposed which is expected to prolong operations.

Figure 17. The Gällivare forest hub area with forestland in dark green, nature reserves light green, national parks light blue and biotope protection yellow. Municipality border in red.

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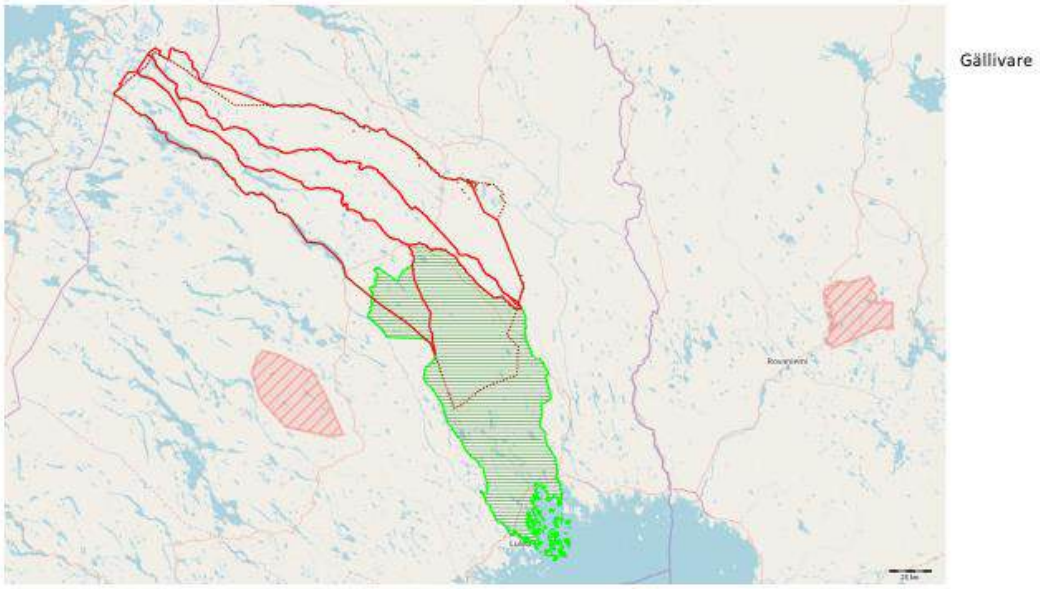

Figure 18. The reindeer herding communities residing/operating in the Gällivare hub, from top to bottom Girjas, Baste Čearru and Unna Tjerusj mountain RHCs (in red) and Gällivare forest RHC (in green).

Gällivare is also part of the traditional lands of Sami people and the town of Gällivare is meeting point of the four RHCs (Sami reindeer herding communities) Gällivare, Girjas, Baste Čearru, Unna Tjerusj. The forest RHC Gällivare is the focus in the Gällivare hub. Of the forested land, i.e. 649,300 hectars, some 30% is formally protected, meaning that some 454,000 hectares may be used for commercial forestry. Thereby it is an important timber resource for neighboring areas but at the same time this land is also important grazing land for the reindeer herds.

4.6.2 Comprehensive descriptions of the current forestry/forest industry within the hubs

Similar to Jokkmokk, most of the harvested timber is transported out of the municipality, as there is no local wood processing industry. Based on final felling assessment data from the Swedish Forestry Agency, the total area of final felling has been assessed to 4722 hectares (0.95% of the area for timber harvesting) during 2021 and the volume has been estimated to 402,000 cu.m.sk in final felling. In addition, it may be assumed that another 80,000 cu.m.sk is harvested in thinning and other cuttings. The annual harvesting on any forest land in Jokkmokk then sum up to some 480,000 cu.m.sk. In Sweden, about 6% of the harvested volume is used for fuelwood [12] and we may then assume that 29,000 cu.m.sk are used locally for this purpose, while 451,000 cu.m.sk (376,000 cu.m.fub) is transported out of the hub.

The forest land/forest properties is then considered to represent the main value. The most current statistics on market prices (Ludvig &Co shows that in the north of Sweden, the prices per hectare is increasing more that price per kubicmeter. If we apply the 2021 hectare prices on all the forestland available for forestry in Gällivare municipality (453,927 hectares) it sum up to 16,341 Million SEK, whereof 2,203 Million SEK is the potential market value of the forestland owned by private individuals (families). To what extent the market prices also covers the other values that forest owners put on

[12]http://pxweb.skogsstyrelsen.se/pxweb/sv/Skogsstyrelsens%20statistikdatabas/Skogsstyrelsens%20statistikdatabas__Bruttoavverkning/JO0312_01.px/table/tableViewLayout2/?rxid=03eb67a3-87d7-486d-acce-92fc8082735d

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their forestland it's hard to tell. However, research shows that in the timber production values are only a part of the total value assessment that forest owners put on their land and ownership (see e.g. Lidestav and Nordfjell 2005, Westin et al 2017 to most Swedish forest owners, the economic values of the property and the ownership (timber, leasing hunting rights, capital assets) are considered less important than the social values (recreation, health, cultural values, etc.) while environmental values (preserving plants and animals, good water quality, carbon storage falls in-between (Lidestav and Westin, forthcoming).

In terms of employment 174 persons are employed in forestry operations (79% men) and 65 persons in reindeer husbandry (75% men) (Eriksson & Lundmark 2020).

In total there are 1016 management units whereof 995 are owned by 1321 individuals living in Gällivare. Their land sums up to 61,200 hectares. In addition, there are another 15 large private owned properties with some 106,000 hectares and 6 management units owned by public owners with 540,000 hectares[13]. The value of these properties is made up by different assessment criteria and components of which the most common is the market value.

A major local management unit is the Gällivare Allmänningsskog, a forest common established in 1885. Because of the local anchoring, a professional management and the availability of business data, we will use forestry data from Gällivare Allmänningskog as a proxy for describing the impact forestry on the hub area.

The common consists of 65,000 hectares, of which about 45,000 are productive forest land, that is jointly managed. Thus, the size of the common is similar to the size of forest land owned and managed by private individuals. Many of those are co-owners of the common, and in this capacity they can benefit from the revenue of the common land. Based on their management report including the income statement (Gällivare Allmänningsskog 2021) we have estimated the amount and value of some forestry variables. During 2020, a total of 88,023 cu.m.sk was harvested at an average price of 243 kl / cu.m.sk (SEK 292 / cu.m.fub), of which final felling was 60,329 cu.m.sk at an average price of SEK 287/cu.m.sk (SEK 344 / cu.m.fub), thinning 21,327 cu.m.sk at a price of SEK 151 / cu.m.sk (SEK 181 / cu.m.fub) and other felling 6322 cu.m.sk at a price of SEK 140 / cu.m.sk (SEK 168 / cu.m.fub). Silviculture has been carried out in the form of cleaning 103 ha (SEK 1818 / ha), land preparation 274 ha (SEK 1973 / ha), planting 285 ha (SEK 2.20 / plant) clearing 87 hectares (SEK 2861 / ha and new breaking of road 16 , 2 km at a price of SEK 67 / m (gravel not included). The net turnover from timber sales y amounts to 21,4 Million SEK, rents and leases (wind power) to 1,6 Million SEK (There are 6 wind turbines on our land, for which we receive an annual compensation in the form of a land lease). Thus, the harvested volume per hectare (productive forest land) can be estimated to 1.96 cu.m.sk/ha and net turnover from forestry per can be estimated to 475 SEK/ha. The dividend is usually distributed in form of subsidies for investments in the co-owners individually owned and managed land. However, cash payment many also exist, and in 2021 the payment of 12.3 Million SEK from the sale of two properties (Liikavaara 3:2 and 3:3) was distributed to the co-owners.

There are a number of proposed major wind power projects in Gällivare RHC. The advent of the wind power expansions has also meant that the common have access to an expanded road network of a high standard. It will facilitate future timber transports in connection with fellings in the area.

[13] Norra skog https://www.norraskog.se/-/media/norra-skog/files/skogen-och-manniskorna/skogen-och-manniskorna-i-norrbotten.pdf

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4.6.3 Overlapping and competing land use interest and its mutual impact

In contrast to Jokkmokk, the community in Gällivare is heavily influenced by mining, both historically, presently and in to the future. In relation to mining interest, both forestry and reindeer husbandry interests are less influential. In fact, the mining interest has made the whole town and neighborhood of Malmberget to move and merge into the town of Gällivare. Forest land that is needed for the expansion of mining activities including infrastructure, is bought and transformed. One example is the Gällivare Allmänningsskog sales of Liikavaara 3:2 and 3:3, a deal that involved a payment of 12.3 million SEK which then was distributed to the co-owners of the common. Thus, the conflicting land use interests between mining and forestry has been settled by an exchange of land for money, and given that the decision by the common is made according to democratically governing principles we may consider that the majority of the co-owners are satisfied with the monetary compensation. For reindeer husbandry, the situation is more difficult, as they do not own the land they use and that is exploited or impacted by the mining industry. Thus, the negotiation then takes a different rout as discussed in the baseline reports on studies on mining industry and indigenous/reindeer husbandry.

With respect to the overlapping and conflicting interests between reindeer husbandry, forestry and conservation interests are similar to in Jokkmokk.

5. Overview of the forestry hubs in Austria as a Learning Case

This will provide a detailed overview of the forestry hubs in Austria. It will discuss the current forest/ forestry within the hubs, and the important forestry regulations affecting the area.

5.1 Mariensee

The private forest company “Forst Schenker” in Mariensee, Lower Austria has a size of about 2000 ha, of which 1700 ha are forest, 170 ha are “Alm”/mountain pasture, and 50 ha are meadows. It is divided in two forest districts, Mariensee and Linsberg.

The area is part of the „Wechsel“-Gebirge in the eastern central alps with altitudes from ca 800 – 1700m above sea level.In this area, spruce does historically play an important role – until about 1865, local forgeries and hammer mills needed wood and coal, resulting in large clear cut areas that were re-afforested with spruce. Nowadays, the forest company relies on a greater diversification of tree species: spruce, larch, silver fir, sycamore, ash, beech are the most important tree species. Today, natural rejuvenation and smaller cuttings are preferred instead of big clearcuts.

The forest company provides a broad range of products in addition to forestry: not only sawn timber, industrial wood and fuel wood, but also hunting permits, rent and lease of buildings and other properties, income from district heating, energy from photovoltaic, hydropower, water for artificial snow, drinking water, and services to other forest owners.

Five wells on the forest company’s land provide the local residential area with drinking water. Water is also used to power a small power station, which provides the forest company with an additional income independent from wood harvesting.

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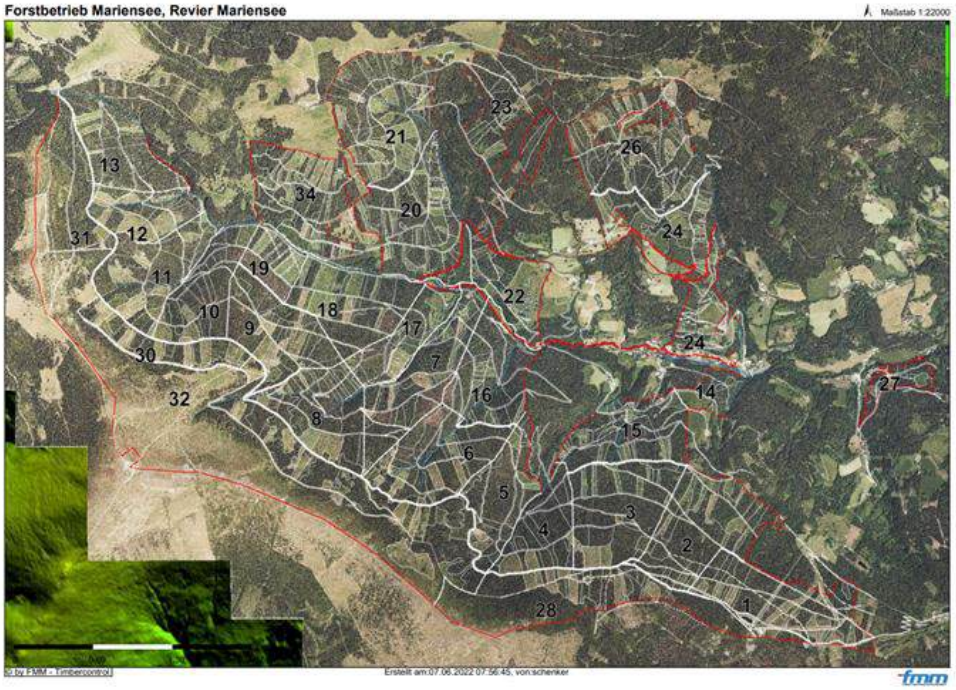

Figure 19. Forest hub Mariensee – forest district Mariensee

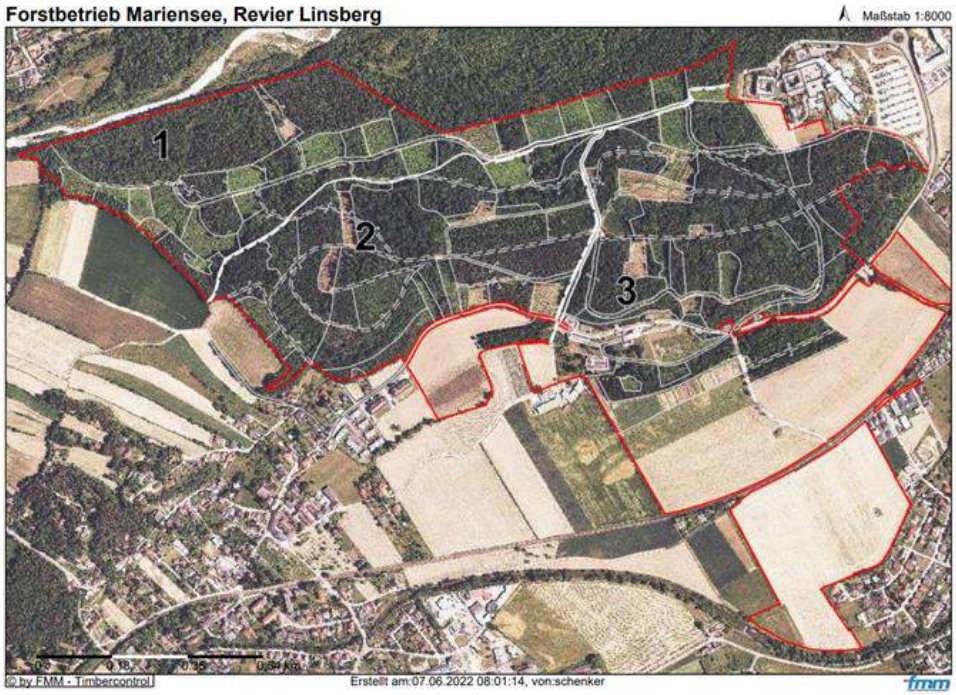

Figure 20. Forest hub Mariensee – forest district Linsberg

Tourism plays an important role in the area: many different hiking trails attract hikers, and in winter, cross-country skiiers visit the “Wechsel-Simmering-Panoramaloipe”, which partly runs along the forest roads. The forest company also leases areas for the use as ski slopes for downhill skiing.

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In 2018, Forst Schenker has started a cooperation with the “Wexl Trails”, a local enterprise that sells tickets to mountainbiking trails.

The company has a business value of about 70 million € and has a yearly harvesting amount of about 12.000 m³ wood with incomes of about 90 € per cubic metre.

Silvicultural costs amount to slightly more than 70.000 €. The most important operating costs are harvesting costs (about 275.000 €), thinning costs (85.000 €), and costs for forest roads (about 50.000 €).

The forest company is employing 5 employees full-year and additionally 4-6 seasonal workers every year. The employment structure is, typically for forest enterprises, dominated by men (75%), with an average age of 36 years.

There are 7,5 ha of forest which are under nature protection. Important regulations affecting forestry activities in the area are the Austrian forest law (“Forstgesetz 1975”), which for example contains hazard zone plans ("Forstgesetz-Gefahrenzonenplanverordnung”). Those determine which areas are susceptible to natural hazards and might need silvicultural measures for protection, and they can greatly influence the values of properties. The law also imposes regulations for the conservation of protection forest, like regulations on clearcuts on certain sites. In the forestry hub Mariensee, this concerns mostly the site protection forests, of which there are 165 ha. However, there is also one area of 10 ha with object protection function, where no regular timber harvesting is done and the forest is only managed to conserve its protective function (“Bannwald”).

The hunting law of Lower Austria (“NÖ Jagdgesetz 1974”) determines also how to deal with forest damages by wild game (e.g. browsing, bark peeling damages). The owner of properties damaged by wild game can request a reduction of the damaging wild game species with the local hunting authorities. The owner of damaged silvicultural properties can demand financial compensation within four weeks. In reality, this is rarely done and leads to potential conflicts. For the forestry hub Mariensee, this does however have little impact, because the hunting there is organized by the land owner itself with trusted hunters, so that there are no conflicts.

The forest company is PEFC certified. While this is not seen as restricting management practices, since the Austrian forest law is mostly stricter than PEFC regulations, it also does not offer much of an advantage anymore, since more than 75% of Austrian forests are PEFC certified (PEFC Austria, 2022).

In an interview with the owner of the forest company “Forst Schenker”, which represents the forestry hub Mariensee, the most important driving forces for adaptation and change were identified as *tourism/recreation* and *societal change/expectations from society*. Other drivers that have called for adaptations of management and measures are climate change, *changes in the timber market* and the *covid pandemic*.

One of the strongest drivers for adaptation is identified by the forest owner as *tourism and recreation*. While there is certainly some conflict potential, there is also a lot of potential for communication and cooperation – the forest company is already working successfully together with an enterprise that provides mountain biking trails on the forest company’s grounds, and hikers’ interests were and are considered, for example by designing round trails and avoiding blocking forest roads for harvests during tourist seasons.

Similarly, *societal change* was identified as an important driving force – society’s growing interest in sustainability, nature protection, and climate change protection are especially noticeable in forestry

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and call for a better communication with the general public. Forst Schenker is doing so with targeted and informative rather than restrictive public relations work – informing forest visitors about which activities are done and why, and connecting timber harvesting with the sustainable end products obtained from wood have proven more successful than trying to keep visitors "out of the forest" and away from harvesting measures, for example.

Climate change, one of the globally most important driving forces for adaptation in forestry has not yet impacted the forestry hub Mariensee too negatively – the colder and rather wet local climate as well as good forest hygiene seem to have avoided larger amounts of damaged wood by bark beetle, for example. Still, the forest company Schenker is taking action to be prepared by diversifying their tree species composition and careful selection of provenances of the seedlings. Climate change was also identified as an important driving force for societal change. It does not only bear the risk of increasing damages by forest pests and droughts, but also lead to an increased need for carbon sequestration and sustainable and renewable products, where forestry might even find new chances for positive developments.

Another driving force is the *timber market*. Large amounts of damaged spruce timber in the past years have made it hard for many forest companies to manage their forests as usual.

The *Covid-pandemic* has been a driver for adaptation and change in all aspects of everyday life as well as industries in the past two years, and it has affected forestry as well; however, the forestry hub Mariensee was not impacted too strongly by it, aside of a three week production stop of the sawmills at the beginning of the pandemic.

5.2 Liezen

The forest enterprise Franz Mayr-Melnhof-Saurau working in the area is the largest private forest enterprise in Austria, owning a total of 32 400 ha of properties, 21 800 ha of which are commercial forest. Those forests are situated in altitudes of 430 up to 2200m, 5600 ha are defined as protection forest. About 75% of the enterprises' forests comprise of coniferous trees, 15% are larch, 10% beech forests and other deciduous species like ash, sycamore, cherry, and oak. Timber production is the main service provided with an average yearly harvest of 180 000 m^3, but the enterprise also diversifies by renting and leasing properties (about 2000 apartments), having a tree nursery to supply the own needs for seedlings, and selling hunting permits and renting hunting areas. Additionally, services like consulting and forest road construction are offered. The subsidiary MM Ökoressourcen GmbH has specialized on development of renewable resources in the area, and is currently operating four small hydropower plants; more projects are planned. A part of the company buildings are heated by biomass heating plants supplied with wood from the enterprises' own forests. A farm owned also by Franz Mayr-Melnhof-Saurau is producing rye and cattle on 170 ha; another 1230 ha alpine pastures can be rented by local farmers.

The forest enterprise divides into 11 forest districts with about 2000 – 3000 ha each, as shown on the map below:

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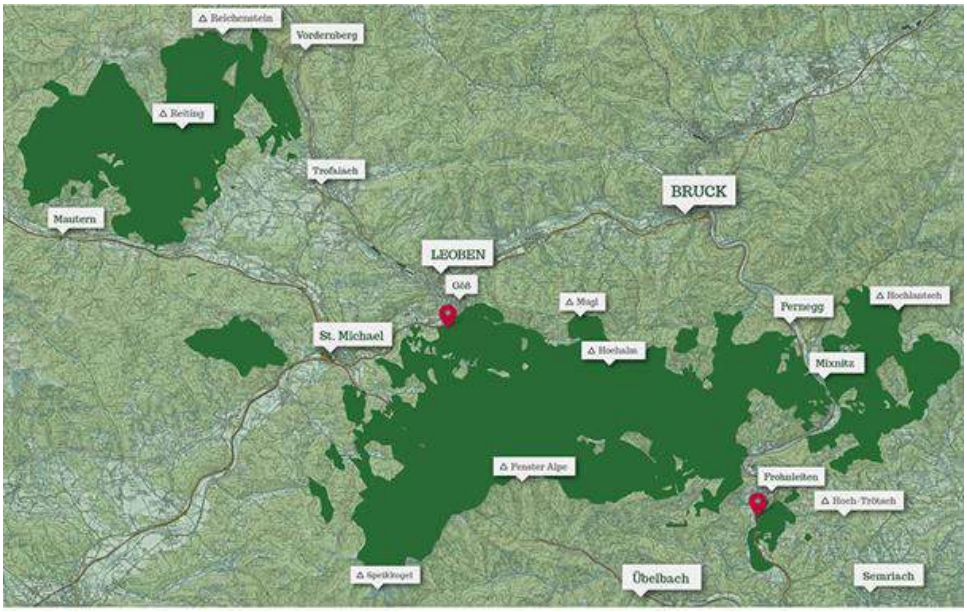

Figure 21. The forest districts of forestry hub Liezen

In Leoben, there is also the sawmill Mayr-Melnhofer Holz, which is producing about 700 000m³ of sawn timber and 95 000 to of pelles yearly and employing about 330 job holders.

6. Discussion and conclusions

For a long time, the forest industry has played an important role in Northern Finland and Northern Sweden which constitutes an integral part of the national economy. The wood processing industries process harvested timber to meet the local wood demand. However, there are no wood processing industries in Jokkmokk, and Gällivare so most of the harvested timber is transported out of the municipality. The forest industries also generate employment. The table below provides the summary of current forestry/ forest industry within hubs.

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Table 5. Summary of current forestry/forest industry within the hubs

	Kemi	Kemijärvi	Jokkmokk	Malå	Gran Sameby	Gällivare
Main operator	Metsä Group pulp- or bioproduct mill	Keitele Group	no wood processing industry, meaning that most of the harvested timber is transported out of the municipality.	Setra Malå sawmill		most of the harvested timber is transported out of the municipality, as there is no local wood processing industry.
Employment		120 workers	96 persons are employed (82% men)			174 persons are employed in forestry operations (79% men)
Wood consumption	3,1 million cubic meters of wood	700 000 cubic meters of pine and spruce sawlogs				
Products	Sawn timber	sawn timber, planed products, finger-jointed structural products, gluelam and side products	timber	timber		harvested volume per hectare (productive forest land) can be estimated to 1.96 m3sk/ha and net turnover from forestry per can be estimated to 475 SEK/ha.
Conflicts	Concerns about sustainability of the wood use in Northern Finland Forestry has competing interests with all of those (tourism, hunting and gathering of natural products).	Concerns about sustainability of the wood use in Northern Finland competing interests with reindeer herding, tourism, hunting and gathering of natural products and its wood procurement area	forestry is by most reindeer herding communities considered as the most impending threat to reindeer husbandry	complex land-use situation where mining, wind power developments, and infrastructure projects overlap with the land use needs of Sami reindeer husbandry	forestry strongly affects the behaviour and the well-being of the reindeer	important timber resource for neighboring areas but at the same time this land is also important grazing land for the reindeer herds a number of expansions of existing mine are planned and proposed which is expected to prolong operations

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However, there has been sustainability issues on wood use in Northern Finland even though the production of new pulp mills and existing pulp mills were combined, specifically in Kemi and Kemijärvi hubs. This could lead to demand for wood in neighbouring countries such as Sweden and Russia and could also affect the import from overseas in Southern America.

Despite the positive impacts of forestry, commercial forestry especially on mountain reindeer herding communities has a variety of effects on reindeer husbandry. For more than a decade, detrimental effects on the ground lichen resource have been recorded. The key habitat for ground lichens, ancient, open pine-dominated post-fire successional stands on low-productive sites have declined as a result of extensive logging, rigorous replanting efforts, and fire suppression. Instead, dense, controlled forests that promote mosses over lichens have taken the place of such stands. Ground lichens have suffered as a result of fertilization and the invasion of lodgepole pine. Furthermore, the cover and biomass of ground lichens both significantly decline as a result of soil scarification damage. Additionally, clear-cut forestry has detrimental effects on arboreal lichen, which are crucial for reindeer during winter.

In Jokkmokk, forestry is considered a threat to reindeer husbandry as it damages the landscape and lichens to feed the reindeers. It calls for active participatory dialogue between reindeer husbandry and forestry actors. In terms of mining, there is no active mines in the area but there is an ongoing dialogue and conflict around the establishment of the Kallak mine.

The Malå forestry hub, represents a complex land-use situation where mining, wind power developments, and infrastructure projects overlap with the land use needs of Sami reindeer husbandry. The forestry hub has sawmills and timber procurement area. The mining activities are conducted in the Kristineberg mine to extract zinc, copper, gold and silver. This also needs dialogue among stakeholders to resolve the complex land use conflict.

The Gran Sameby hub is also affected by different forestry methods and different phases of forestry specifically on the behavior and the well-being of the reindeer. Here it must be pointed out that for a reindeer herder this is almost equivalent to his or her own well-being. Reindeer herding is not a job. It is a culture; it is a way of living and a quite heavy responsibility of the few that stay on. Suffering reindeer means suffering communities, at a core level.

In terms of Gällivare hub area, it is dominated by mining industry which generates employment. The area is also a timber resource and similarly as reindeer grazing area. With respect to the overlapping and conflicting interests between reindeer husbandry, forestry and conservation interests are similar to in Jokkmokk.

Forestry is also affected by climate change. According to the study of Kyriazopoulos et al. (2017) in the northern and central European regions, as a result of climate change, several moth species are attacking birch woods more frequently. Wind, wildfires, grazing, and loss of biodiversity are the primary effects of both climate change and land use change. Avalanches, root diseases, and outbreaks of the bark beetle are next. According to the authors, responses were typically scarce and limited on case studies on governance and political mechanisms that were specifically designed to restore or adapt treeline ecosystems to change.

Relative to the learning case in Austria, climate change is expected to have heavy impacts on forestry in the region (Mariensee). A decrease in water supply and an increase in bark-beetle risk threaten spruce forests in large parts of the province Styria. To better address the new challenges climate change presents for forestry, the FORSITE-project (Dynamische Waldtypisierung – FORSITE) for Styria

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was initiated by BOKU University, the federal research centre for forest BFW (Bundesforschungszentrum für Wald), and other project partners. This extensive project offers advice for silvicultural measures to convert vulnerable, spruce rich, not site-adapted forests into stable, adapted forests that can still fulfil their functions in the altered conditions of climate change. This was achieved by gathering data on soil, vegetation, and site conditions all over Styria, feeding the information into a GIS-system, and classifying forest types, for which different silvicultural measures apply. This tool is expected to help forest owners to be prepared better for climate change.

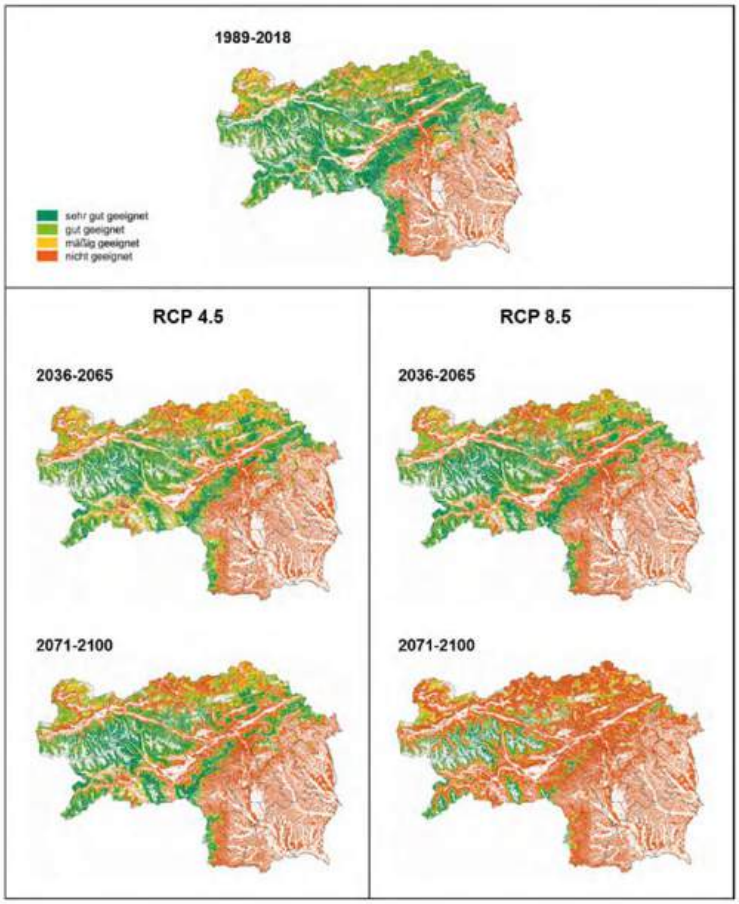

Figure 22. Suitability of spruce in Styria under current climate conditions and for two different climate change scenarios; *Source: Amt der Steiermärkischen Landesregierung, 2022*

Thus, it is necessary to develop strategies to respond to the impacts of climate change in Northern European countries similarly as how Austria develop their strategies. This will help the forest owners to improve the forest conditions.

Generally, the forest sector has positive impacts economically but the negative impacts are primarily on competing land use interests. It needs reconciliation between the actors to sustainably manage the forests. In terms of expansion of sawmills, such as in Mala, the actors should consider the advantages and disadvantages of the expansion of industries regarding the timber resource. Further, the social, ecological and economical sustainability should also be taken into account. In development of plans and strategies, it is necessary to understand the different perspectives of forestry in the hubs of the region.

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1. Introduction

The aquaculture for salmon and trout production has become a tremendous success in the Arctic region. It has become a multi-billion industry with great impact in job creation, trade and community development in rural areas. In general, aquaculture in the Arctic is still limited, but is experiencing strong growth: Norway dominates the sector mainly through salmon farming, and Norwegian companies are leading the expansion of the same production in Iceland too (Chambers et al., 2021). In Iceland the industry is still pretty small (0,3% of GRP in 2018) but it experienced the largest growth in income, that tripled between 2015 and 2018, in contrast to fisheries, whose income was 19% lower in the same period (ECONOR 2020). Faroe Islands economy is historically built upon marine resources: fisheries are still dominant compared to aquaculture, but the second one is rapidly growing (ECONOR 2020).

Beside the economic importance of the industry in the Arctic countries in terms of contribution to the GDP and employment, aquaculture has other positive features: First of all, "recent international policy directives from the UN recommend replacing meat with seafood" since the lower environmental impact: this means that an increased availability of animal proteins from the sea could help meeting the climate goals sei in Paris Agreement. Furthermore, it is less affected by climate change compared to commercial fisheries, and the warming water temperature could actually increase productivity in the northern regions (Chambers et al., 2021). Finally, customers often prefer healthy, nutritious and sustainable food, especially when it has a "unique story" underneath: food from the Arctic could satisfy all these characteristics (Natcher et al., 2021)

Although the success measured in economic terms is big, there are some dark clouds affecting the industry. As a new industry in the Arctic region, there are concerns related to sustainability and environmental impacts, influence on wild fish stocks, especially when it comes to local effects on both wild salmon and other wild species. Traditional users of the sea area are concerned on how the new activity impacts the traditional uses of resources and competes with other industries like fishing, tourism and indigenous use of fjords and rivers. However, this is not the only possible outcome, since positive synergies could be created between different sectors. For example, an increasing number of tourists will not only increase the demand of food in general, but it could also provide opportunities for the creation of new products, benefitting especially local food producers, since "regional products are of particular interest to tourists" (Natcher et al., 2021)

When area conflicts occur, they create controversies that have an impact on the aquaculture industry development and especially on its growth. Company social responsibility (CSR) and Social Licence to Operate (SLO) have become more and more important and affect the possibility of obtaining new production permits and sites. Questions about fair economic distribution with contributions to municipalities and local people are important to prevent the local population from perceiving the local area as an aquarium for the aquaculture industry, with more disadvantages than advantages. Environmental, social and economic sustainability for the arctic aquaculture industry is a key factor for resilience and development.

Another significant challenge is that "there is a general shortage of skilled labour in many rural and remote areas", and this limits the possibility for the industry to grow and develop innovations (Natcher et al., 2021): this shows the complex relation between population, education and the industry, since on one hand the growth of a sector such as aquaculture could help mitigating the phenomenon of outmigration from rural areas, but on the other site it's challenging to establish a prosperous industry in areas with a lack of workforce, especially the qualified one. To make sure that all the potential socio-

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economic benefits are enjoyed, sustainable solutions have to be found with the cooperation of different local actors: examples from mining show that, for instance, the creation of an industry-specific high school program could help in recruiting young trained people in the sector.

ArcticHubs project includes four fish farming hubs in three northern European countries, Norway, Iceland and Faroe Islands. A learning hub in Canada was included, but the responsible partner withdrew from the project and it was therefore removed. The four European fish farming hubs are all co-located with tourism hubs, and both Varangerfjord and Egersund also with mining hubs. Fish farming is well established in Norway and the Faroe Islands, while in Iceland, salmon farming has been rapidly increasing since 2010.

2. Overview of the fish farming industry in the selected countries

2.1. Iceland

Culturing of salmon for propagation has a long history in Iceland and salmon ranching started in a state-owned fish farm in the 1960s. The business model of ranching was to augment natural salmon runs for sport fishing. In the late 70s and early 80s a couple of large ocean ranching farms were established, but both were short lived (Júlíus B. Kristinsson, 1992; Ásgeir Jónsson, 2014). Today ranching is exclusively for sport fishing, and two of Iceland's main salmon rivers rely entirely on the release of hatchery produced smolts. Farming salmon for food started in Iceland in the 1980s, both with land-based operations and in cages, but experienced catastrophic losses and went bankrupt. The next growth period in salmon farming started with cage farming in the east of Iceland in the late 90s. Production gradually rose to about 7000 t in 2006, but disease in a major provider of smolts led to a crash in the industry which had all but disappeared in 2008. In recent years salmon farming has been growing again driven by foreign investment in cage culture in the Westfjords and in the east.

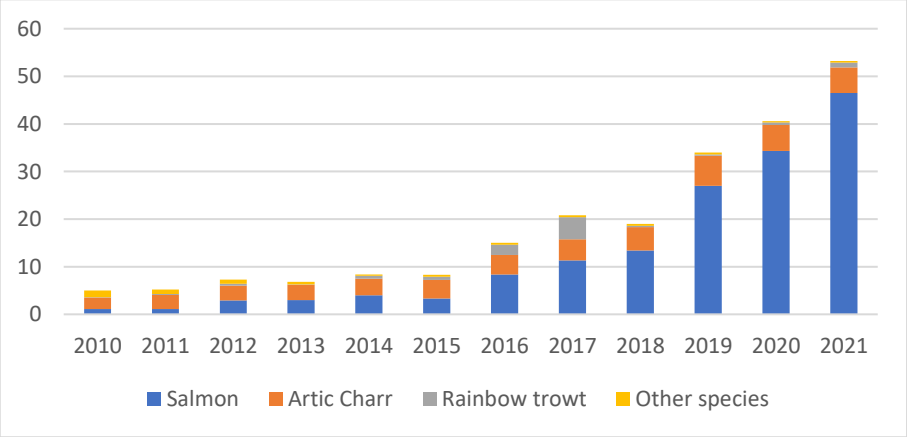

Figure 1. Aquaculture production–thousands of tons (Radarinn–The fishing industry´s dashboard)

Figure 1 shows the rapid growth from 5000 t to around 55.000 t in aquaculture production since 2010. As seen the growth has mainly been in cultivation of salmon in sea-cages, but cultivation of Artic Charr has been stable, while cultivation of rainbow trout and other species has declined, which have mostly been cultivated in land-based facilities (Radarinn – The fishing industry´s dashboard).

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Figure 2 shows the value of export from 2011-2021. It shows the same pattern as in aquaculture production. In 2011 aquaculture production was exported for ISK 3.5 billion but in 2022 the value export had increased to ISK 29 billion, with salmon the biggest export product. However, the export value of Arctic Charr has also increased, but shows more stability. The same can be said about exporting fertilized eggs and other species (Radarinn – The fishing industry´s dashboard, n.d.).

As aquaculture production increases, so does the value of export.

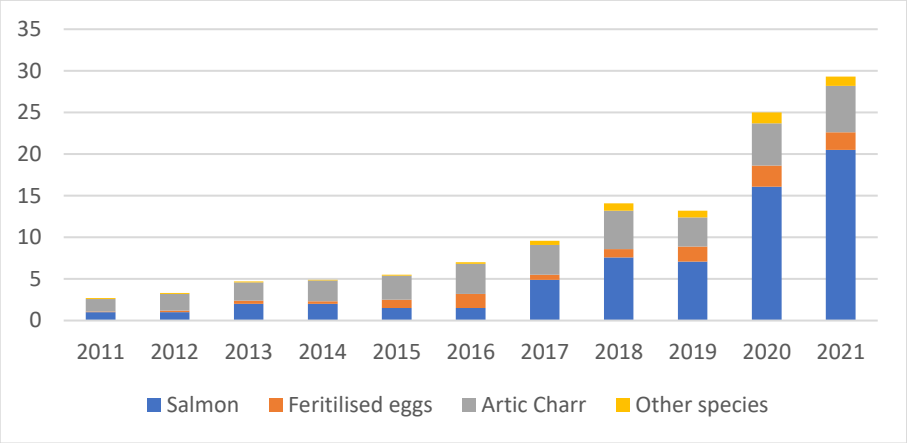

Figure 2. The value of export in aquaculture – ISK billions (Radarinn – The fishing industry´s dashboard, n.d.)

The aquaculture companies have established themselves in the Westfjords and East Iceland because the fjords in the area are suitable for aquaculture in sea-cages and the Icelandic legislation allows aquaculture in these areas (Ásgeir Jónsson, 2014). In the beginning the companies were founded and owned by Icelanders, but in recent years Norwegian companies have bought the majority of companies´ shares. That has led to a market concentration as few big parent companies, who operate globally and are listed on the Oslo Stock Exchange, own more than one company (Arnarlax, n.d.; Arctic Fish, n.d.; Helgi Bjarnason, 2022).

Even though around 45.000 thousand tons of cultivated salmon is being produced in Iceland in 2021 the companies have plans of an increase up to 70 thousand tons per year (Ásgeir Jónsson, 2014). Such a large-scale industry puts enormous strain on the rural communities of Westfjords and East Iceland, who have for a long time been struggling to maintain the well-being and quality of life of their inhabitants (Ásgeir Jónsson, 2014; Edvardsdóttir, 2016).

Up till now the traditional fisheries companies have focused on traditional fishery, but recently at least two major Icelandic companies, Samherji and HG are establishing themselves in the aquaculture industry; Samherji focusing on land-based facilities in south and northern part of Iceland to cultivate Artic Charr and salmon and Hraðfrystihúsið Gunnvör (HG) has been granted license in cultivating salmon in open-sea cages in the Westfjords (Samherji, e.d; Hraðfrystihúsið Gunnvör, e.d.). The reason for this shift is that it is estimated that in the next 10 years aquaculture´s value of export will be more than of traditional fisheries and then aquaculture production would be a bigger industry than traditional fisheries (Ásgeir Ingvarsson, 2022).

When looking into conflicts regarding aquaculture at national level, the North Atlantic Salmon Fund (NASF) which is an international volunteer organization founded in Iceland is worth introducing here as the strongest opponent to aquaculture along with the Icelandic Wildlife Fund. These two NGO´s

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main objective is to protect wild salmon in the North Atlantic Basin and other freshwater fish in lakes and rivers. The Funds are outspoken about its opposition against large-scale aquaculture in open pens on Icelandic shores and uses every opportunity to draw attention to the subsequent danger to the wild salmon and the environment. However, the Funds supports sustainable aquaculture in closed systems and favors land-based facilities (NASF, n.d.; Icelandic Wildlife Fund, n.d.).

2.1.1 Laws and regulations regarding aquaculture

The law about aquaculture nr. 71/2008 states that the main goals are: ii) to create conditions for development of aquaculture and by that promote the economy and settlements in Iceland, and ii) support responsible aquaculture and ensure the protection of wild species. Therefore, it is important to ensure the quality of the production, prevent possible pollution on wild exploitable marine stock and their biological environment and ensure the interests of those who exploit those marine stock (law about aquaculture nr. 71/2008).

According to the law about planning of ocean and coastal areas, which replaced older law from 1979 (nr. 88/2018), the minister of infrastructure is responsible for the matter of planning activities in coastal areas, including the fjords. The goals of the law is that i) exploitation and protection of coastal areas should be in harmony with a plan that has economic, social, and cultural needs of the nation, their health and safety, ii) planning should create a foundation for diverse exploitation of ocean and coastal areas resources, which is based on a vision of the issues of the ocean, ecosystem approach and protection of nature and cultural heritage, with sustainable development as a guiding light and take notice of climate change, iii) ensure that legal certainty in planning processing, so that the individual's right and legal entity do not suffer, even though the nation interest is the guiding light, iv) to ensure consultation and cooperation with municipalities about coastal planning, v) to ensure consultation with the public and other stakeholders in planning and vi) to ensure professional preparation in ocean and coastal areas planning (law about ocean and coastal areas planning nr. 88/2018).

This means that exploitation of natural resources, including natural resources in the fjords should be done in a sustainable way and municipalities and their inhabitants should be consulted when planning activities in the fjords.

However, the aquaculture companies must apply for a license to operate in the fjords and for that they must apply to governmental official organizations. They base their decisions on an evaluation on each fjord´s carrying capacity, done by another governmental official organization called Marine and Freshwater Research Institute (resolution on aquaculture 540/2020). It is noteworthy that even though the ocean and coastal areas law stresses a consultation and cooperation with municipalities and inhabitants about the exploitation of natural resources of the fjords, it is not addressed in the license to do so. As it is practiced today, the companies do not have to get a social license to operate from the municipalities and inhabitants, enough is to get license from the official organizations on how much production is allowed (Iceland Regional Development Institute, 2017).

2.2 Faroes Islands

The Faroe Islands, or the Faroes, are an archipelago of 18 islands in the North Atlantic, approximately midway between Iceland and Norway. Land area is 1399 square kilometers, and the population was 53.641 per January 1st, 2022. Politically, the Faroes are an autonomous nation within the Danish Kingdom, together with Greenland. The Faroes were settled some time between 300 and 800 AD, by

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Celtic and Norse settlers, and belong to the Norse cultural tradition with their own language, Faroese, and a distinct culture. The Faroese landscape is dominated by mountain pastures, which are grazed by sheep, also giving the islands their name, Føroyar, meaning "Sheep Islands".

2.2.1 The Faroese economy – from fisheries to aquaculture and tourism?

Traditionally, the Faroese economy has been dominated by industrial fisheries, and fish and fish products still make up between 90 and 95 percent of export value and 20% of GDP (GFI 2022). In recent decades, initiatives have been made to promote new industries. New industries are perceived as necessary to modernize, strengthen and diversify the Faroese economy and society, for instance by creating more diverse employment opportunities and so on. In the Faroes the new industries that have emerged and which are increasingly dominating in Faroese society, are aquaculture and tourism. Aquaculture has become a very important element in the Faroese economy during the past decades, and in recent years aquaculture has accounted for around 40% of export value. As is seen in Figure 3, industrial fisheries do however still dominate. In comparison, tourism was estimated to be around 2% of GDP before Covid19.

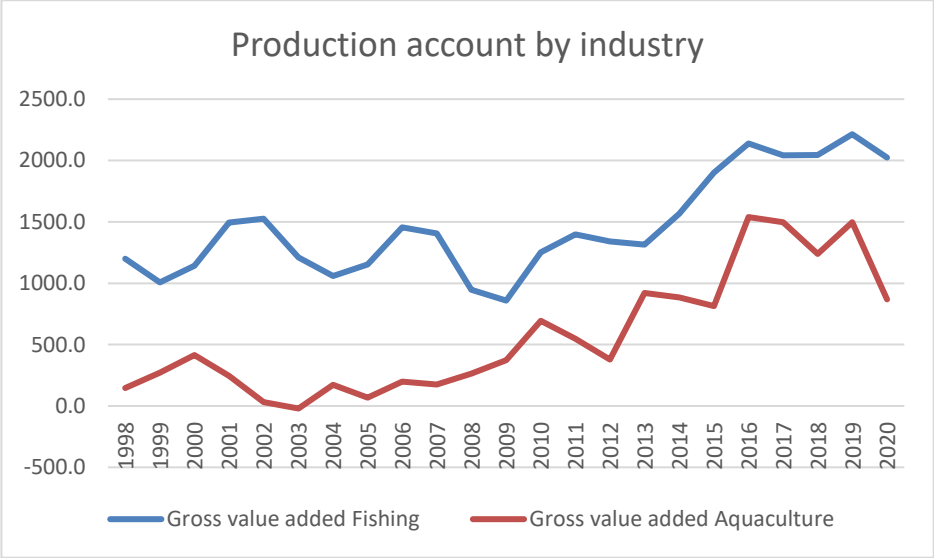

Figure 3. Production account by industry showing fisheries and aquaculture. *Source: Statistics Faroe Islands*

2.2.3 Socio-economic change and the new global industries

The changes in the Faroese economy mean that aquaculture and tourism now have a big influence on society, and the Faroes may indeed be seen as a "hub" for tourism and aquaculture. The recent success of the pelagic fisheries and aquaculture industries have meant that economic growth rates have been very high, and during the past years population growth in the Faroes has been rapid (Figure 6), but Covid19 and the new political situation with the Russian invasion of Ukraine has exposed the vulnerabilities of the Faroese economy. However, with its isolated position and small size, and the great economic reliance upon only one key resource (fish), the Faroes are part of a peripheral region, and outmigration especially of young and educated people is an issue that has received much attention and concern. As can be seen in the historical population statistics, one trend that has been ongoing

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since the 1950 is the outmigration of women (Figures 4 and 5), something which is characteristic of most peripheral areas in the North and the Arctic.

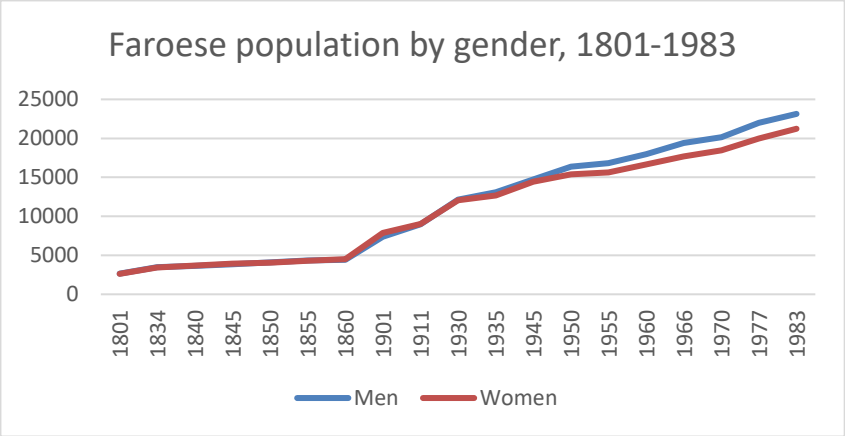

Figure 4. Total Faroese population by gender 1801-1983. *Source: Statistics Faroe Islands*

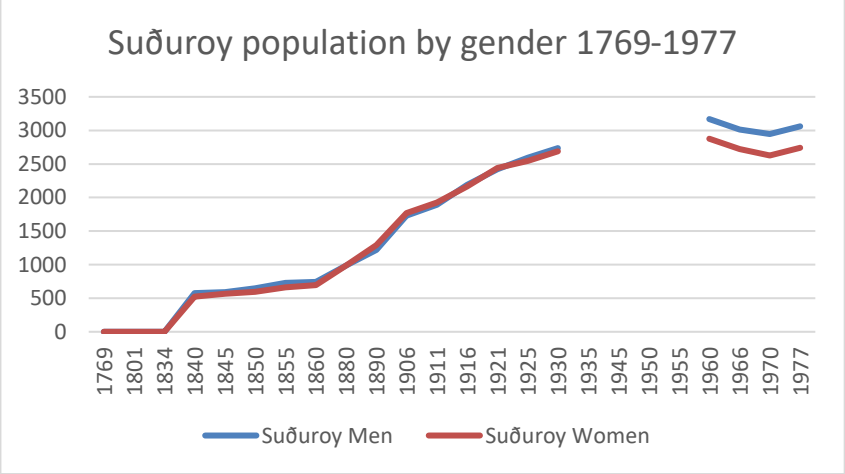

Figure 5. Suðuroy population by gender 1769-1977. *Source: Statistics Faroe Islands*

The gender ratio between men and women for the whole country per January 1st, 2022, was 27.799 men and 25.842 women per January 1st in 2022 (Figure 6). This discrepancy is often discussed as a "deficiency" of almost 2.000 women in Faroese society.

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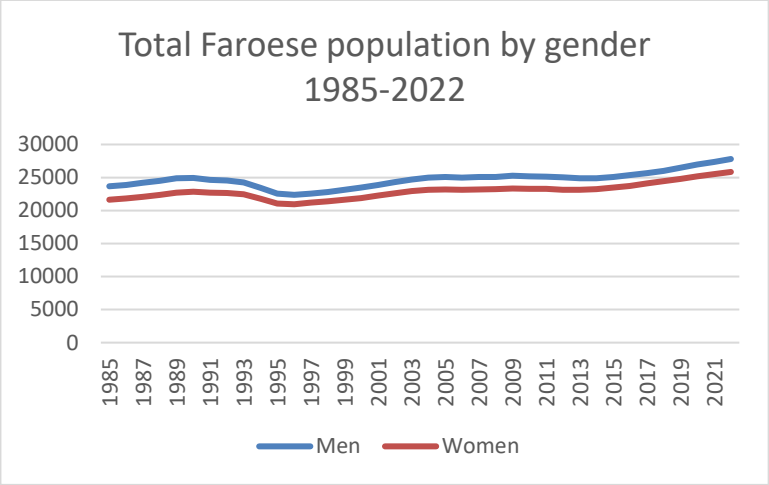

Figure 6. Total Faroese population by gender 1985-2022. Source: Statistics Faroe Islands

2.2.4 Fish farming in The Faroes

Fish farming is an industry that has grown very rapidly in the Faroes during the past 20 years. Sporadic attempts at fish farming began in the Faroes in the 1950s and 1960s, and the industry began to establish itself around 1980. In 1985 there were more than 50 fish farming companies in the Faroes (Hovgaard and Bogadóttir 2020). Today, there is no production of trout, and there are only three large salmon farming companies; Bakkafrost is a Faroese company but was listed on the Oslo Stock Exchange in 2010. Hiddenfjord/Luna is a Faroese company, and the third salmon farming operator in the Faroes is MOWI, previously Marine Harvest. As can be seen in Figure 9, production reached more than 40.000 tons in the early 2000s, but the industry more or less collapsed around 2005 because of disease and poor management. After reaching a low in 2006 production has skyrocketed to 94.823 tons in 2021 corresponding to almost 1,8 tons of salmon annually per capita. However, in recent years production under current conditions seems to have reached limits, and parts of the industry face severe problems especially with sea lice and increasing fish mortality.

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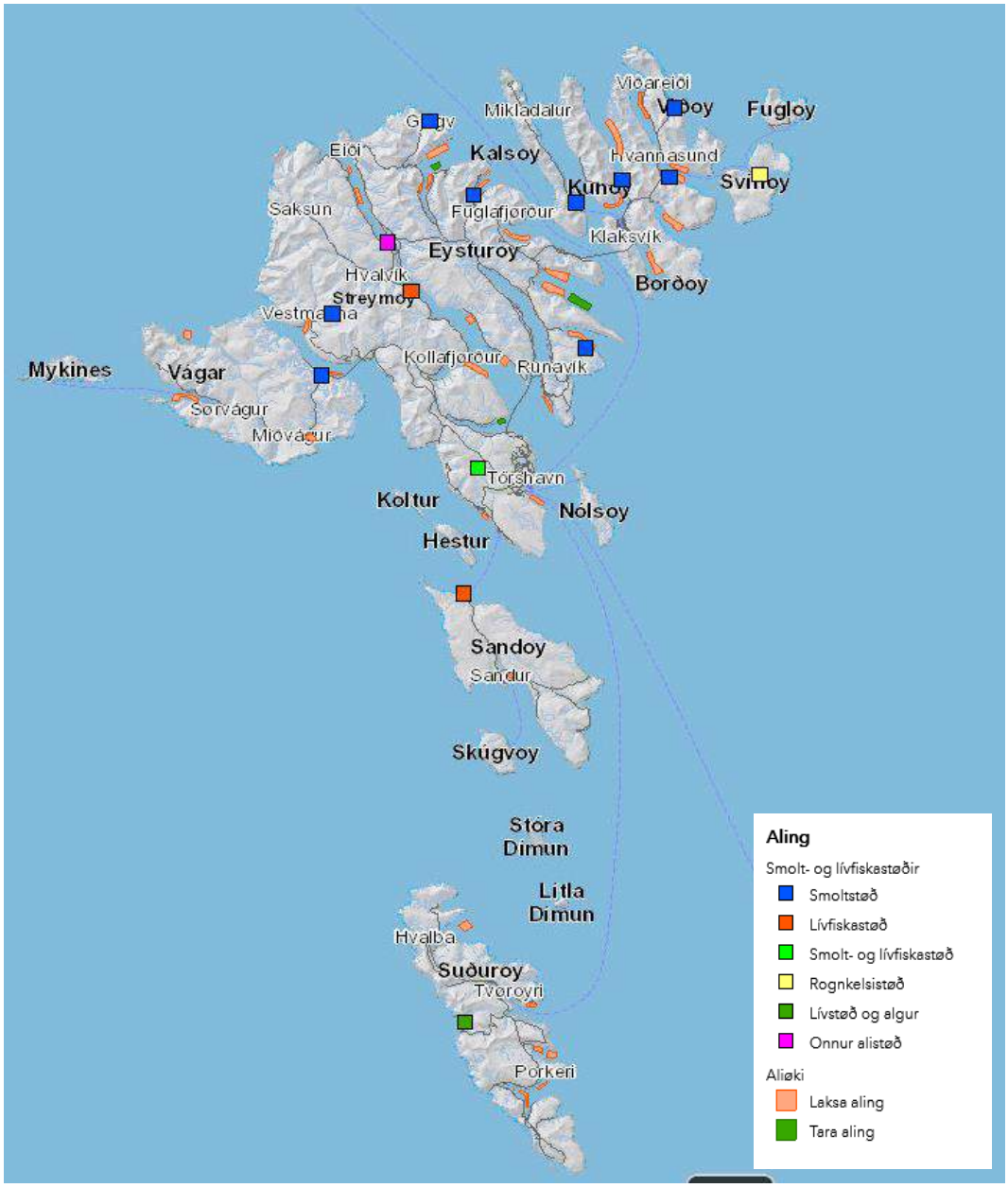

Figure 7. Map of the Faroe Islands showing sites for smolt and fish-breeding plants (squares), and aquaculture farming areas (polygons), which are almost exclusively used for salmon farming. *Source: www.kortal .fo*

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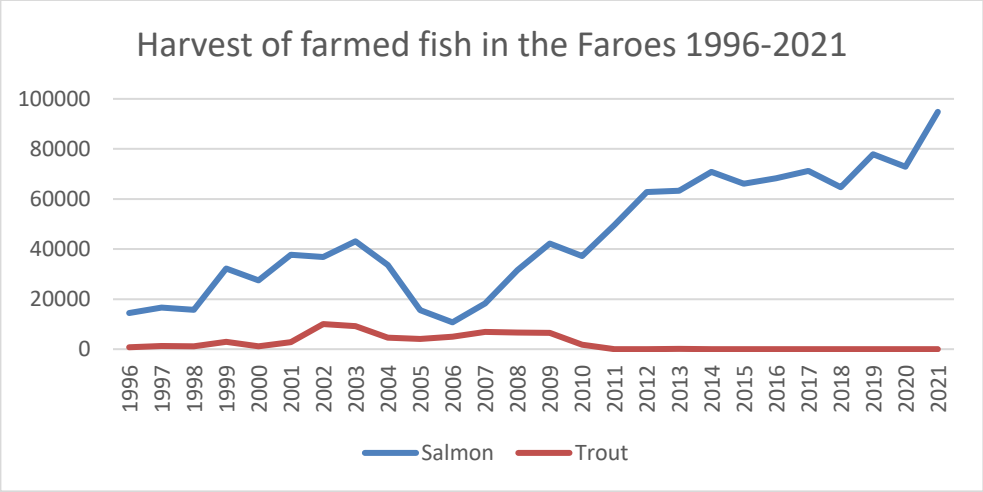

Figure 8. Annual production of farmed trout and salmon in the Faroe Islands. *Source: Statistics Faroe Islands*

In this same time period between 1990 and today, total catch of the industrial Faroese fisheries fleet has also grown, reaching a high of 701658,2 tons in 2017. Much of this growth in total catch is based on pelagic fish species (mackerel, herring, blue whiting). In 2021 total catch was 540,603.5 tons (Figure 9). In the Faroes, fisheries and aquaculture production are directly connected as large volumes of pelagic fish, especially blue whiting, have gone into the production of fish feed.

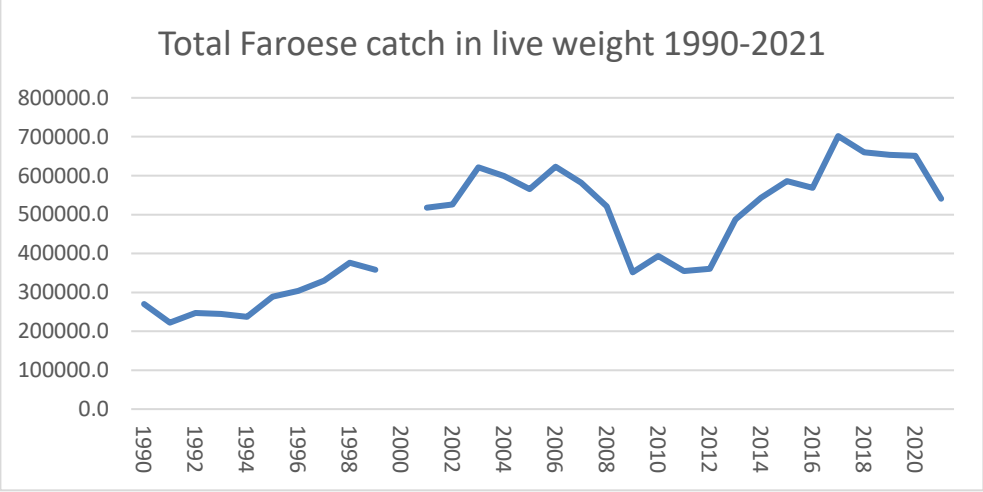

Figure 9. Total catch in the Faroes between 1990-2021. Source: Statistics Faroe Islands

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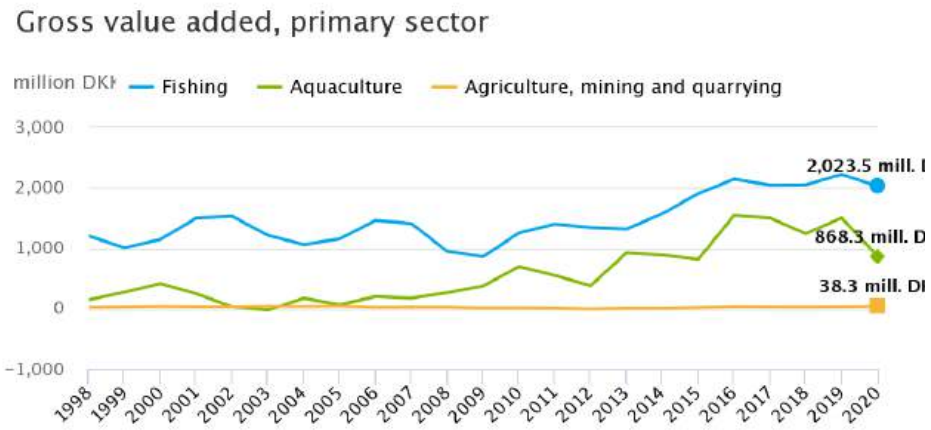

Figure 10. Gross value added in fishing and aquaculture in the Faroes. Source: Statistics Faroe Islands

2.3 Norway

The Norwegian aquaculture industry is very important and is now the largest activity in the Norwegian seafood industry measured in value. The development has been very positive, not least driven by high international sales prices and at times a very positive currency situation, which has helped to create high export values as shown in Figure 11. Production of salmon and trout measured in carcass weight round weight (Wfe) in Norway was 1,474 thousand tonnes worth NOK 68.5 billion in 2020, of which salmon to a value of NOK 65 billion in 2020.

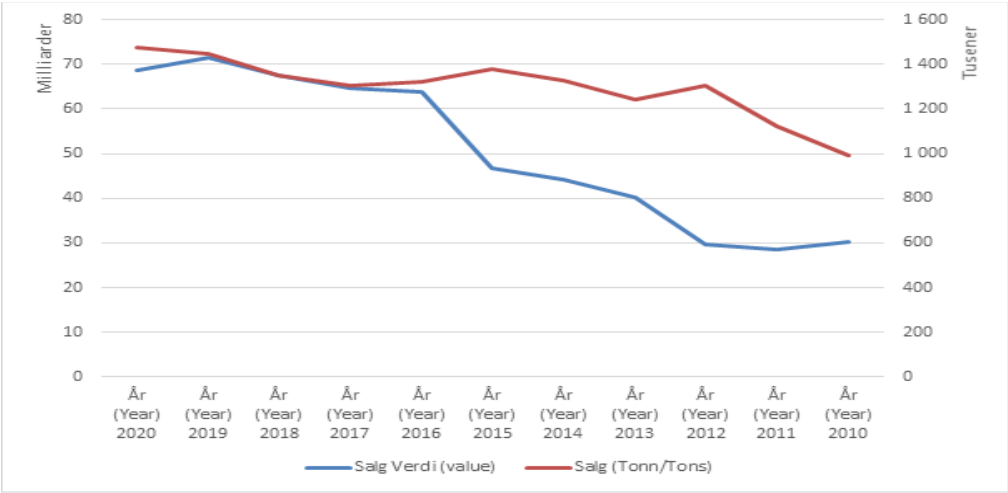

Figure 11. Production of salmon and trout measured in carcass weight round weight (Wfe) in Norway

We see that the value has more than doubled since 2010, with strong growth from 2012 to 2016. At the same time, the amount of salmon and trout produced has not increased more than 48% in 10 years. We see that the quantity sold has leveled off and has had a moderate increase from 2012 of approx. 13%. The reason for the moderate increase in volume in production is primarily that the companies have not solved the lice problem, which entails restrictions in growth based on current practice of the traffic light system. In addition, there is a high mortality rate mainly due to diseases and mechanical treatment of lice.

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In Norway 600 salmon/trout farming locations were active in 2020 distributed along the Norwegian coastline (Figure 12). Approximant 5 % was used for rainbow trout and 95 % was used for salmon production. North Norway accounts for 25 % of this production. The production has increased from 1 million metric tons in 2009 to 1,4 million metric tons in 2019 (SSB).

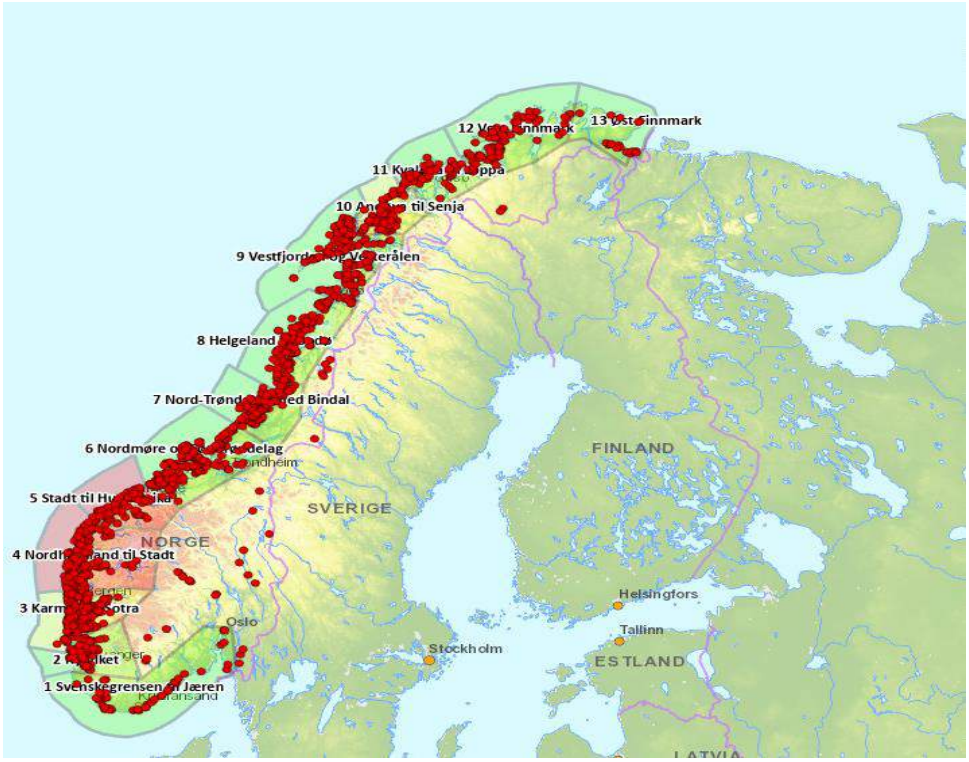

Figure 12. Salmon and Trout sites and production areas in Norway

The seafood industry is Norway's most important rural industry. The industry is represented throughout the country, but it is in the regions of Western and Northern Norway that the industry has the strongest significance for value creation and employment.

Few industries have grown more than the seafood industry in the last 15 years. In 2019, exports exceeded NOK 100 billion. The growth in the seafood industry makes Norway a richer country and is very socio-economically profitable. Value creation per person employed in the seafood industry is almost twice as high as the average for mainland Norwegian industries. The more labor and capital that is provided to the seafood industry, the higher the Norwegian future welfare will therefore be.

Through the purchase of goods and services, the seafood industry lays the foundation for employment and value creation throughout the country and in large parts of Norwegian business and industry. The total employment effects of the seafood industry's activity in 2019 were just over 90,000, while the total value creation was 127 billion according to our calculations. The figures below show the most important results from this survey.

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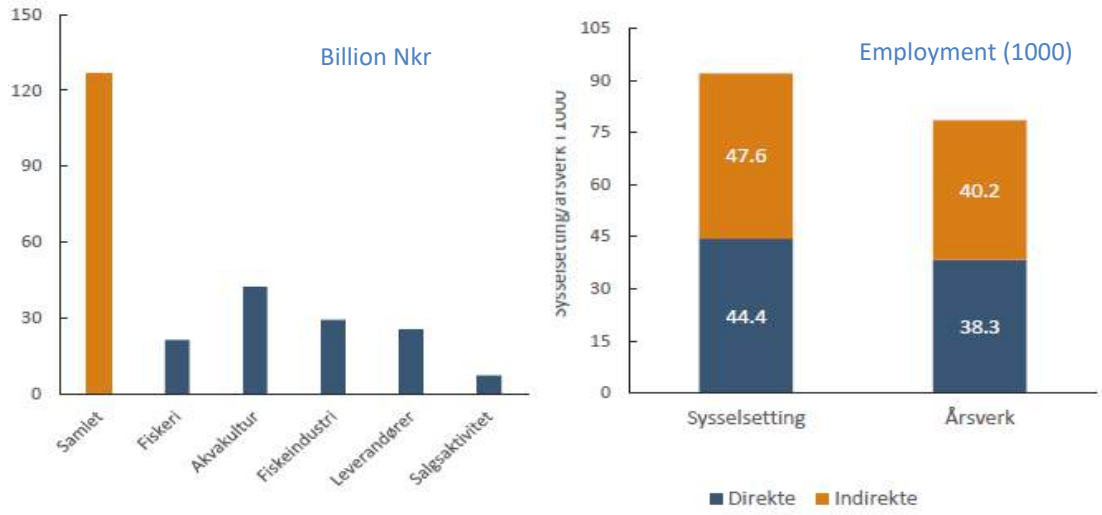

Figure 13 Total value creation effects (left) and total employment effects (right) of the seafood industry in 2019. Effects including the seafood industry's purchases of goods and services. Source: Menon Economics 2020

3. The fish farming hubs

3.1 Icelandic hub: Westfjords

The Westfjords region comprises about 9400 km² of the country's land area or 9% (NLSI, n.d.). The landscape is characterized by steep mountains and deep and narrow fjords formed by the ice age glaciers. Agricultural land is limited but rich fishing grounds and sheltered fjords have been the foundation for many settlements over the past century. The landscape and difficult road transport, especially in winter, has influenced the region´s settlement pattern, and when urbanization started in the early 20th century, many small but independent communities were formed which relied on transport by sea, and later air. Throughout the ages, the region has interacted with foreign markets, such as, selling fish to the Dutch and Germans in the 14th century, and being used as a base century for Basque whalers in the 17th century, as recent archaeological excavations reveal (Edvardsson, 2015, 2010; Edvardsson & Egilsson, 2011). In the 19th century, the Norwegians built numerous whaling stations all around the Westfjords, which operated until 1915 when Icelanders banned whaling (Einarsson, 1987).

The Westfjords peninsula may be divided into three economic areas: the North, the South and Strandir, where small fishing villages are the basis for the economy (Icelandic Regional Development Institute, 2012). There are currently nine municipalities and 13 communities in the region, as more than one smaller community belongs to larger municipalities (The Prime Minister's Office, 2007; Karlsdóttir et al., 2012).

Since 1970 there has been a decrease in the population of the Westfjords (Table 1). This decrease can be attributed to a number of factors, including: the introduction of the quota system of fisheries in 1983 and a few years later the individual transferable quota system in the fishing industry, changes in quota ownership in 1991, the bankruptcy of companies in the fishing industry, and devastating snow avalanches in 1995 (Hall, Jónsson & Agnarson, 2002; Matthíasson, 2003; Edvardsdóttir, 2016)

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However, with the recent rapid growth of the aquaculture industry in the region, the population is rising again. This is especially the case in the south, where the aquaculture industry has established itself (Edvardsdóttir, 2016).

Table 1. Demographic changes in the Westfjords region 1970-2021 (Source: Statistics Iceland, 2022a)

	1970	1981	1991	2011	2016	2022
Population	10.050	10.500	9.722	7.137	6.883	7.205

3.1.1 Education status and gender perspective

All over the world more women than men pursue university studies, and this has been the trend for some time. In Iceland this trend is also apparent as seen in table 2. Attendance in both further and university studies has increased since 2000, but the trend seems to be that men finish further education, such as vocational and short courses of studies and women pursue into university studies.

Table 2. Students attending further and university education 2000 – 2020 (Source: Statistics Iceland, 2022d)

Year	Education	Total	Men	Women
2000	Further	20.674	10.117	10.557
	University	10.126	3.798	6.326
2005	Further	24.132	11.724	12.408
	University	15.839	5.638	10.200
2010	Further	26.158	13.077	13.081
	University	18.846	7.119	11.727
2015	Further	23.947	12.309	11.638
	University	18.640	6.755	11.885
2020	Further	24.261	12.968	11.293
	University	22.067	7.550	14.517

In the context of the Westfjords region the same trend can be seen as table 3 shows.

Table 3. Students living in the Westfjords attending further and university education 2000 – 2020 (Source: Statistics Iceland, 2022e)

Year	Education	Total	Men	Women
2000	Further	672	304	338
	University	166	57	109
2005	Further	719	310	398
	University	285	100	183
2010	Further	597	285	312
	University	297	113	184
2015	Further	550	295	255
	University	275	87	188
2020	Further	507	274	233
	University	303	81	222

As seen, both men and women are admitted into further education, but women are more likely to continue studying and go to university. No university is based in the Westfjords area, so in order to pursue a university degree, one must either leave or study on-line. Various researches show that even though women in rural areas get university degrees by using distant learning methods and continue to live in their hometowns, it does not mean that they expand their action space. Women tend to

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pursue education in the field of nursing or teaching that has been linked to the public sphere of life. Even though they get a degree in financing or business administration they do not seek jobs inside the dominant industries in their community, which in the case of the Westfjords are fisheries and aquaculture. Research has also shown that in rural communities where traditional fisheries and aquaculture are the dominant industries male values are the dominant values. In such communities, women do not have the access to the dominant discourse about the system (Anna Guðrún Edvardsdóttir, 2016; Edvardsdóttir, 2013; Byrne, et al., 2013, Pini et al., 2014; Karlsdóttir og Ingólfsdóttir, 2011).

As said earlier, industry development in rural areas tends to be on large-scale primary production industries, which seem to be more suited for men, especially those who have pursued a further education, such as technicians, mechanics, or captain´s certificate. Such jobs are often well paid.

3.1.2 Vesturbyggð and Tálknafjörður municipalities

Figure 14 shows the Westfjords peninsula, but inside the circle is the southern part of the Westfjords, which is the Icelandic research area in the ArticHubs project. There are two municipalities in the southern part, Vesturbyggð and Tálknafjörður, but in Vesturbyggð there are two communities: Patreksfjörður and Bíldudalur. The lines on the map show where aquaculture production takes place in the fjords. Like other communities in the Westfjords region, the three communities have been facing out-migration, especially of young people and women, for a long time, which has led to minimum of infrastructure development and a struggle of keeping minimum services in the communities (Edvardsdóttir, 2016). However, as Table 4 shows, the population has been slowly growing in recent years. What is notable is that Vesturbyggð seems to gain more from the aquaculture development than Tálknafjörður regarding population growth

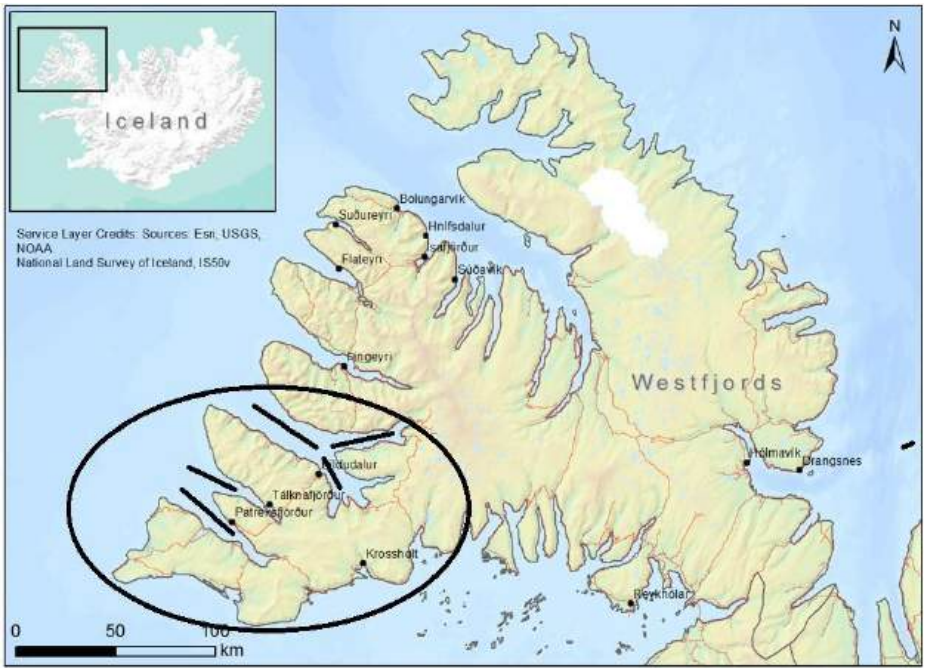

Figure 14. The Westfjords region (NLSI, n.d.)

Table 4 shows also that since 1990 more men than women live in the area and research shows that it is mostly young people and women who move from rural communities. Women seem to prefer to live

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in bigger communities where diverse job opportunities can be found and socially it seems that they feel better in bigger communities. It is also noteworthy that all over the world more women than men study at university level and are therefore not likely to move to rural communities where the job market is homogenous (Edvardsdóttir, 2013; 2016; Karlsdóttir and Ingólfsdóttir, 2011; Nikk I Norden and Nordic Council of Ministers, 2018). The gender gap seems to have widened in Vesturbyggð as nearly 100 more men live there than women. Edvardsdóttir (2013) points out that rural communities in Iceland are male dominated, with values, beliefs, and the labour market heavily linked to male dominated industries, such as: the primary production sector, fisheries, agriculture, and manufacturing industry. This suggests that the aquaculture jobs refer more to men than to women.

Table 4. Demographic changes in Vesturbyggð and Tálknafjörður 1990-2022. *Source: Statistics Iceland, 2022b.*

Years	Municipalities	Total	Men	Women
1990	Vesturbyggð	1.540	Not available	Not available
	Tálknafjörður	371	Not available	Not available
2001	Vesturbyggð	1.162	583	579
	Tálknafjörður	367	202	165
2011	Vesturbyggð	890	455	435
	Tálknafjörður	306	165	141
2016	Vesturbyggð	1.013	523	490
	Tálknafjörður	267	146	121
2022	Vesturbyggð	1.131	620	511
	Tálknafjörður	255	144	111

Figure 15 shows the population divided by age in both Vesturbyggð and Tálknafjörður municipalities from 1998.

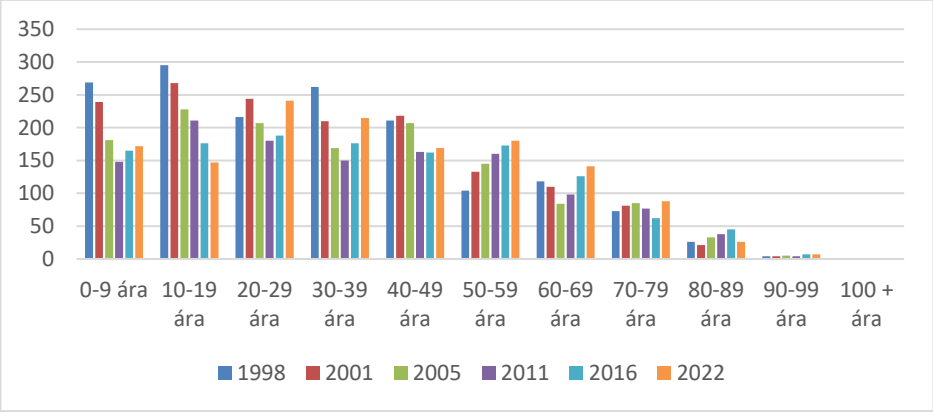

Figure 15. Demographic changes in Vesturbyggð and Tálknafjörður by age. *Source: Statistics Iceland, 2022c*

It shows a decline among the youngest age groups (0-19 years) from 1998 – 2022, however it seems that the population of the youngest age group is starting to increase again. In other age groups, the population seems to be increasing again after some time of a decline. What is noteworthy is the increase in population of the age group 20 – 29, which indicates that the out-migration pattern is changing as young people are moving to the area.

Since 2009 the number of people of foreign origin living in Vesturbyggð and Tálknafjörður has increased; in 2009 180 people of foreign origin live in these two municipalities, but in 2021 330 people of foreign origin live there (Statistic Iceland, 2022d).

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3.1.3 Aquaculture in Vesturbyggð and Tálknafjörður municipalities

Aquaculture in open sea-cages is only allowed in the Westfjords and East Iceland regions. The reason is that in 2008 the Icelandic parliament agreed a regulation that forbids cultivation of salmon in open sea-cages in areas where it is likely that the wild salmon's route into the salmon rivers lie. So, in the Westfjords and East Iceland regions no major salmon rivers can be found so the foundation for an aquaculture development in these areas were set (Kristinn Ingi Jónsson, 2013).

The cultivation of salmon in open sea-cages started in Vesturbyggð and Tálknafjörður in 2009, when Fjarðarlax was established, later Arctic Fish, followed by Arnarlax. These companies were founded by Icelanders, but foreign investors, especially Norwegians, took part in the establishment from the beginning (Kristinn Ingi Jónsson, 2023). Today, both Arctic Fish and Arnarlax are owned by the same Norwegian parent company, SalMar ASA, which owned the majority of shares in Arnarlax. Recently SalMar ASA bought the majority of shares in Arctic Fish. For now, no changes have been made, but it is assumed that the companies will merge (Gunnlaugur Snær Ólafsson, 2022).

Figure 16 shows the scale of the aquaculture production in thousands of tons since 2011, both land- and sea-based production. As seen the sea-based salmon production is at the level with the land-based Arctic Charr production until 2017 when the salmon production in Westfjords and East increased rapidly. It is estimated that it will continue doing so. In the south part of Iceland and in the north-west smolt production for other aquaculture facilities is the foundation for the operation, both for Arctic Charr and salmon.

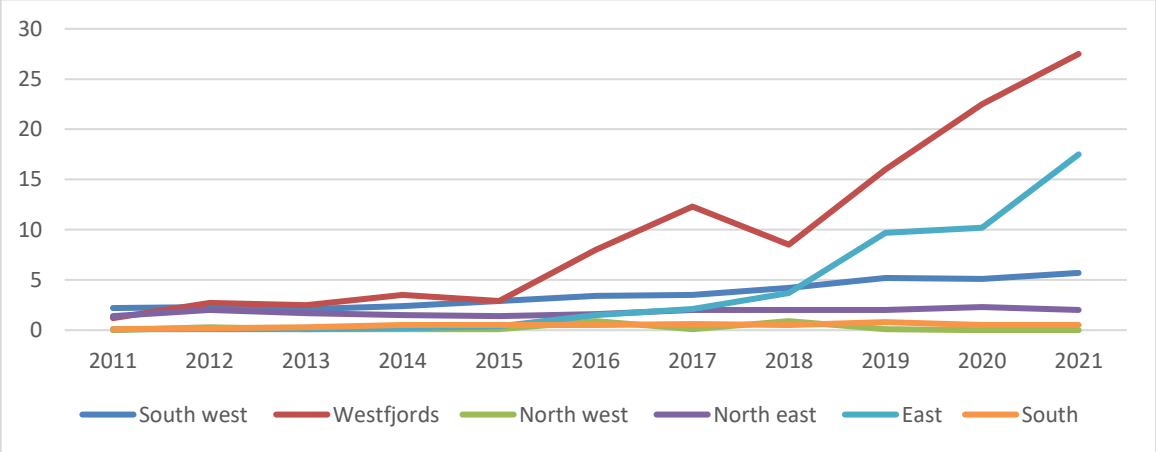

Figure 16. Land- and sea-based aquaculture by regions (Radarinn – The fishing industry dashboard, e.d.)

Figure 17 shows how much sea-based aquaculture has increased since 2011, while land-based aquaculture remains stable. The figure shows the national pattern, but the increase in aquaculture production in Iceland is mostly based on the increase in salmon production in open sea-cages in the Westfjords and East Iceland.

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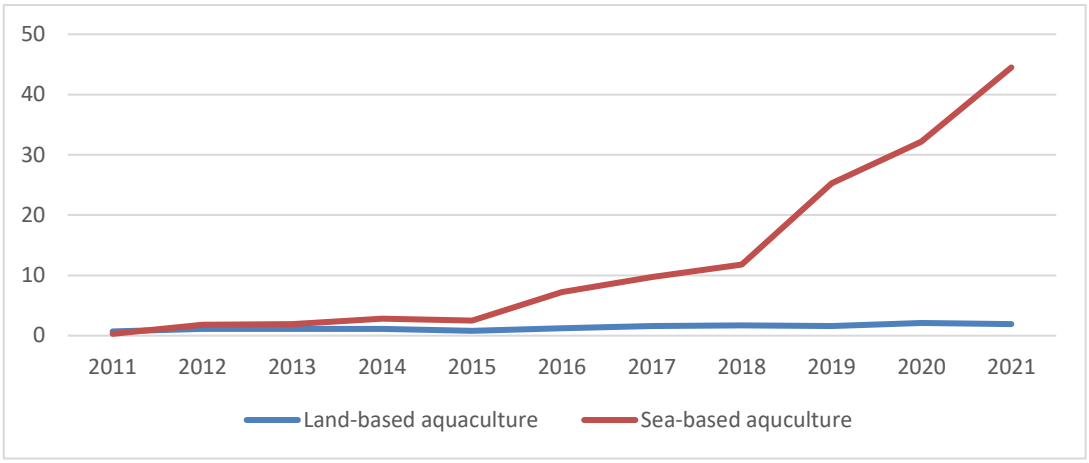

Figure 17. Land- and sea-based aquaculture in thousands of tons. *Source: Radarinn – The fishing industry dashboard, e.d.*

The number of those who work in the aquaculture industry has increased along with increased aquaculture activities. Figure 18 shows this increase from 2008 – 2018 at the national level. However, the importance of the industry is more in rural areas than in the capital area, as 87% of the aquaculture industry income is traced to rural areas.

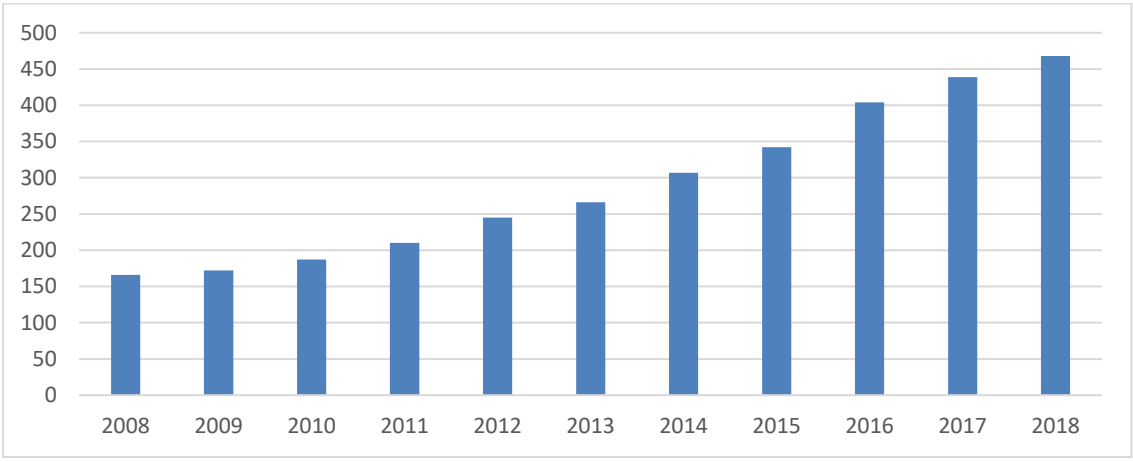

Figure 18. Number of those working in the aquaculture industry. *SourceRadarinn – The fishing industry dashboard, e.d.*

Again, this increase of job creation in the aquaculture industry is mostly due to increase in aquaculture activities in the Westfjords and East Iceland. However, it is noteworthy that at the same time as more jobs can be found in the aquaculture industry in these areas, the gender gap in Vesturbyggð and Tálknafjörður, where most of Westfjords aquaculture activities takes place, is widening. That support various research, (Edvardsdóttir, 2013; 2016; Karlsdóttir and Ingólfsdóttir, 2011; Nikk I Norden and Nordic Council of Ministers, 2018) claiming that industrial development in rural areas tend to be male oriented and the aquaculture industry follows that pattern.

Figure 19 shows the aquaculture part of employee compensation of the whole employee compensation in each region in Iceland. What is noteworthy is how important the aquaculture industry is in the Westfjords region from 0.3% in 2008 to 4.2% in 2018.

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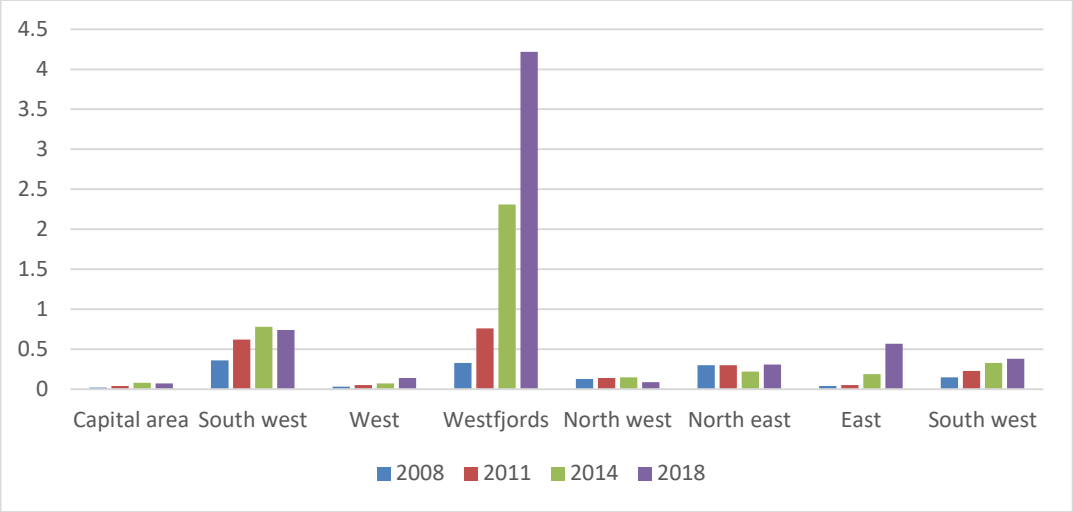

Figure 19. Portion of employee compensation in percentage by regions *Source: Radarinn – The fishing industry dashboard, e.d.*

This illustrates how important this industry has become as a major player in the future development of the Westfjords region.

When looking into conflicts at hub level, it seems that there is a consensus about the development of aquaculture in the area. At least the local interviews revealed that other industries in the region, f.ex., local fishermen, tourism, the calcareous algae mining industry, salmon anglers and the local people have reached an agreement about how the aquaculture should develop in the fjords in harmony with the other industries.

3.2 Suðuroy

Suðuroy, is the southernmost island of the Faroes. Population in Suðuroy per January 1st 2022 was 4.684 people which is 8.7% of the total Faroese population. The land area of Suðuroy is 165 square kilometers which is 11.8% of total land area. The island is divided into seven municipalities and 15 settlements (see Figure 20).

Suðuroy is today considered a peripheral region of the Faroes, but during the first half of the twentieth century, Suðuroy was the center of the transformation of the Faroes from a relatively self-sufficient peasant society to a modern industrial fisheries nation. During this period, from the late 19th century to the middle of the twentieth century, Suðuroy experienced high rates of population growth (Figure 22). After World War II Suðuroy lost its prominent position as the center of the Faroese fisheries economy to the northern region, and population growth stagnated. Suðuroy experienced population decline after the severe economic crisis that hit the Faroes in the early 1990s, and although population has remained relatively stable during the past two decades, with an upwards trend in recent years, the population is aging. Average age for men in 1985 was 35.5 years and 36.3 for women. In 2022 the average age is 42.4 years for men and 43.6 for women (Figure 23), while the average age in the Faroes was 39.5 in 2021.

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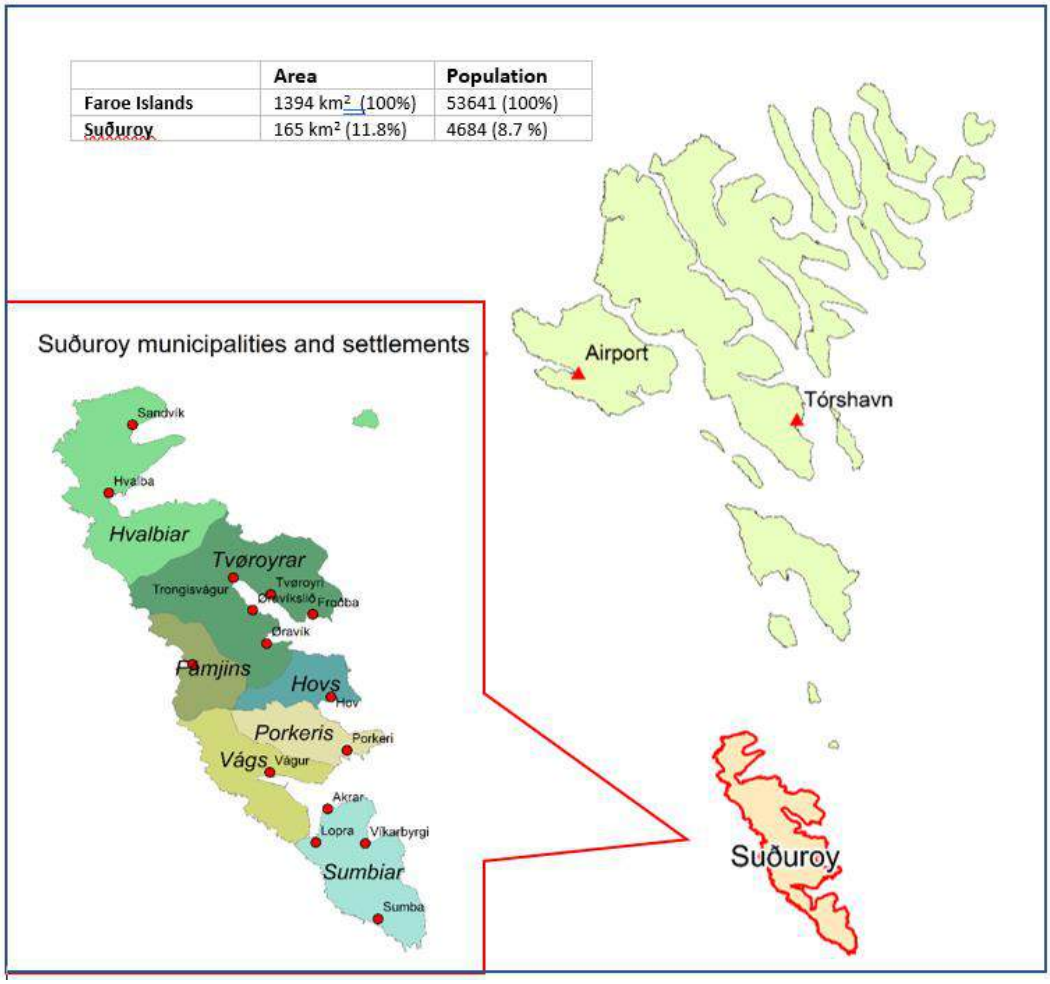

Figure 20. Suðuroy municipalities

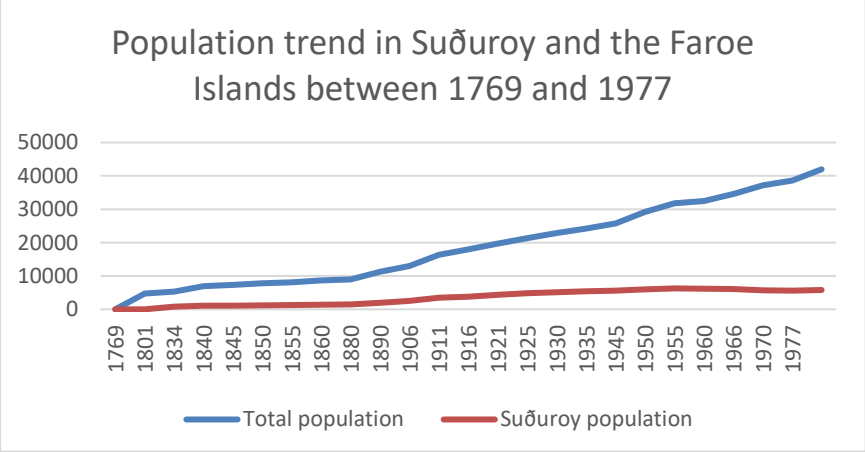

Figure 21. Historical population figures for Suðuroy and the Faroe Islands. *Source: Statistics Faroe Islands*

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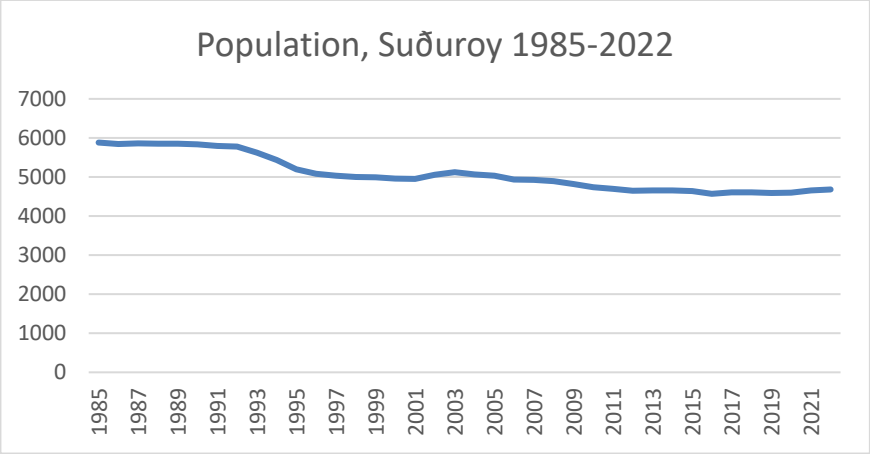

Figure 22 Suðuroy population 1985-2022. *Source: Statistics Faroe Islands*

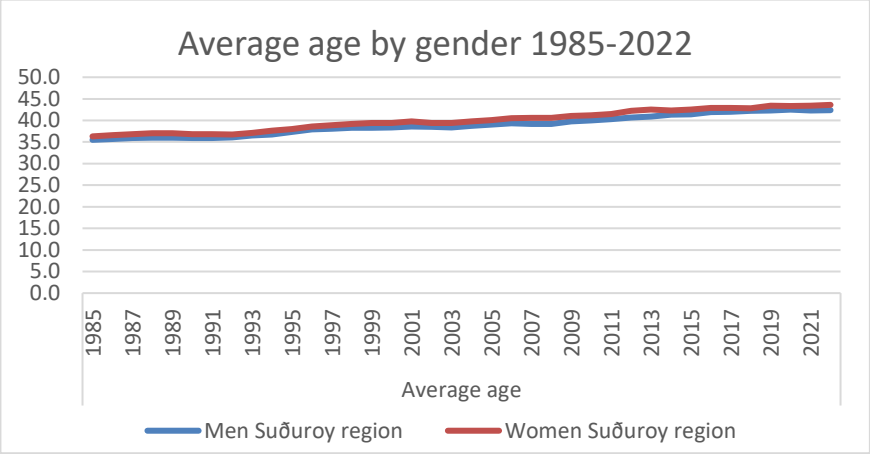

Figure 23 Average age by gender, Suðuroy region, 1985-2022. *Source: Statistics Faroe Islands*

When it comes to gender balance, the pattern is similar to the national one. Although figures are missing for the years between 1935 and 1960 for the Suðuroy region, the trend is similar there with a balance between both genders up until the Second World War period, and after that a steady increase in the gender imbalance, which continues today (Figures 24). In Suðuroy, the gender balance is slightly more skewed than in the country as a whole. Per January 1st in 2022 the number of women was 2.211 and the number of men was 2.473. In 1985, the ratio was 3.044 men and 2.838 women.

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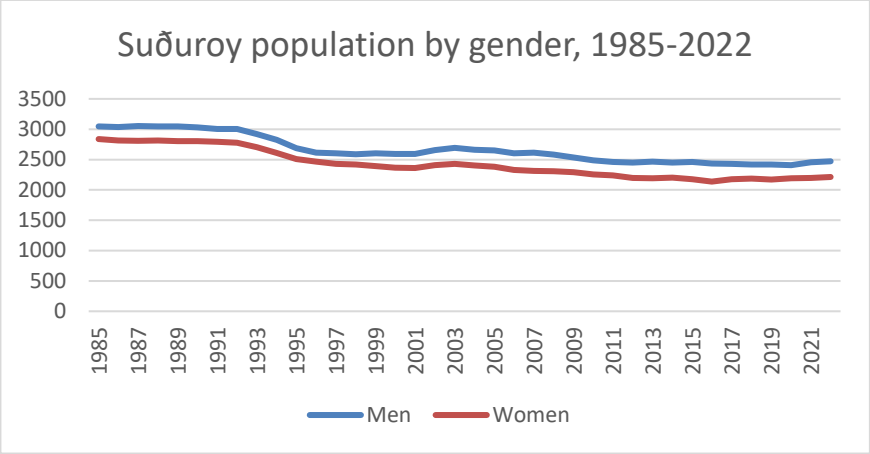

Figure 24. Suðuroy population by gender 1985-2022. *Source: Statistics Faroe Islands*

In summary, the general trend over the past decades for Suðuroy is that the population is aging and has declined, and that the gender balance shows that it is in particular women that move away. The past decades have also seen great changes in the traditional fisheries industry, and this again has had a great impact on the local communities in Suðuroy. At the turn of the century, the fisheries industry as well as the aquaculture industry in Suðuroy was still mainly locally owned and controlled, with a large number of fishing vessels and fish processing plants. Today, the fisheries industry has become centralized, and ownership is to a large extent non-local. As the aquaculture and tourism industries are growing rapidly in the Faroes and in the whole Arctic region, the local communities in Suðuroy are struggling to become part of these industries in ways that benefit the local community.

3.2.1 Fish farming in Suðuroy

Although fish farming has been practiced in Suðuroy for a long time, it is one of the last places to be exploited in the newest expansion phase, and a large portion of the prospected growth in production announced by the salmon farming company Bakkafrost is to be in Suðuroy. As shown in the national overview, both the fisheries and aquaculture industries have become more resource intensive, both in total volume of biomass and per capita. At the same time, for the Faroes as a whole, the number of employees in the fisheries and fish processing industry has gone down, while the number of employees in the aquaculture industry has increased (Figure 25).

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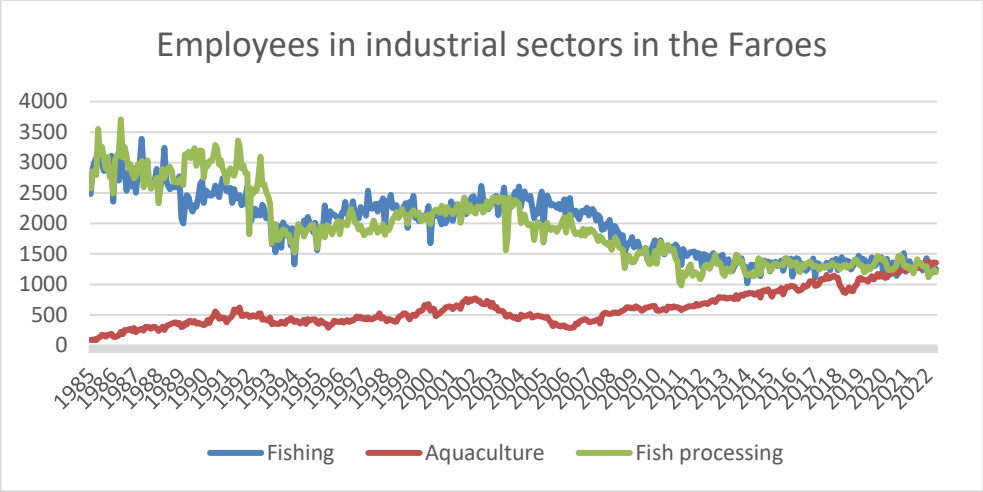

Figure 25. Employees in industrial sectors (fishing, aquaculture, fish processing) in the Faroes. *Source: Statistics Faroe Islands*

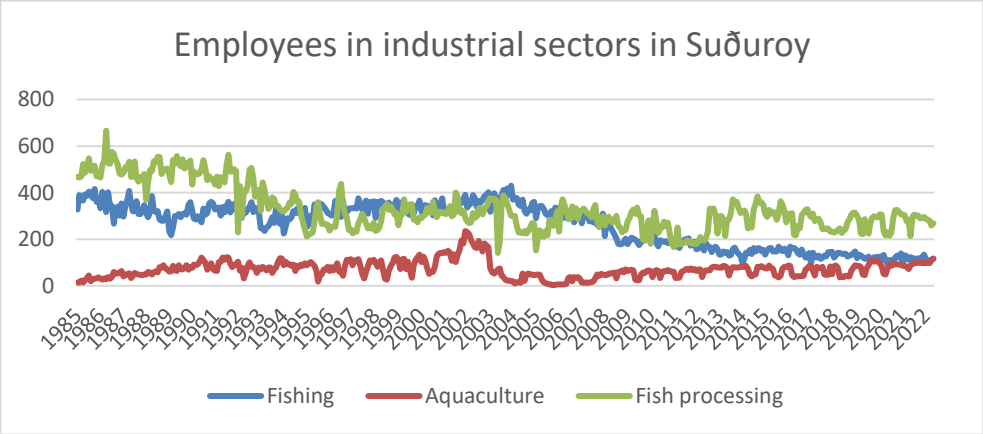

Figure 26. Employees in industrial sectors (fishing, aquaculture, fish processing) in Suðuroy. *Source: Statistics Faroe Islands*

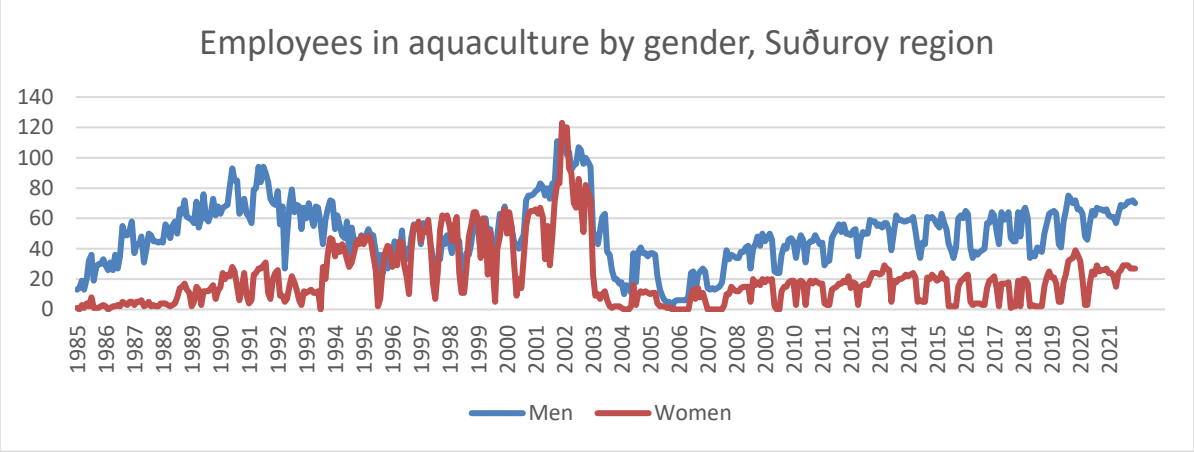

Figure 27. Employees in aquaculture by gender, Suðuroy region. *Source: Statistics Faroe Islands*

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In Suðuroy, the only salmon farming company operating in the island is Bakkafrost. In addition, there is one seaweed farming company in Suðuroy, TARI based in Fámjin. Bakkafrost has announced plans to expand and increase production in Suðuroy to 15.000 tons annually, corresponding to more than 3 tons per Suðuroy inhabitant. In addition to using the fjords in Suðuroy for open-cage salmon farming, another element in this growth strategy is the construction of a new smolt plant in Suðuroy (Figure 28). The expected employment in Suðuroy from this expansion was reported to be around 100 in total, 10 of which to operate the Ónavík plant. It is unclear whether this employment is all-year or only seasonal.

Figure 28. Map of aquaculture infrastructure in Suðuroy. Map produced by Bogadóttir 2022. *Source: www.us.fo*

In summary, the growth in the salmon farming industry has been very large in the past decade in the Faroes, and practically all areas suitable for aquaculture in the coastal zone have been exploited. This means that further expansion at least when it comes to salmon farming must rely on either offshore aquaculture or land-based aquaculture. One of the changes in the aquaculture industry visible in the Faroes is that the development of the aquaculture industry has become more centralized. Also, as can be seen in the statistics, the consequences, benefits and risks associated with the industry, vary between the different regions and local areas of the Faroes.

Salmon farming in the Faroes has been very successful and profitable in the past two decades, but the growth of the industry is not unproblematic.

3.3 Norwegian hubs

3.3.1 Troms and Finnmark county and Varangerfjord HUB

The coastal zone in the north is distinctive with large fish and shellfish resources and a great potential for value creation for other marine industries like aquaculture, tourism, offshore windmill plants and mining. The precondition for sustainable business development in the north is that different industries

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can live well side by side in the coastal zone. What is seen is that there is often a conflict about the use between existing and new industries. The level of conflict between the various players in the coastal zone can be high at times. There is therefore a need for knowledge that sheds light on the various conflicts, obtain new knowledge about the pros and cons related to environmental impact, as well as find synergies that help to create better dialogue between the different actors in the coastal zone.

The number of companies in Troms and Finnmark County have the last ten years increased from 22 44 in 2010 to 26 448 in 2019. The main industries are Agriculture, Forestry and Fishing (including Aquaculture) representing a share of 16,6%. Technical services and real estate management follow with 15,5% as seen in Figure 29.

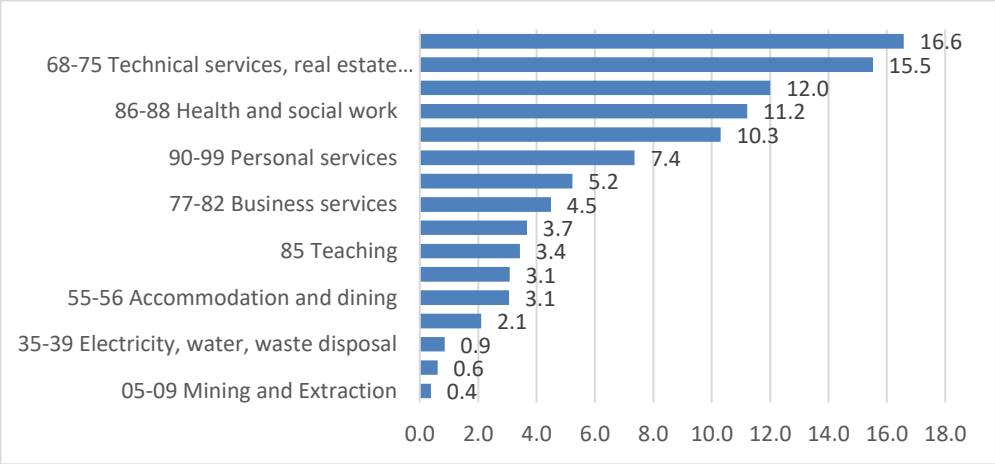

Figure 29. Companies in different industries in Troms & Finnmark County (% average from year 2010-2019)

In Troms and Finnmark there are 241,680 people per. 30.06.2021 with an average age of 41 years. In 2010, the population in Troms and Finnmark accounted for 4.7% of the country's population, in 2021 the population in Troms and Finnmark accounted for 4.5% of the country's population, and since the beginning of 2021 we have had a decrease in the population in the region of 0.2 %.

Despite this, forecasts for the future show that the population in the region will grow further towards 2040. In 2040, the average age in Troms and Finnmark will be 44 years, while the rest of the country will have an average age of 43 years. (Source: Troms and Finnmark County Municipality)

3.3.1.1 Fish farming in the county

Production of salmon in North Norway has been steady increasing for the past 25 years and is currently at about 600 metric tons, where Nordland county still has the largest production after Troms and Finnmark county.

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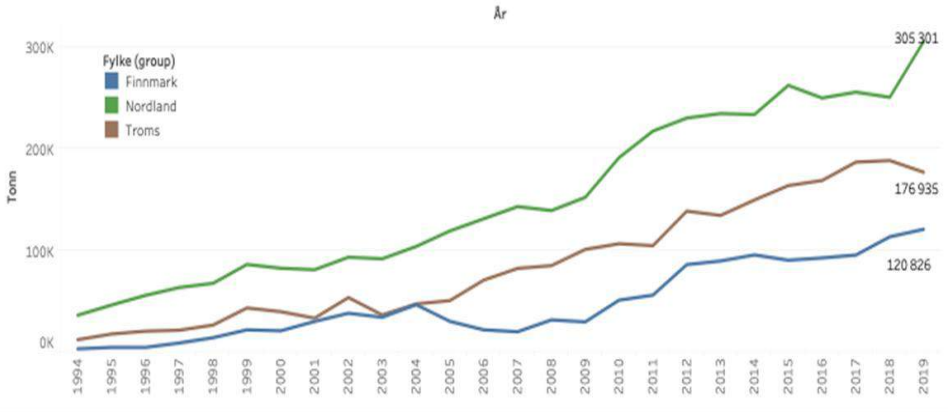

Figure 30. Production of salmon (metric tons) in Northern Norway in the period 1994 to 2019. *Sources: FDR*

Troms and Finnmark is the third largest fish farming county in Norway, where Trøndelag and Nordland produce more than Troms and Finnmark. This new county (Troms and Finnmark) sold 293,000 tonnes of salmon and trout worth NOK 13.4 billion in 2020.

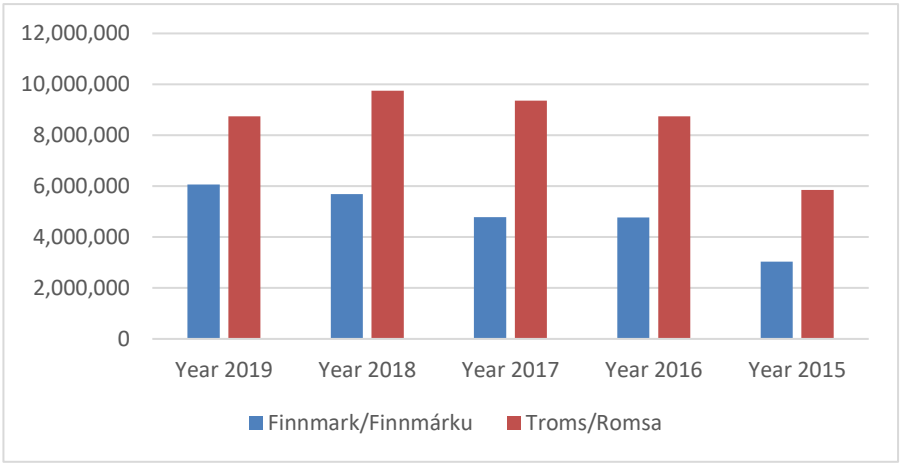

Figure 31. Value of slaughtered Salmon (in value). Value in 1000 NOK – Troms og Finnmark County. Year 2015-2019. *Source Fiskeridirektoratet*

Troms and Finnmark were merged into one county in 2020. Before 2020, we have statistics distributed among the two old counties. Finnmark sold 120 thousand tonnes of salmon worth just over NOK 6 billion in 2019. The corresponding figure for Troms was 177 thousand tonnes worth NOK 8.75 billion. Troms had a decrease in production of 12,000 tonnes from 2018 to 2019.

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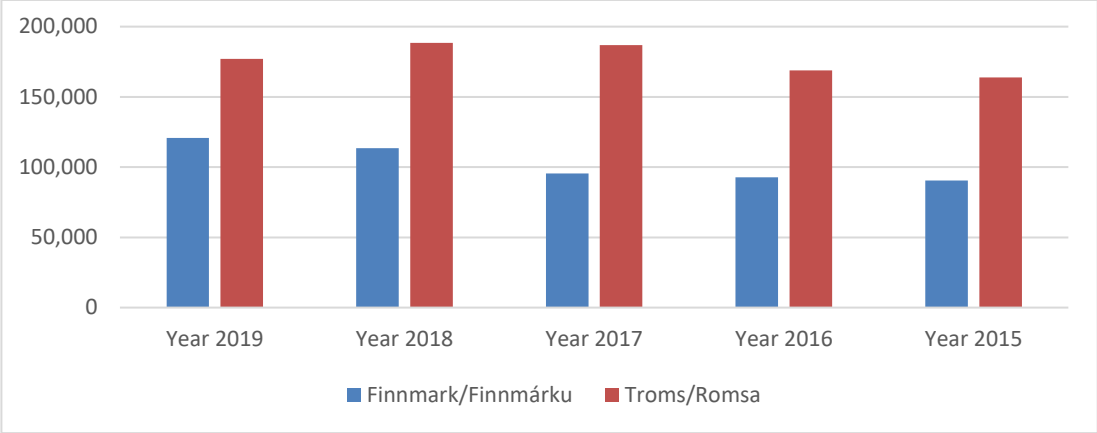

Figure 32. Sale of slaughtered fish. Weight in metric ton round weight in Tros and Finnmark County. *Source Fiskeridirektoratet*

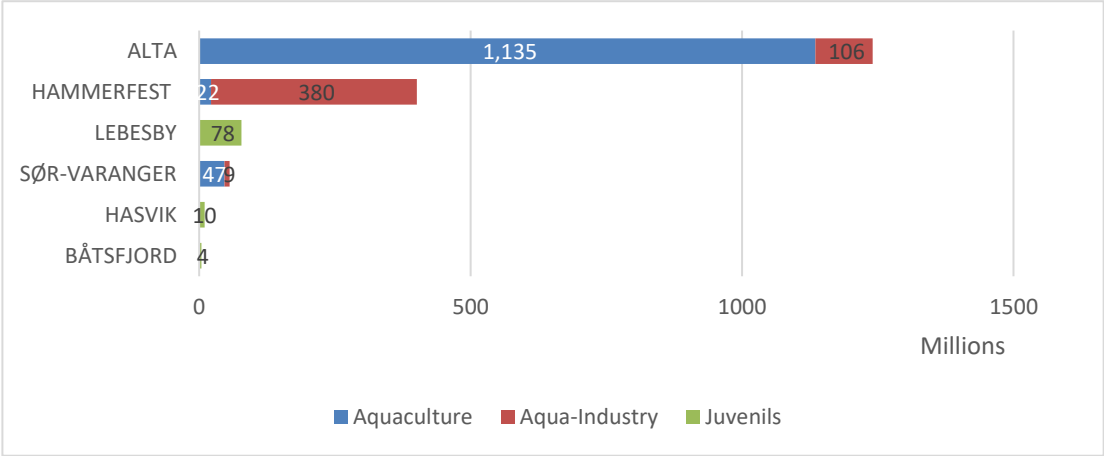

Figure 33. Value creation from aquaculture activity in Finnmark 2020

The direct value creation from aquaculture I Finnmark was in 2020, 1.78 billion NKR. The southern and western part with Alta and Hammerfest municipalities have the biggest contribution due to the dominant share of production in the county. Sør Varanger has 3 % with 59 million NKR in Value Creation I year 2020.

3.3.2 Varangerfjord hub

The fish farming hub in Norway is Varangerfjord. Varangerfjord is part of Troms & Finnmark County. There are 4 municipalities in Varangerfjord HUB populated with 21 413 inhabitants (year 2021). The municipalities are Sør-Varanger, Vadsø, Vardø og Nesseby.

The Varangerfjord (Northern Sami: Várjavuonna, Kven: Varenkinvuono, Finnish: Varanginvuono) is the easternmost fjord in Norway. The fjord is located in Troms og Finnmark county between the Varanger Peninsula and the mainland of Norway. The fjord flows through the municipalities of Vardø, Vadsø, Nesseby, and Sør-Varanger. The fjord is approximately 95 kilometers long, emptying into the Barents Sea. Its mouth is about 70 kilometers wide, located between the town of Vardø in the northwest and the village of Grense Jakobselv in the southeast (Figure 34).

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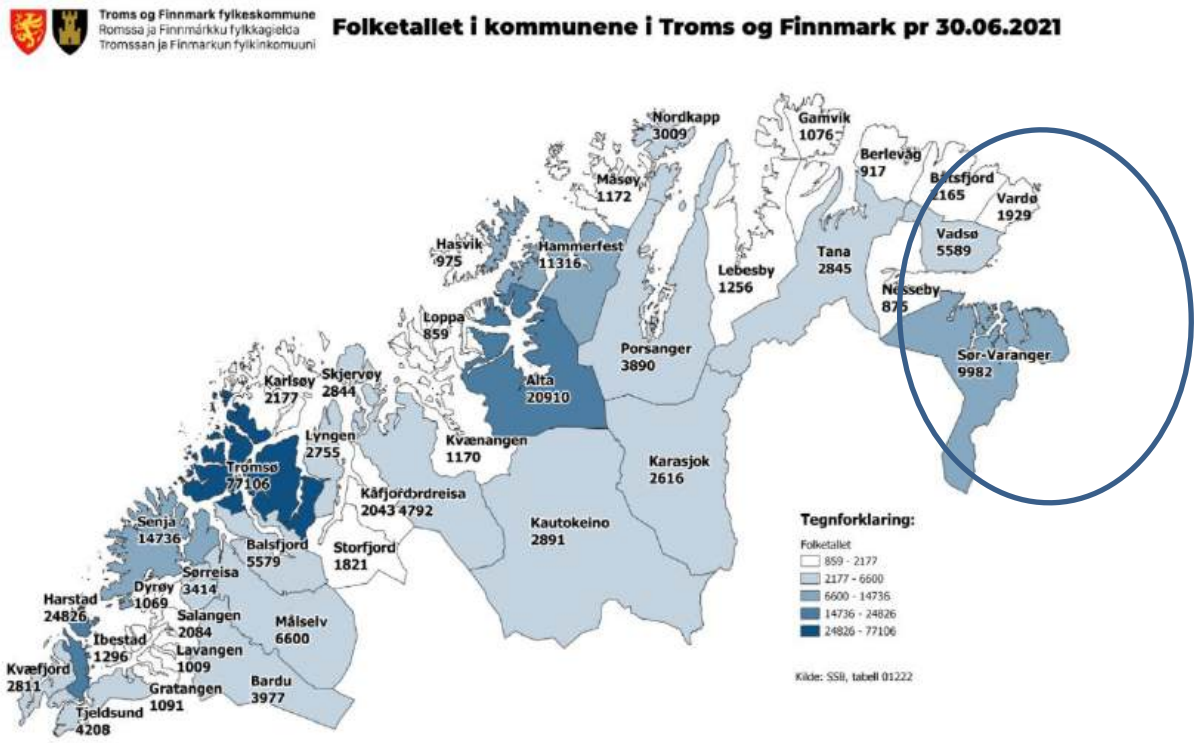

Figure 34. Map and municipality population in Troms and Finnmark County

Figure 35. The location of the Varangerfjord Hub.

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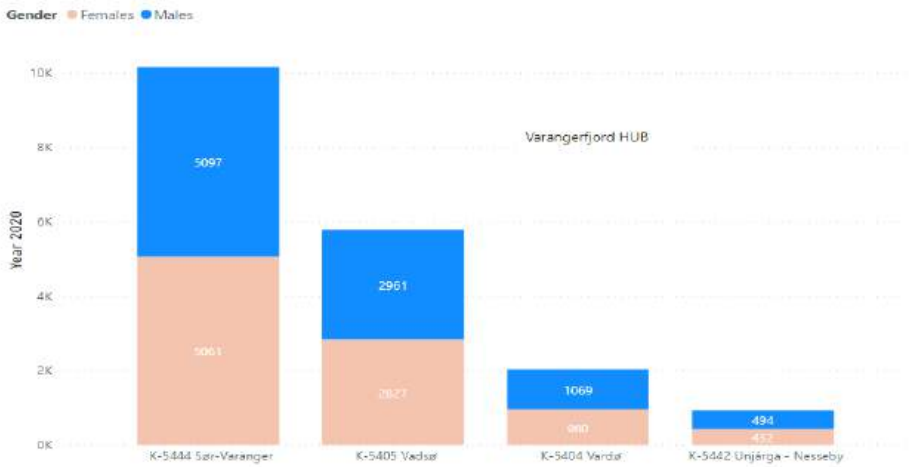

Figure 36. Population in the Varangerfjord HUB, by municipality

The biggest municipality in the Varangerfjord HUB is Sør-Varanger with just over 11.000 inhabitants, followed by Vadsø (5600), Vardø (2000) and Nesseby with just above 900 inhabitants.

Figure 37. Sør-Varanger municipality, demographics

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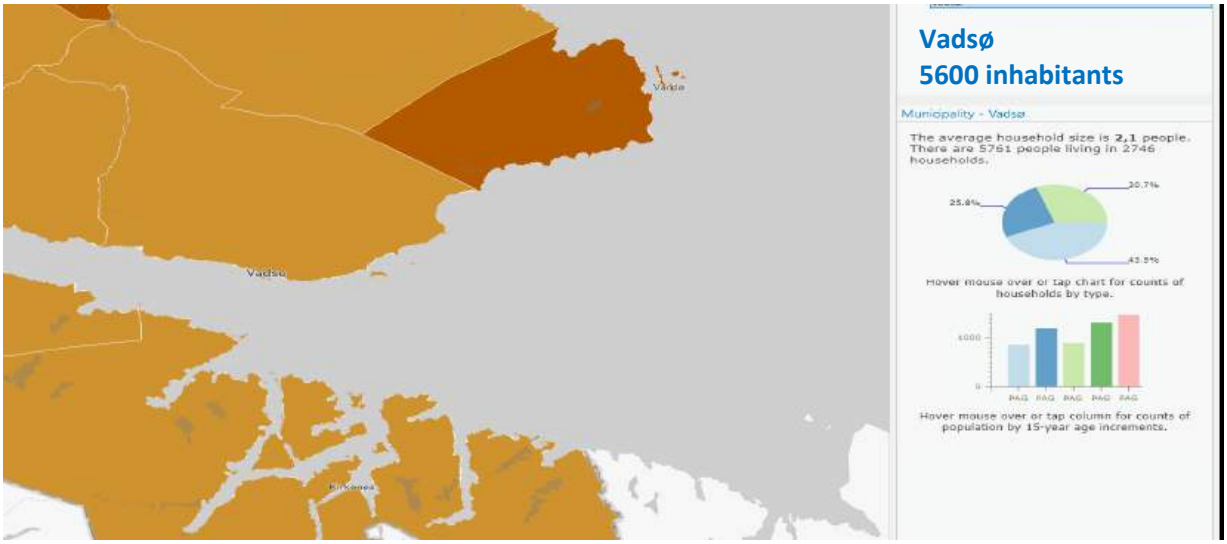

Figure 38. Vadsø municipality, demographics

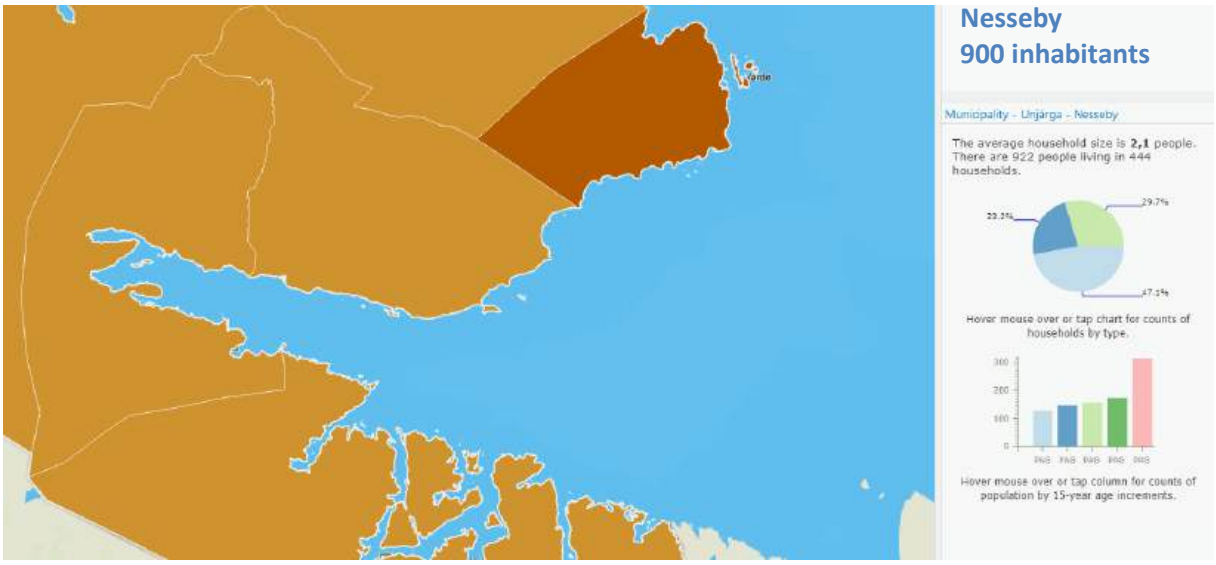

Figure 39. Nesseby municipality, demographics

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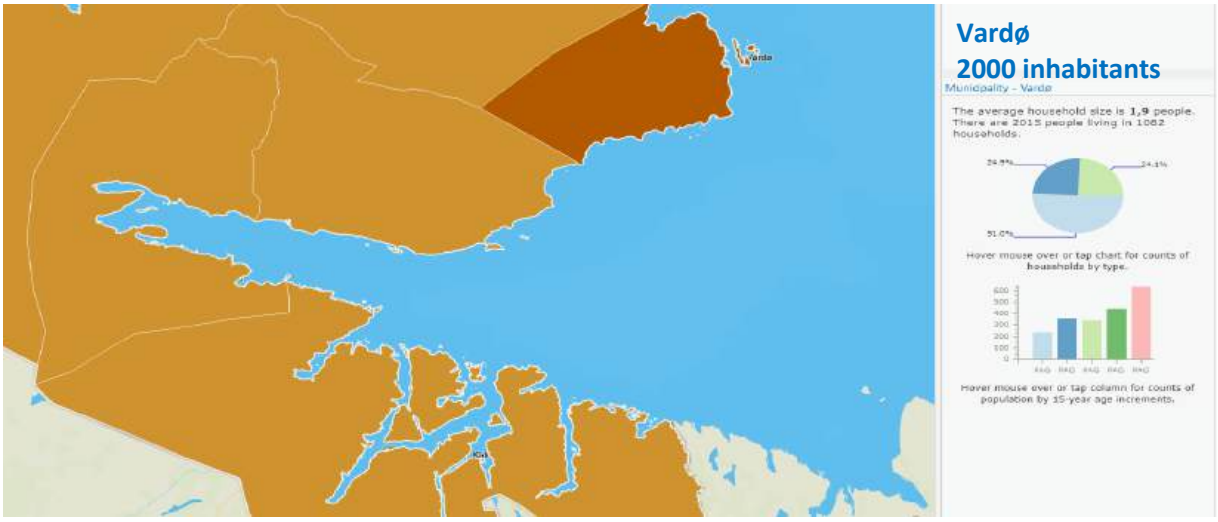

Figure 40. Vardø municipality, demographics

The number of companies in the municipalities differ from around 150 in Nesseby to over thousand in Sør-Varanger. Sør-Varanger has a nice increase the 10 last years as we see in Figure 41.

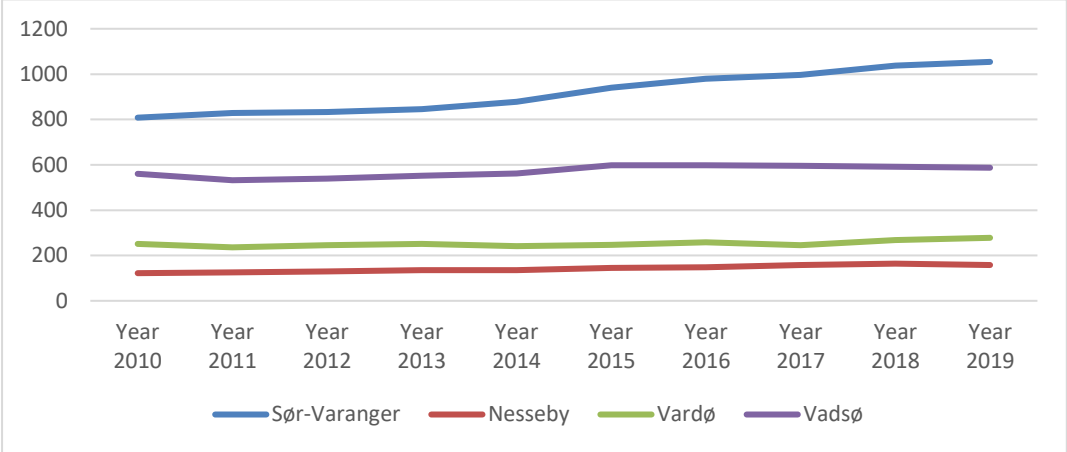

Figure 41. Number of companies in the Varanger hub municipalities

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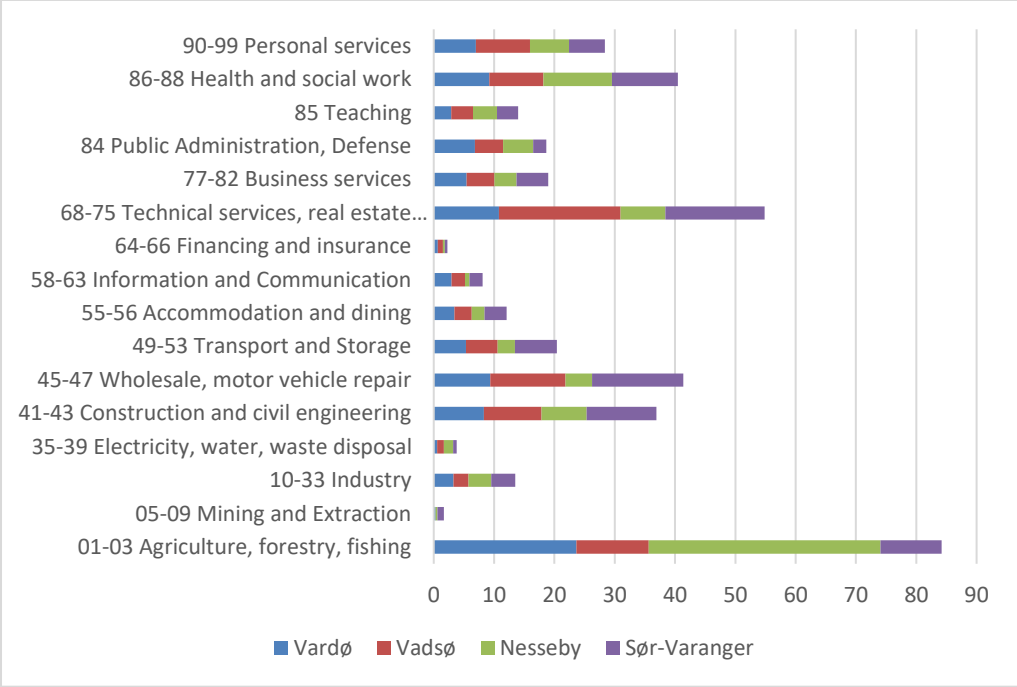

Figure 42. Hub municipalities company structure (in %)

If we look into the pattern of company structure, we see that Nesseby and Vardø have more companies in agriculture, forestry and fishing (where fishing is dominant). Sør-Varanger and Vadsø have a more diverse company structure.

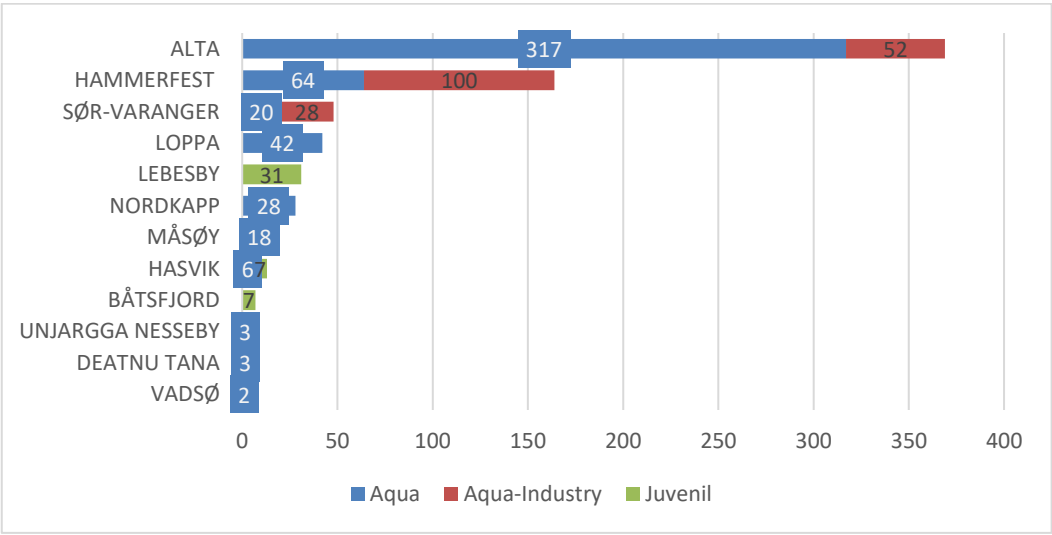

Figure 43. Employment in aquaculture in Finnmark 2020. *Source: Menon Economics and Nofima*

By 2020 there are 728 employees working in aquaculture in Finnmark. This includes farming, slaughtering and fileting, and smolt (juvenile) production. In the Varangerfjord HUB – the main activity is in Sør-Varanger municipality, which hosts 48 workers. Vadsø and Nesseby municipalities have 2 and 3 workers. Lerøy Aurora Ltd owns and operates farming and processing related to aquaculture in

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Varangerfjord. In Finnmark County there are only National Aquaculture companies who own and operate production. There are no local actors in the business.

In the Varangerfjord hub area four production licenses have been granted. Two in sea-based facilities and two land-based facilities with salmon smolt and arctic charr production. There is also one license for shellfish and macroalgae production (Figure 44). The sea cage farming license for salmon is owned by the company Lerøy Aurora.

Figure 44. Aquaculture license, shrimp area and restricted area for use of chitin inhibitory lice chemicals in Varangerfjord. *Source: FD*

Fisheries are important in the hub too. The traditional fisheries in Varangerfjord hub are whitefish (cod, saith and haddock), halibut, shrimps and red king crab, where approximately 140 small fishing boats (size under 11 m) are fishing and delivering their catch in the Varangerfjord (Figure 45)

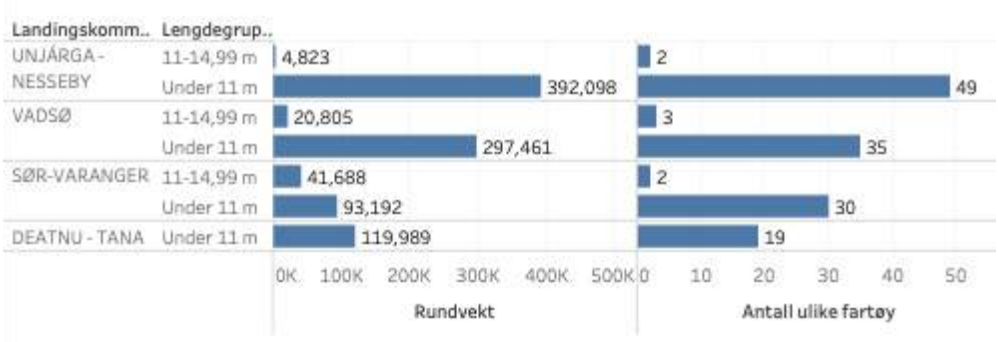

Figure 45. Catch (tons) and number of fishing boats fishing cod and saith in Varangerfjord in 2020. *Source: Norges Råfisklag (NRL).*

The red king crab (RCK) was introduced to the southern Barents Sea in the 1960's with the aim to develop a new, commercially attractive stock of the species. In the subsequent decades, the stock has indeed become abundant and widespread, but the species' presence also implies intense predation on benthic biota and thereby severe degradation of benthic ecosystems. King crab is the most valuable

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species currently exported from Norway. In Norwegian waters, the RCK is managed according to two different approaches. In the areas east of 26 °E (North Cape), the fishery follows a conventional management regime, whereas west of this border an eradication fishery is implemented. Since 2000, a total of 38 539 tons of RCK have been caught, 89 % of the catch has been registered in the quota area while the remaining catch has been taken in unregulated sea areas. In 2020, Norway king crab exported MNOK 668, equivalent to a volume of 2017 tons (Seafood.no). A total of 772 vessels with king crab concessions have been registered in 2020: 665 vessels in open group and 107 in closed group. Of this, 106 king crab vessels are related to Varangerfjord.

3.3.3 Rogaland county and Egersund hub

The Egersund harbor is one of the biggest fishing harbors in Norway. The area has 4 salmon rivers which have been the main source of sustenance for local inhabitants and recreational/tourist fishing. The area is characterized by more than 6000 lakes rich in trout. Recently one big fish farm industry has been established and one more is planned. Several projects are exploring the possibility of land-based fish farming and pumping seawater into land base tanks. Magma Geopark has been developing the GEOfood brand for local producers, supporting "zero km" food and sustainability practices. One of the GEOfood partners is Norks Ørret which is a small-scale fish farm using fresh water which reduces the problems linked with e.g., fish parasites.

Rogaland county consists of 23 municipalities with a total of 483.000 inhabitants (Statistic Norway, 2022). Eigersund municipality has in the last ten years hosted above 14.000 inhabitants. The gender distribution in the year 2022 is 7549 males and 7311 females.

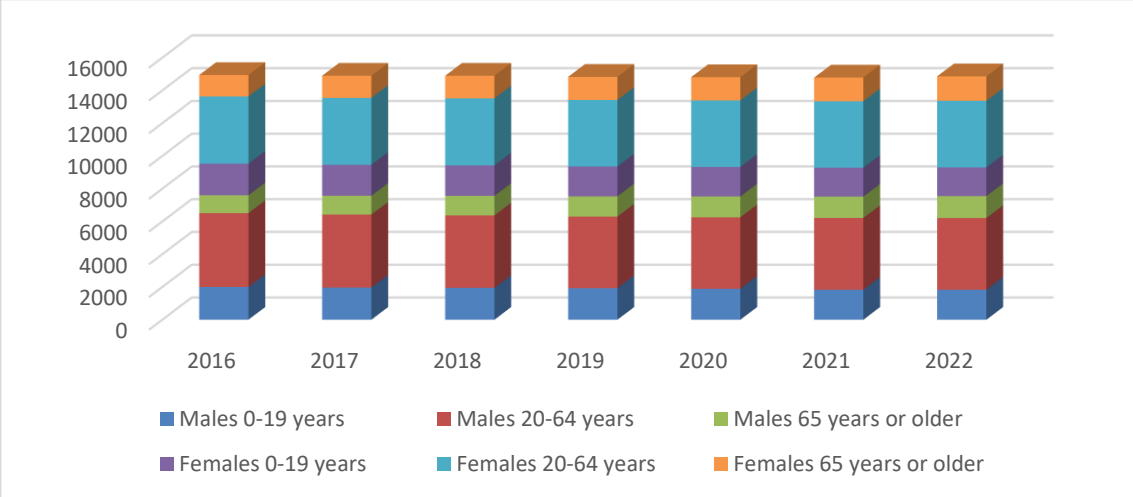

Figure 46. Population in Egersund municipality, sex, age and year. *Source: Statistics Norway 2022.*

3.3.3.1 Location

Eigersund Hub is located in the southwest part of Norway (Figure 47). This region of Norway has some naturally advantage in term of climatic and oceanographic condition for aquaculture purpose. In particular those natural conditions differ from the southeaster part of Norway due of the presence of the coastal currents that origin from the North Atlantic Current (Figure 48).

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Figure 47. The picture shows the currents activity along the Norwegian shore line. The red square shows the area of study «Eigersund hub». [3]

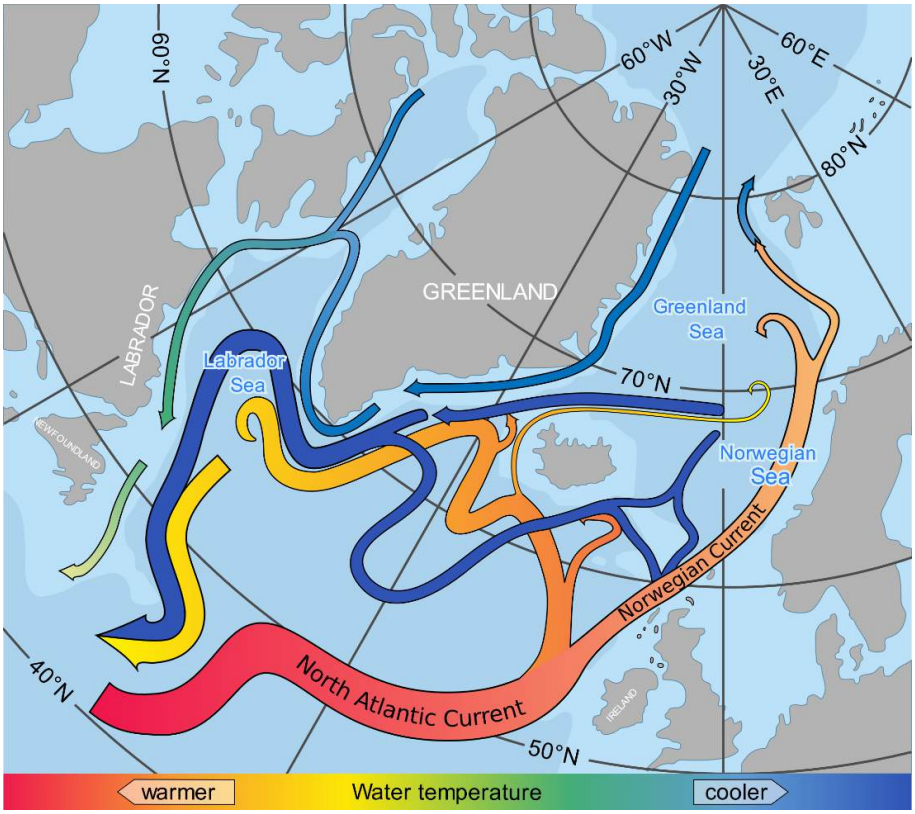

Figure 48. Water currents dynamics in Atlantic See and its effect on Norwegian coast. *Source: wikimedia*

The Norwegian Current (also known as the Norway Coastal Current) is one of two dominant arctic inflows of water. It is considerably warmer and saltier than the Arctic Ocean, which is freshened by precipitation and ice in and around it. Winter temperatures in the flow are typically between 2 and 5

[3] https://imr.brage.unit.no/imr-xmlui/bitstream/handle/11250/2938760/WKNORAO_2021.pdf?sequence=1

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°C. The co-parent North Atlantic flow, a heat remnant of its Gulf Stream chief contributor, exceeds 6 °C[4].

This current dynamic is the reason why Norway have one of the biggest fishing industries in the world, harvesting an average of 3 million metric tons of fish each year[5]. Also, in Eigersund hub area the water temperature, current and salinity conditions given by the costal water currents in addition to a bathymetric profile (figure 48) with very deep-sea bottom is one of the main reasons why aquaculture production in open sea pen is so well established. But this business is also facing several challenges. Both opportunities and challenges will be closer described in the following paragraph named: «Challenges and opportunities».

Eigersund hub is located between two important region in Norway, the Agder in the East and Rogaland in the West side, the border of those two regions goes along Lundevatnet, who is the name of the lake that also set the border between Flekkefjord and the municipality of Lund and Sokndal.

The location of the aquaculture sites and plants along the area of Eigersund hub is mainly concentrated in the area of the region of Agder and municipality of Flekkefjord as shown in figure 49, figure 50 and summarized in Table 5. The only exception is the freshwater plants of Bjerkreim, where they license to produce 100 tonns of trout (*Salmo trutta*) or arctic char (*Salvelinus alpinus*) in the freshwater lake of Ørsdalsvatnet.

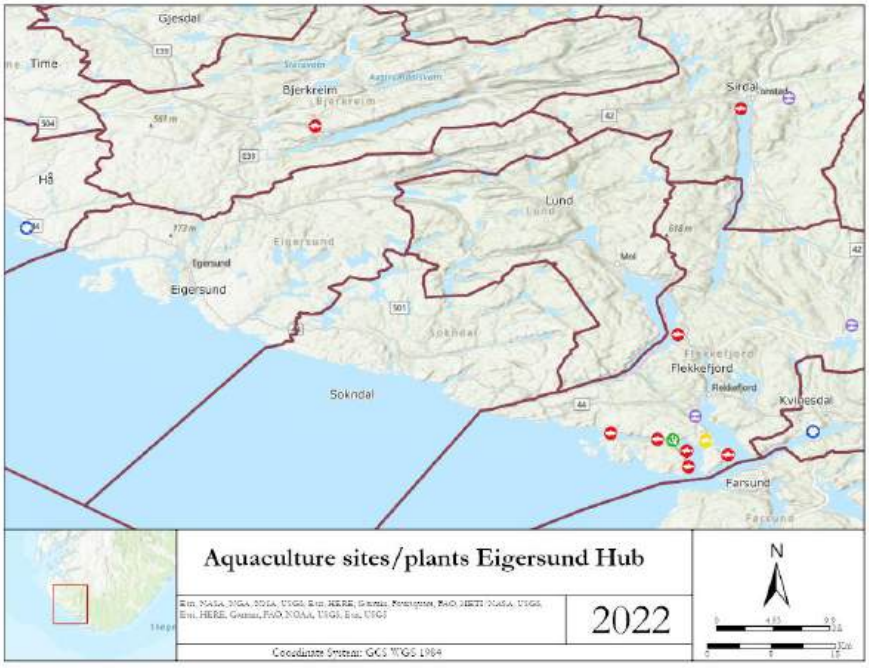

Figure 49. Aquaculture sites and plants. Overview of the area of the whole Eigersund hub

[4] https://en.wikipedia.org/wiki/Norwegian_Current
[5] https://en.wikipedia.org/wiki/Norwegian_Current

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In the municipality of Flekkefjord the main farmed species is the Atlantic salmon (S*almo salar*). The main actor is MOWI ASA, but there is also sites and plants for production of cleaner fish (mainly lumpfish and ballan wrasse) and seaweed in the area as showed in Figure 50 and summarized in table 5. More details about company, ownership and production capacity will be discussed in the next paragraph.

Figure 50. Overview of the municipality of Flekkefjord where there is main presence of aquaculture facilities in the Eigersund hub.

3.3.3.1 Company and ownership

The previous year, 2021, have been a strong year for Norwegian export of fish from aquaculture. Totally in Norway have exported 1,4 million tonnes of fish, with a total export value of 85,7 billion. This is an increase of 11% compared with the previous year and about 16% in relation to 2020[6].

The dominance of salmon farming as main aquaculture activity is also reflected in the region of Rogaland and Agder where Eigersund hub is located. Those regions contribute respectively with 15 company in Agder and 17 in Rogaland in activity in 2021 licensed to produce Atlantic salmon and rainbow trout for human consumption. In comparison, the aquaculture activity of others fish species (mainly cod, halibut, wolf fish) account for only 7 company in Agder and 3 in Rogaland as shown in figure 51 and figure 52.

Meanwhile salmon and "other fish species" company producer presence have been quite stable in the time period from 2007 to 2021 in Agder, the "other fish species" production in Rogaland have shown

[6] https://en.seafood.no/news-and-media/news-archive/record-high-norwegian-seafood-exports-in-2021/

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a small decrease, this decrease have not affected salmon production company presence who have almost been the same amount in the studied time period (Figure 51).

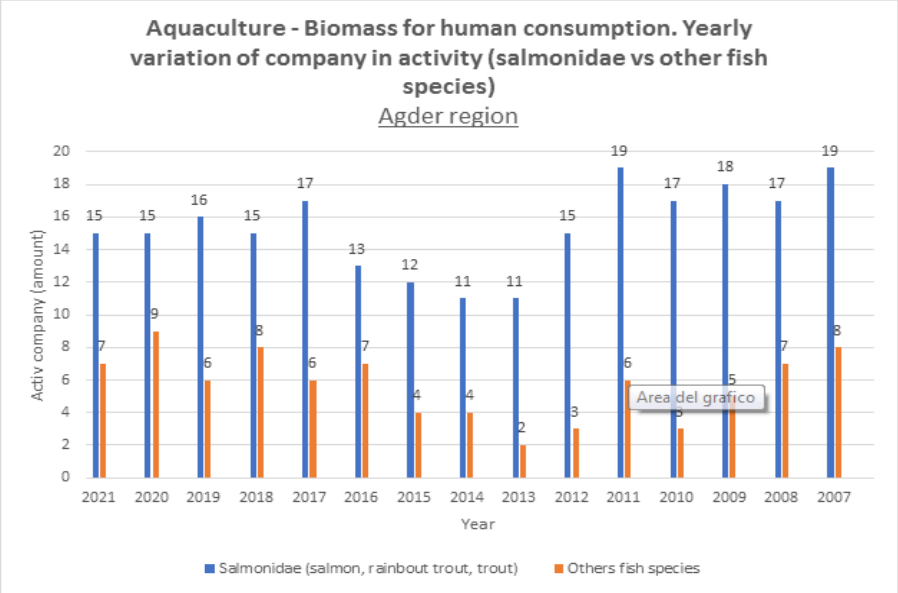

Figure 51. The figure shows the amount of company in activity in the region of Agder in the time period from 2021 to 2007. Two different aquaculture species is confronted, the Salmonidae production (salmon, rainbow trout, trout) visible as blue column and the orange is other fish species (cod, halibut, wolf fish, etc). *Source: Fiskedir.no*

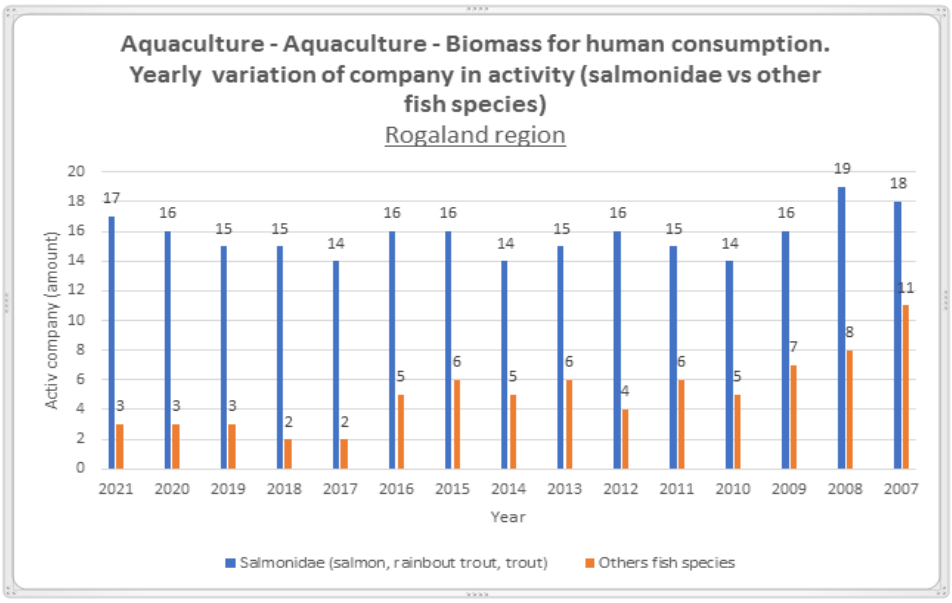

Figure 52. The figure shows the amount of company in activity in the region of Rogaland in the time period from 2021 to 2007. Two different aquaculture species is confronted, the Salmonidae production (salmon, rainbow trout, trout) visible as blue column and the orange is other fish species (cod, halibut, wolf fish, etc). *Source: Fiskedir.no*

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In Eigersund hub Atlantic salmon farming is still the main fish farming activity. MOWI ASA, who is the world biggest salmon producer company have 5 localities in the municipality of Flekkefjord. This is actually the highest density of biomass of farmed salmon per square kilometres in Norway. This density is possible thanks to the almost constant current flow passing around the isle of Hidra and thanks to presence of deep fjords where the food and faces particles can be spread wide. Interestingly, for two localities owned by MOWI, the region of Agder is co-owner of the biomass produced. This is because the two actors collaborate with the education of the pupils of aquaculture school line of Flekkefjord upper secondary school. MOWI is also the owner of the land-based salmon hatchery where the juvenile is farmed at the growth stages before release in the farming sea pen localities. Thereafter, still in Flekkefjord there is the seaweed installation of «Seaweedproduction AS» that have as goal to produce macro algae for human and animal consumption. The company named «Norsk Oppdrettsservice AS» is the first facility that started to produce lumpfish as cleaner fish for salmon in the world. Those cleaner fish, who is mainly lumpfish (*Cyclopterus lumpus*) and ballan wrasse (*Labrus bergylta)* graze and eat the sea lice, who is an ectodermic parasite that live on the body surface of the salmon and damage the quality of the fish filet, in worst case, if not treat it can also kill the fish.

In the freshwater lakes of Eigersund hub, during the last years, there have been a growing trend of establishment of trout and arctic char production. The main company representing this growth in Eigersund hub is «Norsk Ørret AS» and «Rekevig Ørret AS». There is also a hatchery licensed to produce both trout and arctic char juvenile in Flekkefjord owned by «Roy Hjelleset». For more company details, see table 5 below.

Table 5. Overview of the aquaculture sites with ownership, capacity and farmed species.

Municipallity	Location	Capacity	Species	Company
Bjerkreim	MJÅVATNET	65	Arctic char/trout	Norsk Ørret AS
Flekkefjord	REKEVIKA	100	Trout	REKEVIG ØRRET AS
Flekkefjord	FJELLSÆ I	2500000 (amount)	Salmon	MOWI ASA
Flekkefjord	GYLAND	50000 (amount)	Salmon, Rainbow trout, Arctic char, Trout	HJELLESET, ROY
Flekkefjord	GULEODDEN	120	Seaweed	SEAWEEDPRODUCTION AS
Flekkefjord	ABELSNES	20	Cleaner fish (lumpfish, ballan wrasse)	NORSK OPPDRETTSSERVICE AS
Flekkefjord	ABELSNES II	10	Lumpfish, Cod	INNAKVA LAB AS
Flekkefjord	NAPP	2340	Salmon, Rainbow trout, trout	MOWI ASA
Flekkefjord	SKIPNINGSDALEN	6240	Salmon, Rainbow trout, trout	AGDER FYLKESKOMMUNE, MOWI ASA
Flekkefjord	SALVÅGVIKA	7020	Salmon, Rainbow trout, trout	MOWI ASA
Flekkefjord	BUKSEVIKA	4680	Salmon, Rainbow trout, trout	AGDER FYLKESKOMMUNE, MOWI ASA
Flekkefjord	PINNEN	6240	Salmon, Rainbow trout, trout	MOWI ASA
Lund	-	-	-	-
Sokndal	-	-	-	-
Eigersund	-	-	-	-

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Triggered by political, social and natural driver that will be discussed further later in the paragraphs: «*opportunities and challenges*» there are willingness to establish more aquaculture facilities in Eigersund hub. But before discussing the bottlenecks for those new establishment we will take a closer lock to the production capacity and the value creation of those ongoing sites and plants.

3.3.3.3 Production data

As introduced in the previous chapter the fish farming business have faced a big growth during the pandemic year 2020 and 2021. In the whole Rogaland and Agder region the sale of slaughtered fish has increase from 66 thousand metric tons round weigh from Salmonidae, 613 tons of molluscs, and 0 reported tons of algae to 117 thousand tons from Salmonidae, 111 tons of molluscs and 249 tons of algae (Figure 53). The dominance of salmon industry is also reflected in the sale value of slaughtered fish. Only in 2021 the sale value of salmonidae in the Agder and Rogaland region only account for 5,7 billion NOK. In comparison, still for 2021, the sale value has been little bit more than 6 million NOK for alge and 799 thousand NOK for molluscs (Figure 54).

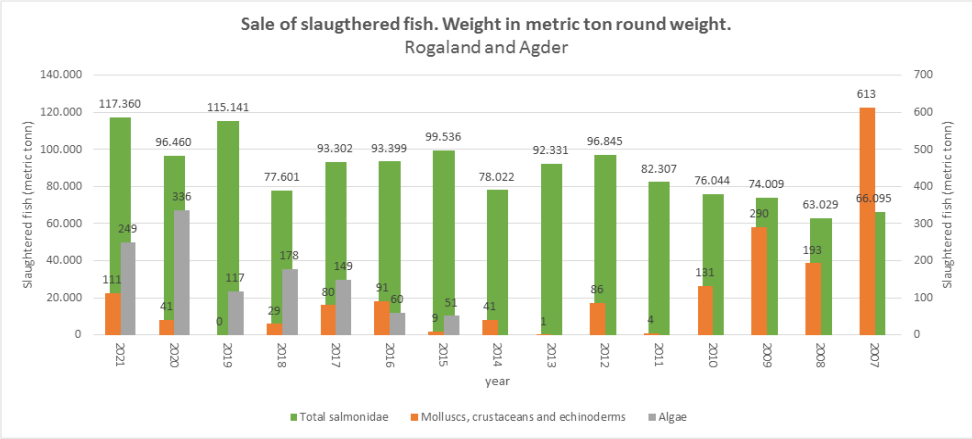

Figure 53: The figure shows the different sale of slaughtered fish in weight (metric ton round weight) in the time period 2007 and 2021. The three different colours of the columns refer to Salmonidae (green), molluscs (orange) and algae in grey. The study area is the region of Agder and Rogaland. *Source: Fiskedir.no*

The value increase of marine aquacultures industries, in the last decades, as shown in figure 8 is an important driver for aquaculture growth in Norway as well as in Eigersund hub. Meanwhile molluscs as crustaceans and echinoderms have been quite stable in value or even decrease, salmon sale, and especially algae have showed the biggest increase. The increasing global demand together with a god marketing and communication campaign globally is one of the main reasons of this growth of value.

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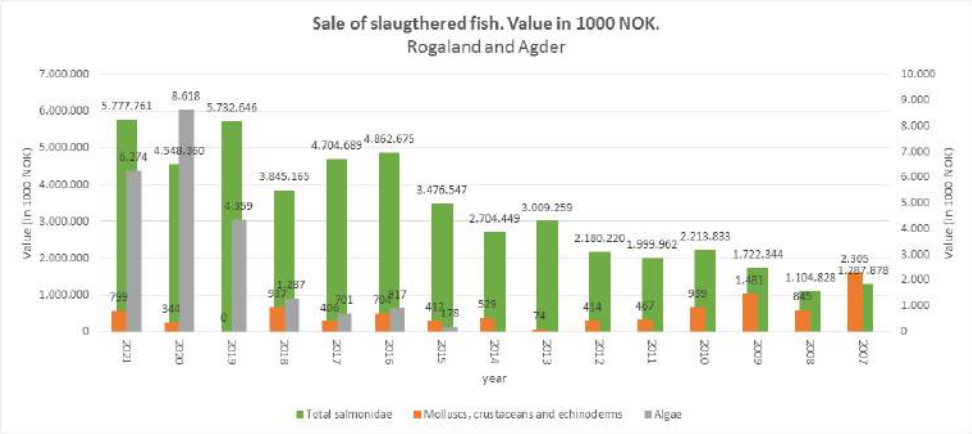

Figure 54: The figure shows the different sale of slaughtered fish (value 1000 NOK) in the time period 2007 and 2021. The three different colours of the columns refer to Salmonidae (green), molluscs (orange) and algae in grey. The study area is the region of Agder and Rogaland. *Source: Fiskedir.no*

In Eigersund hub there are eight registered aquaculture company. For those working in marine environment the biggest biomass production licensed is still for Salmonidae, in line with the regional trends. All together the 5 localities placed in the municipality of Flekkefjord can produce 26 thousand tonnes of biomass. The second place in order of production capacity belong to seaweed production with 120 tonnes, this is also in line with the regional trends (figure 53 and figure 54). And last but not least there is licensed to produce 20 tonnes of cleaner fish and 10 tonnes of cod (land-based facility).

The salmon plants have been in activity for decades meanwhile the seaweed as well as cod and cleaner fish production have been in activity since less than a decade. So, this is showing a trend where the new establishment is differencing itself in terms of species and technology (land-based vs sea plants) in the Eigersund hub.

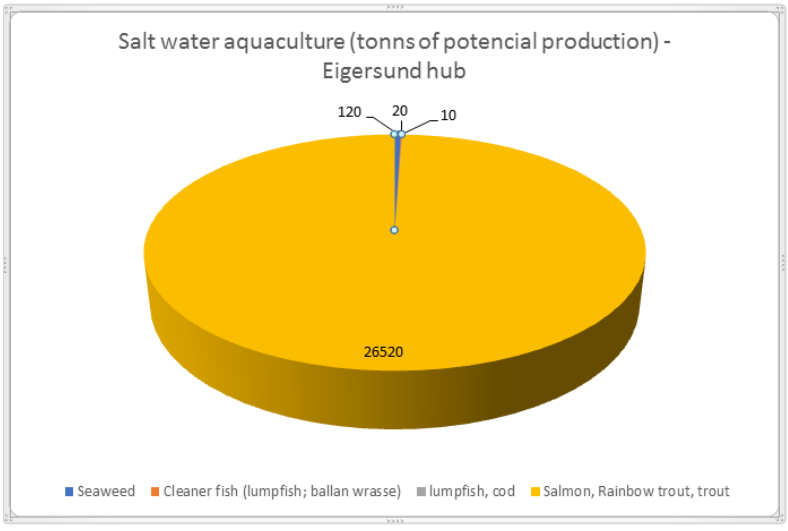

Figure 55. This cake diagram show the distribution of production capacities in Eigersund hub between the different marine species Salmonidae (yellow), lumpfish only (orange), seaweed (blue), cleaner fish and cod (grey).

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Placed mainly in the municipality of Flekkefjord and Bjerkreim, the Eigersund hub shows also a growing and promising freshwater aquaculture industries. Those plants are located in huge and deep glacier lake that is characteristics of the area of the UNESCO Magma Geopark. Those oligotrophic lake, that means poor of nutrients, allow intensive aquaculture farming within limited production quantity frame for trout and arctic char. Those are the main pelagic autochthon species in the area.

For the freshwater production, one of the main challenges is given by the fact that those lakes have also often drinking water intake for cabins or smaller town, so both the authorities and the citizens are very sceptical to intensive fish production that can worsen the water quality. Given this social and natural frame it still interesting to notice the presence of those two main actors in Eigersund hub that together have license to produce 165 tonnes of trout (*Salmo trutta*) and 65 tons of arctic char (*Salverinus alpinus*) Figure 56.

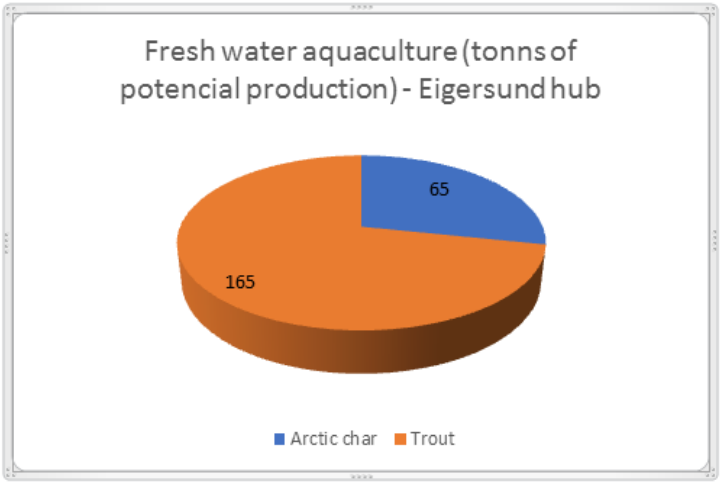

Figure 56. This cake diagram shows the distribution of production capacities in Eigersund hub between the different freshwater species. Arctic char is marked with blue colour and trout in orange.

3.3.3.4 Employment

Norway is an oil and gas nation, but fish export in form of both aquaculture and fisheries is the second biggest export in Norway. The region of Rogaland is characterized by a strong presence of both the industries meanwhile Agder is working in order to strength it's positioning in the seafood export.

This political willingness is also reflected in the employment trends showed in Figure 57 where the linear trend line reflects the steady increase of number of men and women employed in Agder together with Rogaland in the aquaculture sector in the time periods from 2010 to 2021.

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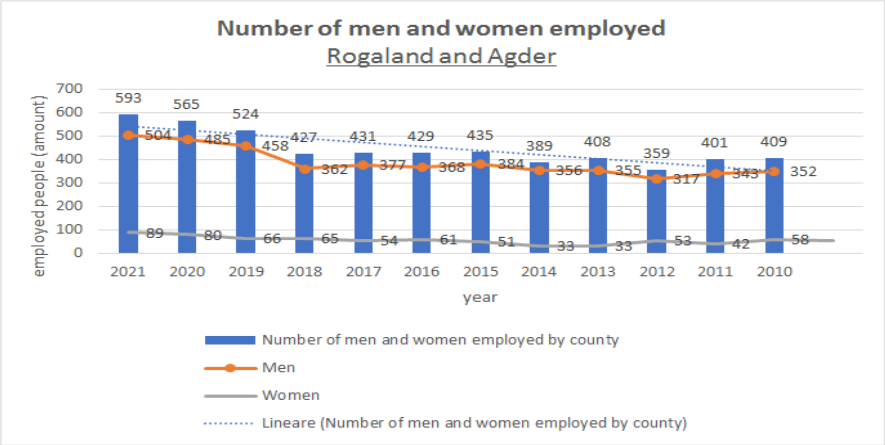

Figure 57. The figure show the number of men and women employed in Agder and Rogaland in the aquaculture sector in the time periods from 2010 to 2021. The punctuate line show the linear trend of increase of employment in the sector. The blue columns show the total employment, the orange column account for the man and the grey for the women equivalent employed.

Moreover, the subdivision between man and women in work in the sector witness a very unbalanced situation. With relatively small variation with time the man has been the main gender at work in the field since 2010. The relation between man:woman at work are 5.8 in 2021 and 5.6 in 2010.

A concrete action done by the region of Agder to invert this trend and continue to guarantee the needed competence to this business is the establishment of an upper secondary school line in aquaculture, who took place in 2019. Those pupils, when they have concluded theirs 4 years long school and traineeship period is ready to guarantee the needed knowledge and competence to an industry in growth.

3.3.3.5 Challenges and Opportunities

The aquaculture industries have always been facing many challenges due to the complexity to preserve the environmental balance when this are exposed to intensive production. In addition to the social pressure given by the occupation of natural marine and freshwater (but also land based) surface for industrial purpose.

The main challenges related to intensive aquaculture industries, especially when it operated in open sea pens is its effect to the environment and consequence alteration of the habitat. The most known environmental effects caused from fish farming have over the years been caused by escape of farmed fish, spread of sea lice, disease, and emission of nutrients, organic waste, medicine and other foreign substances into the marine environment[7]. Especially the escape of farmed salmon has been reported several times in the last decades from the sea pen placed in the Eigersund hub, municipality of Flekkefjord. That is a serious threat to the wild salmon stock and genetics. The presence of sea lice and especially the threat it represents for the juvenile wild salmon outside the farmed sea pen is also an issue that should be prevented more in the area of the UNESCO Magma Geopark (Egersund HUB).

[7] Hauge, K. B., & Stokke, K. B. (2021). Integrert kystsoneforvaltning. Planfaglege, samfunnsvitskapelege og juridiske perspektiv.

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Furthermore, the other effects to the marine environment given by disease and emission of nutrients and organic waste as well as medicine use and other foreign substances is not known as a main issue in the local area of Eigersund hub compared to other parts of Norway and the world. Some concern has been shared regarding the presence of copper in some new coating system used on the sea pen, but there is now willingness to stop the use of those in the fjords system in Flekkefjord, so this is well promising for the future.

In order to reduce the main effect to the environment, the escape and the sea lice problematics, some step ahead have been done whit the technology of closed sea pen. Company as "Nekkar AS"[8] have established test plants in Flekkefjord that have showed promising results (Figure 58). They are now working in collaboration with MOWI in order to replace with time the open sea pen in closed system. This technology requires well competent and prepared employee since the complexity of the technical operation but also the biology will be more challenging, but this solution is a good opportunity also for establish a better reputation about the effect and the occupation of marine surface among the population.

Figure 58. The picture shows the closed sea pen tested by the company Nekkar AS in Flekkefjord in the period 2021-2022.

Regarding the social pressure given because of the occupation of natural marine and freshwater (but also land-based) surface for industrial purpose, the conflict is particularly high in the area of Eigersund hub where the crossing interest along the shore is very high. The main uses of the marine, but also freshwater environment are fisheries and recreational use. On the top of that, Norway is pressed internationally for sticking to the international convention that have been signed during the biologic biodiversity convention in 2010. In this convention Norway agreed to have 10% of the coastal shoreline protected before 2020, and there is now a new goal to increase this percentage to 30% for 2030[9]. For comparison, Norway, today in 2022 have almost 4% of its shoreline protected, and of this only a very small part is totally protected from human intervention.

All together there are promising perspective for the aquaculture field in Egersund hub, mainly given by the outgoing investment on the technology front that will most likely improve the research and development in the direction of more sustainable circular economy-oriented aquaculture. This have

[8] https://nekkar.com/
[9] https://salt.nu/innsikt/30-prosent-marint-vern-innen-2030-hva-betyr-det-egentlig

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the potential to strength the employment numbers of the district, the preservation of habitat and increase the reputation of this blue business.

4. Discussion and conclusions

The four fish farming hubs included in ArcticHubs project have different characteristics, but they all show that the industry is growing in the Arctic and is generating high-value export products that contribute more and more to national GDP/GRP. Another common aspect is that the industry employs more men than women. This is an important challenge: as the hubs in Iceland and Faroe Island show, fish farming could be an attractive industry for new workers, and the presence of this activity could help reduce or even invert the rural outmigration trend. At the same time, since women migrate toward bigger cities more than men, rural communities are affected by gender imbalance: a more inclusive fish farming industry, today reported to be mostly male-dominated and male-oriented, could help facing this challenge.

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Table 6. Summary of key characteristics among fish farming hubs

	Westfjords, Iceland	Suðuroy, Faroe Islands	Varangerfjord, Norway	Egersund, Norway
Population dynamics	Decrease in population since the 70s caused by major changes in fishing industry. New rise from 2016 with acquaculture growth. Gender gap: nearly 100 more men than women	Population decline after economic crises in the early 90s, upward trend in recent years. population aging. Gender imbalance	Population decrease (county level)	
socio-economic challenges	gender gap is widening			
companies and ownership	Fjarðarlax, Arctic Fish, Arnarlax: founded by Icelanders but then bought by Norwegian company SalMar ASA	Bakkafrost. Expansion and production increase planned. Ownership is centralized and non-local	Lerøy Aurora Ltd, norwegian but not local	Cfr tab 6
production	Salmon and Arctic Charr	Salmon	Salmon and Arctic Charr	Cfr tab 6
employment	Growing (data on national level)	Growing but unstable and variable between seasons. 100 new employees expected with Bakkafrost expansion	48 (Sør-Varanger) + 2 (Vadsø) + 3 (Nesseby)	409 (2010) - 593 (2021) in Rogaland+Agder

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gender	Aquaculture and fisheries are male-dominated industries: woman seek job elsewhere, mostly in bigger cities	Gender imbalance. Aquaculture employs more men		Men/women ratio in 2021 is 5.6
education	More women than men have a university degree			establishment of an upper secondary school line in aquaculture (4 years of school and trainsheep), who took place in 2019 in Agder
conflicts	TBA	All available areas in coastal zone have been exploited: expansion will be off-shore or land-based (need for large amounts of energy, fresh water and land) Ownership is non-local: communities have no control over development Large volumes of wasted are released in the fjords: changes in the ecosystem services used by locals Smaller-scale industries have been displaced		Water quality: use of water from lakes from which are used by residents for drinking water; environmental impacts: spread of sea lice, disease, and emission of nutrients, organic waste, medicine and other foreign substances into the marine environment. To solve it, new technology of closed pens; coasts protection and recreational use

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In all three countries, aquaculture is a growing industry. While Norway and the Faroe Islands have had strong growth since the 70s and 80s, Iceland is now catching up. Aquaculture jobs are also well paid, requires higher education and have in general a better gender balance than traditional fisheries. For coastal communities, this new industry represents a possibility for new growth, in communities where the number of fishermen and employees in fish-processing has been decreasing (as fisheries modernize, the number of fishermen decrease, but with well-managed stock, the value of the fishery and the pay for fishermen increase). Aquaculture now employ more people than the wild fisheries in Norway and the Faroe Islands, while Iceland will need some time to get there.

However, aquaculture also has its challenges, both regarding environmental and social sustainability. All food production has an environmental footprint that must be understood, monitored, and held within limits given by a sustainability framework. Aquaculture still have issues with lice and escapes, many disease issues have been handled with vaccines (but some remain), and the release of nutrients is closely monitored and controlled.

On the social sustainability side, the aquaculture industry is expected to contribute to local communities. The international market situation for salmon, with very high profitability, attracts global players to invest in the aquaculture industry, sometimes weakening the link with the local community. To the extent that local players want it, ownership changes from local to (inter-)national, often with good profit for the locals who sell. In Iceland, where the industry is now growing by foreign companies, it is feared that much of the labour will not be from the residents.

A related challenge is the industry's ability to attract labour. We see that both jobs and economic values are created which can provide a basis for settlement. Still, we find that the peripheral communities are unable to recruit, especially younger people, but also families and women. They would rather live in cities and towns than in the peripheral areas where nature-based businesses often operate. We see a decline in the population in the periphery, even though the opportunities for work are good. This is part of a global trend of urbanization and centralization, though, and challenge that may be too big for aquaculture alone to turn around.

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Table of Content

1. Introduction and background

Mining is a crucial activity in modern society, but it is also a complex activity that can generate contradictions. For example, the ambitious standards of the new EU Green Deal requires a major effort towards electrification were minerals are needed to support the process. At the same time, mining operations have high and long-lasting environmental impacts. Another example is the potential for local societies' improvement, especially in remote and sparsely populated areas, where a new mine can create jobs, services and infrastructures. However, major social conflicts could arise too: bankruptcies and closures due to low mineral prices are not uncommon; resettlements, housing shortages due to high number of new workers moving in the municipality, fly-in-fly-out workforce who uses local services without paying taxes to the local administration. These examples unveil one of the main features of this complexity: the multiple levels involved. The mining industry is driven by national and international policies and a global demand of raw materials, but operates in specific localities where the impacts (both positive and negative) are directly experienced. Mining companies are usually international, and "their decision-making and primary concerns reflect interests beyond the local, making local situations relevant largely in terms of resource use rather than long-term employment" (AHDR II, 2014: p. 403-404). This opens the debate about the social and economic sustainability of the sector together with the environmental one. The sustainable management of conflicts and opportunities shaped by the interplay of global and local level is at the very core of the ArcticHubs project. It is through this lens that the mining sector in the Arctic will be considered.

In this deliverable, the objective is to provide "a systematic overview of economic activities in the arctic regions as basis for further examination of impacts and local perceptions on these developments". This will be done through collection and analysis of secondary socio-economic data at all the relevant levels: country, regional and hub. Short qualitative, historical description of the sector and each considered mine is provided as well. After the description of each area, a comparison between countries and hubs is carried out in the final chapter, to underly the most important socio-economic aspects of the industry and how similar issues are addressed in different contexts.

Mining activities are intensifying in some areas of the Arctic. For example, in Finland the mining industry's income grew by 200 % from 2015 to 2018, primarily as a result of the growing "demand for metals and minerals used for batteries, fuel cells and electronic devices relevant for the green transition" (ECONOR 2020: p. 71-73). Arctic Sweden is also highly attractive for mineral exploration, however mining activity in this region could threaten other livelihoods such as tourism and reindeer herding. The area is also interesting because there are important innovation projects, such as the HYBRIT which aims to develop fossil free steel. This gives another example of the complex relation between the mining industry and the "green" global objectives: global CO_2 emissions would drop by 10 % if all the steel production used this technology. At the same time the greening of steel puts "increased pressure on the environment through wind parks and infrastructure, interfering with wilderness for hunting, herding, fishing and tourism".

Besides potential expansion and innovations, the mining industry is growing in other areas too. For instance, its share in GRP went from 6.2 % in 2015 to 10 % in 2018 (ECONOR 2020: p. 89-90). The growth is also reflected in the employment of the sector. As an example, the population working in the mining and quarrying industry went from 19 % in 2000 to 28 % in 2012 in Gällivare municipality, while remaining stable at the country level at 2% (Viinamäki, 2015: p. 53). The trend is not the same in Norway though, where the mining industry is relatively small and oil extraction dominates (ECONOR 2020: p. 84). Nevertheless, the case of Svalbard is interesting because of the long tradition of coal production, which has been the main economic activity for more than a century (early 1900s-2016). The situation changed in 2017 when one of the main plants was shut down. Currently, there is still some extraction activity but other closings are already planned and other sectors, such as tourism and research, are gaining more importance (ECONOR 2020: p. 94-97).

Viinamäki (2015: p.15) states that "actions of mining companies and mining start-ups at some locality reconstruct the community both indirectly and directly – both permanently and temporarily as a change in the demand and supply of welfare services, as an increase in the working possibilities, and as a change in nature (*especially open pit mines*). There will also be changes in the population structure because of mine worker's age- and occupational and educational factors. Especially in the North of Finland as well as in the Barents Region, socio-economic and ecological questions are essential, because many localities have a competing and even contradictory mining and tourism industry." As mentioned, this report's focus will be on the local scale of different industries in the Arctic, building on Viinamäkis findings. When it comes to mining, the impacts on the local landscapes, economies and communities are significant as the activity requires relatively large areas, resources and workforce. The management of these impacts and a fair distribution of compensation and benefits to local communities is crucial for the industry (and each specific company operating in the sector) to obtain a Social Licence to Operate (SLO). Benefit sharing, both monetary and non-monetary, can be organised in many ways depending on the interaction between the industry and the local and indigenous communities considered a partner, beneficiary or shareholder. Other types of arrangements can also be made, shaped as compensation, investment or charity. The principle that leads to the sharing process can be mandatory by law, negotiated with local authorities and/or local and indigenous communities, semi-formal according to specific requests from community actors and. Finally, indirect trickle down benefits are the ones that are gained through general economic impacts (income growth, employment, new infrastructure development etc.) (ECONOR 2020: p. 114). This is relevant because SLO improvement and implementation will constitute one of the next steps in the ArcticHubs project. Positive and negative impacts are highly context specific.

This report constitutes the first exploration of hubs' context, in order to get an overview of the most important features that influence the relation between each locality and the mining industry. Mancini et al. (2018) went through the main indicator sources (Sustainable Development Goals, Global Reporting Initiative, EU Better Regulation policy and Social Life Cycle Assessment) that are currently used in grey and scientific literature to assess the social impacts of the mining sectors. They identified these six impact categories: 1. economy, income and security; 2. employment and education; 3. land use and territorial aspects; 4. demography; 5. environment, health and safety; 6. human rights. All of these are relevant in the Arctic context and the present report tries to account for all of them.

According to the first one, economy, income and security, it's important to note the double effect that mining could have: on one hand, the industry can provide new jobs and business opportunities in remote areas that need a diversification of economic activities to mitigate young people outmigration (Frederiksen et al., 2016). On the other hand, an excessive dependence on mining could make the region vulnerable and exposed to global demand and price fluctuations of the mining products. Mines are often subject to bankruptcies and closures, but even when sudden adverse market conditions don't interfere, the mineral will eventually be consumed, and the activity will, sooner or later, cease. Furthermore, mining activities can be in conflict with other industries such as tourism and reduce or destroy the natural resources used for traditional livelihoods such as reindeer herding.

In relation to employment and education, one of the main challenges is the limited available local workforce and/or without the right education in remote areas. Companies often recruit workers from outside the local community and organize educational and training programmes to deal with these issues. One example from the Gällivare hub is the high school program with a mining profile set up in cooperation with Boliden Aitik, one of the mining companies operating in the municipality (Viinamäki, 2015: p. 21)

Land use and territorial aspects are particularly relevant for ArcticHubs. In most of the hubs, one of the main rightholders are reindeer herders, who need extensive pasture areas for their activity. A mine with all its infrastructure can interfere with reindeer migration paths and fragment or destroy pastures

(AHDR II, 2014: p: 137). On the other hand, remote settlements can get important benefits from the industry, such as new infrastructures and services.

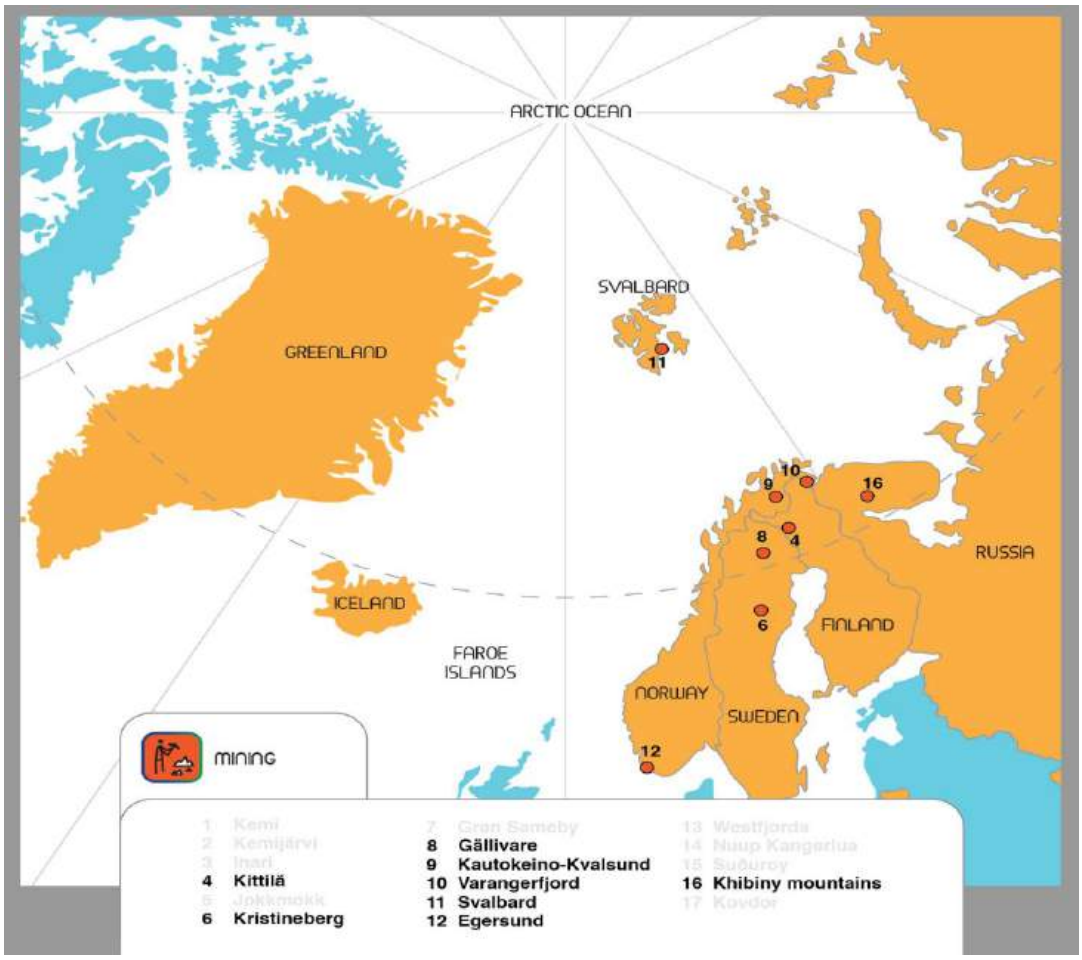
Demography is primarily impacted in two ways. In remote areas, which suffer from outmigration of young people, mining can contribute to mitigate the problem, offering jobs to the local residents. On the other hand, important migration flows can be generated when workers are coming from other regions. The second case can constitute a resource by bringing new residents and increasing the tax income available for the municipality. Nevertheless, this has to be carefully managed to avoid negative effects, such as housing shortages and prices growth, which happened in Gällivare (Viinamäki, 2015: p. 21) for instance. A case study from Finland showed (Viinamäki, 2015: p. 68-73) additional issues with insufficient welfare services, for example day care services for children and health care services, and heavy traffic increase.

Environment, health and safety are crucial issues. As examples from Norway will show, tailings deposition is a major challenge. Land deposits and fjord deposits are both contested practices that affect the local environment in regard, for example, to dust, air and water pollution. Noise pollution from mining activity is also important, as it negatively affects the environment and can modify animal behaviours, both domestic (or semi-domestic, such as reindeer) and wildlife.

Finally, human rights must be taken into account, especially in relation to the indigenous right to land and resource use, such as access to pasture for reindeer herders and clean water for fishing. In all the three considered countries, Norway, Sweden and Finland, Sami people have different degrees of legal rights, political power and institutions that have to be involved in the planning phase. However, the effectiveness of the enforcement of land and resource use rights is not always satisfactory, making Sami society and culture vulnerable to expropriation as conflicts in different hubs will illustrate. The mining industry, although not the only source of pressure towards indigenous livelihoods and culture, has big and long-lasting impact on the natural resources that are vital for them. Therefore, mining activities must be managed with special caution and through meaningful involvement and participation from the first stages. It must be noted here that “meaningful involvement” is difficult to obtain even when some kind of participation and a public hearing is mandatory by law. As reported in the report YOUTH (2015: p. 86-), minority groups such as indigenous communities do not see their traditional knowledge sufficiently recognized even when they prove that the scientific estimation of negative impacts on their livelihoods is wrong. Furthermore, there is a fundamental power imbalance problem as indigenous groups often lack “sufficient human and financial resources to protect their interests”, while mining companies can rely on “enormous” resources.

The Arctichubs project includes eight mining hubs in four of the northern European countries, including Norway, Finland, Sweden and Russia[3], and one learning hub, Germanasca Valley in Italy. All the eight hubs are co-located with either tourism or indigenous hubs, and two of them are co-located with a third, fish farming hub.

[3] The Russian partner withdraw from the project in December 2021, and data on the Russian mining HUB will be excluded from this report. Kristineberg hub was renamed with Malå.



Overview of the Mining hubs in Arctichubs project

2. Overview of the mining industry in the Arctic European countries (national level)

The first part of this report aims to give an overview of the mining industry and its importance in the three Arctic countries Norway, Sweden and Finland. National level data is presented with the following topics: mining history, mining products and export, employment, investments and state support.

2.1. Norway

2.1.1 Mining history

Norway has a long history of mining and exploration with rich deposits. Large-scale mining started in the 17th century, and several towns were built up around mining resources. Foreign investments were important for mine development in the late 1800s and early 1900s, particularly in the northern part of the country. New deposits of iron ore laid the foundation for company-forming towns, like Kirkenes and Mo i Rana.

Control over the mining resources and transport routes played a pivotal role in the German occupation of Norway during the World War II, and the battle of Narvik to secure the shipping of iron ore from Kiruna, Sweden. The post-war period is characterized by an active role of the State in rebuilding industry as important infrastructure were bombed. Mining products provided input to an expanding metallurgy industry located along the Norwegian fjords due to easy access and development of hydro-electric power.

The first oil was found in the North Sea in 1969, and Norway entered the petroleum age. This affected other industries as the focus shifted to a strong State control over petroleum resources, securing decades of massive income to the State budget and welfare state through taxation. The State took the costs of exploration and initial expenses of making the fields ready for production. The Norwegian State has not given the mining sector the same financial support. The mining sector became less important for industrial priorities and for the national economy. Some of the deposits ran out, and others struggled to keep the profitability. Gradually, the Norwegian State withdraw from active ownership, except from a few cases like Svalbard. Foreign capital and ownership took over most of the operating mines, a few stayed under Norwegian private company control.

2.1.2 Mining products, value and export

When presented in the national statistics, mining production in Norway consists of five categories of products:

- Building materials are used in construction of building, roads and industrial sites and consists of various forms of crushed rocks and uncompacted materials, gravel, and sand. This category constitutes 59 % of the total value of all mining products in Norway and is primarily used in the domestic market. Only 1/3 of the value of production is exported.
- Industrial minerals have non-metallic characteristics, and the most important in Norway are dolomite, graphite, limestone, quartz/quartzite, nepheline syenite and olivine. Industrial minerals constitute 14 % of the value of all mining resources, and is mainly used in production of paper, ceramics, steel cement, glass and paint. 32 % of the value of the minerals are exported.
- Present metallic ore excavation in Norway consists of iron, illmenite and some nickel. This category constitutes 19 % of the value of all national mining production. Only two companies are active: Rana Gruber in Nordland region producing iron ore and Titania AS in Rogaland region producing ilmenite. Almost all production is exported. Three more mines are planned and have completed the licenses process; Nussir mine (copper) and Sydvaranger (iron) in Troms and Finnmark region, and Engerbø (rutile) in the Vestland region.

- Natural stone is a category consisting of block stones, slate and bricks used in building, monuments and outdoors. This category constitutes 6 % of the total value of mining industry, and 60 % of the value is exported. Rogaland region is most important producer of natural stone.
- The last category is energy minerals, and the only resource excavated on Norwegian land territory is coal. The production only takes place in the northern island of Svalbard and have been dramatically reduced from 2017 when the biggest mine closed. 66 % of the 2020-production value was exported.

In 2020 total value of mining product was 12 billion NOK, of which 5.44 billion went for export (Dirmin 2021). This constituted 104 million tonnes of mining products.

Table 1. Total value of mining product

Type of mining products	Million NOK	Million tonnes
Building materials	7012	92,1
Industrial minerals	1615	8,9
Metallic ore	2292	2,2
Natural stone	993	0,9
Energy minerals	47	0,1
Total	11960	104.2

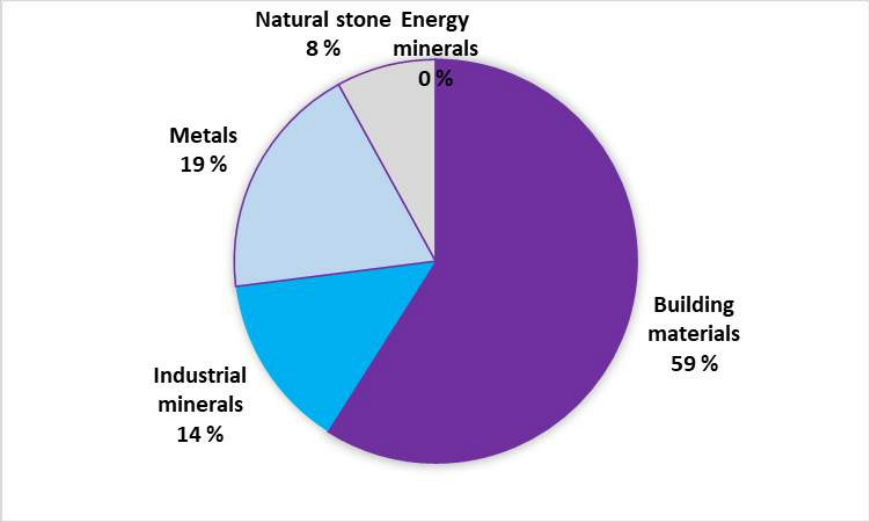


Figure 1. Percentage of value creation of different mining products of total, 2020 (DirMin 2021)

2.1.3 Employment

The mineral industry consisted of 4646 man-labour years in 2020. This is only 0,17 % of total employment in the country (SSB). The employment decreased from about 6300 persons in 2013. The main reason for this reduction was the closure of Sydvaranger mine in Kirkenes in 2016. The employment has stabilized since 2016. Rogaland and Nordland regions are the most important for mining employment. The mining industry employment in Norway is modest compared to Sweden and Finland.

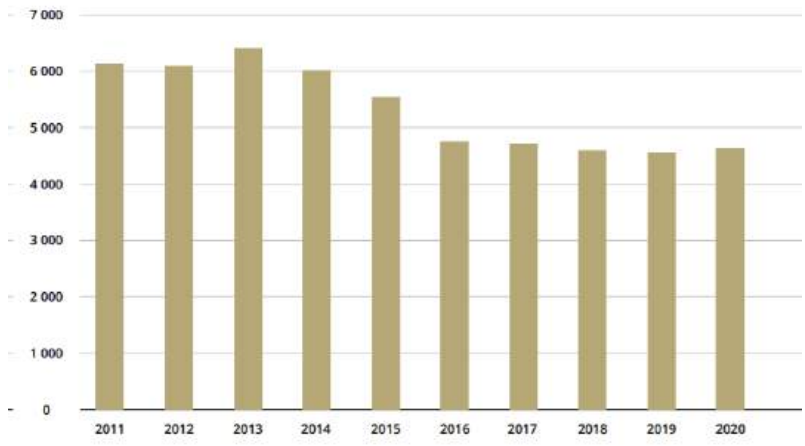


Figure 2. Employment in the mining industry 2011-2020. (Dirmin 2021)

2.1.4 Investments in the mining industry

In 2019 the total investment in the Norwegian mining industry was only 2 billion NOK (DirMin 2020). This is mainly investments with the purpose to increase production capacity, productivity and environmental demands in an existing industry. Opening of new mines are very capital intensive and requires huge investments. No new mines were opened in 2019. Nevertheless, compared to the last 10 years, mining investments in 2019 are the highest during the period. A peak was also reached around 2013 but decreased up to 2017. Another indicator is investments in exploration activities, in areas of present mining activity and new areas. The sum used in areas with no present mining activity increased considerably in 2020 compared to previous years (DirMin 2021).

Fraser Institute published an annual survey of mining and exploration companies. The survey is an attempt to assess how mineral endowments and public policy factors such as taxation and regulatory uncertainty affect exploration investment. Finland is at the top of this list as the most investment-friendly country (index 92), Sweden is also quite attractive with an index of 82. Norway is at the bottom among the Nordic countries with an investment index of 70. This indicates that other northern European countries are more attractive for mining investments (Fraser Institute 2020).

2.1.5 State policy to support mining industry and socio-economic impacts

After many decades with moderate mining activities and no new mines opening, a shift appeared in the State mining policy with the increased focus on development of natural resources in the northern part of the country, particularly articulated with the first national “Northern strategy” in 2005 (Ministry of Foreign Affairs 2005).

State programs for exploration of resources confirmed valuable deposits in the northern part of the country. Mining legislation was at this time fragmented and not suitable for attracting investments to the industry. A new Minerals Act was adopted in 2010, and the Government worked out a national Mineral strategy (2013). This led to several foreign and national initiatives in exploration, but few of them were taken to the level of application for license. The limited numbers of initiatives have however experienced a long and complicated planning process, much due to objections to the different permissions given at various stage of the planning process, put forward from different State organs, stakeholders, rightsholders and interest groups. Most of the planned mining projects are in the northern part of Norway, in areas where Sámi interests and rights holds a strong position, particularly traditional reindeer herding. Another challenge in gaining local acceptance for new mining projects is the mining tax system not providing for a proportional economic benefit to the local societies affected by the industry. This, among other challenges, is raised in the Minerals Act now under revision.

Another contested topic for implementing the national mineral policy is the increased opposition to the deposit of mining waste in the Norwegian fjords, causing harm to marine life and fishing/aquaculture industry. Norway is one of very few countries to permit this form of waste disposal, and the Government decided in 2020, to stop this practice for new mining projects, granting two disputed mining projects (Nussir in Kvalsund and Nordic Mining in Engerbo) already receiving the permit, to continue with their plan for fjord deposits. This practice is challenged by the EU water directive.

The role of the municipality is unique in Norway as the Planning and building act- PBA entitles the Municipal Council to allocate land for mining operations. The municipality can consequently say NO to a mining initiative. This was the case when the Swedish company Arctic Gold tried to develop a mine in the sámi Kautokeino municipality in the period 2013-2015, and the Municipal Council rejected to approve the plan. Such a possibility to stop a mining initiative is often assessed as a "disadvantage" for attracting investors. The situation is different in Sweden and Finland were mining policy is more of a State responsibility.

Despite some local resistance, the regional level in Northern Norway is still eager to attract national and international investors to the mining industry, and in 2019 the County Councils of Nordland, Troms and Finnmark worked out a Mineral strategy of Northern Norway (Ministry of Foreign affairs 2005). The strategy aims to develop a sustainable northern mineral industry moving towards the green shift.

2.2. Sweden

2.2.1 Mining history

The mining history in Sweden dates back to the end of the Viking age around the year 1000 (SGU 2022). During that period mining began at the Falu copper mine. The mine became vital for Sweden's economy and politics and during the 17th century when Sweden reach the status of European power, two-thirds of the world's copper production came from the Falu mine. When it was finally closed down in 1992 it ended a 1000-year production era. During the 12th-century iron production form iron ore began and iron mines, blast furnaces and other industrial facilities are known from the Bergslagen region since the Middle Ages. Sweden became one of the dominant producers of iron in the world and remained so until the 19th century. In the northern part of Sweden discoveries of important ore findings were made as far back as the 17th century including what is now some of the major mines in Sweden, Gällivare Malmberget (1660s) and Kiirunavaara-Luossavaara (1696). However, production of ore and metal industry was difficult in the low populated, harsh environment and it was not until the early 20th century that the exploitation of these ores reached an industrial level. The other important mining district Boliden were discovered in 1924. Metals like gold, silver and copper from different mines in the area were produced locally and the Boliden gold mine became the largest and richest in Europe. Production from this gold mine ended in 1967 but the mining area has continued to be important with new mines opening up as old ones shut down.

2.2.2 Mining products, value and export

When presented in the national statistics, mining production in Sweden consists of five categories of products (SGU 2022):

- The metallic ore production in Sweden was at its highest level ever 2021 when it reached 88,6 million tonnes. The metallic ore extraction consists of iron (41,3 Mtonnes) and non-ferrous ores (47,3 Mtonnes). The major non-ferrous ores are gold, silver, copper, zinc, lead and tellur. The State-owned company LKAB has four active iron mines (Malmberget in Gällivare municipality, Kiirunavaara in Kiruna municipality, Leveäniemi and Gruvberget in Svappavaara municipality) while Kaunis Iron has an active mine (Kaunisvaara) in Pajala municipality. All five

iron mines are located in the county of Norrbotten. There are eight non-ferrous mines in Sweden of which five are located in the northern part of Sweden. Boliden Mineral AB has three mines in the county of Västerbotten; Kristineberg in Lycksele municipality producing copper, lead and zinc, Renström in Skellefteå municipality producing copper, lead and zinc and Kankberg in Skellefteå municipality producing gold and tellur. Boliden Mineral AB also operates the Aitik mine in the county of Norrbotten, Gällivare municipality, producing copper and gold. Skellefteå municipality is also hosting the Björkdalsgruvan gold mine owned by the company Björkdalsgruvan AB.

- Building materials are used in construction of building, roads and industrial sites and consists of various forms of crushed rocks and uncompacted materials, gravel, and sand. Aggregates are the most used material in Sweden because it is the main component of asphalt and concrete. It is also used as railway macadam and as filling material (SGU 2021b).
- Industrial minerals are defined by their physical properties such as fibrosity, insulation capacity, density and hardness and by their chemical properties such as composition, content and impurities. Examples are limestone for cement production or clay for brick production. There are more than 60 different types of minerals, rocks or similar raw materials in this category. In 2021 7,6 million tonnes of industrial minerals were delivered with limestone being the major mineral with 6,4 million tonnes. This is followed by quartz sand (775 ktonnes), dolomite (306 ktonnes), quartz/quartzite (86 ktonnes) and clay (31 ktonnes). The total value of produced industrial minerals 2020 were expected to be in the range of 2 billion SEK (SGU 2021a). No data is available for 2021 since SGU no longer collect this information (SGU 2022). In 2021, production was reported from 28 quarries in Sweden, but the only one of those was located in the northern part of Sweden, Masugnsbyn (dolomite) in Kiruna municipality, owned by LKAB.
- Dimension stones is a category consisting of natural stones from stone quarries. Granite, gneiss, diabase and gabbro are mined in the bedrock and are found in many parts of Sweden. In southern Sweden where you find younger sedimentary bedrock, mainly Ordovician limestone is mined. In the mountains, deposits of limestone and slate are mined. In 2020 a total of 216 ktonnes were delivered as final products which included trading block for further processing, semi-finished stone products and finished stone products. About 40 % of mined granite, gneiss and diabase are exported. In 2021, production was reported from 57 quarries in Sweden, but the only one of those was located in the northern part of Sweden, Korpkullen (mylonite) in Vilhelmina municipality, owned by Lapplands Natursten AB.
- The last category is energy minerals, which includes coal, peat and similar minerals (SGU 2021a). The only energy mineral in Sweden is peat. Sweden has vast areas of peatlands, which constitutes 15 % of Sweden's total land area. However, only a small percentage of the peatland is used for peat extraction. The area was estimated to be ca. 63 km^2 in 2020. That year, production of peat was ca. 2,2 million cubic meters, where 32 % consisted of energy peat while the remaining 68 % consisted of peat used for cultivation purposes. The energy peat produced equals an energy content of 0,76 TWh. Energy peat is produced all over Sweden including the most northern counties Norrbotten (76 758 kbm) and Västerbotten (114 234 kbm).

Table 2. Mining products from Sweden 2021 (SGU 2022)

Type of mining products	Million SEK	Million tonnes
Building materials		101*
Industrial minerals		7,6
Metallic ore		88,6

Type of mining products	Million SEK	Million tonnes
Dimension stones (Natural)		0,2
Peat (Energy minerals)		709 000 kbm*
Total		197,4

Source: SGU 2021a, SGU 2021b, SGU 2022

The total export value from the mining industry (ores, metals and minerals) in Sweden was ca. 170 billion SEK 2021, which is about 11% of total export (SGU 2022). At the same time, the import value was ca. 130 billion SEK. Europe is the major export market followed by Asia and MENA (SveMin 2022a). The total mineral export expressed in tonnage was ca. 35 000 tonnes while the total import reached ca. 16 000 tonnes.

2.2.3 Employment

In 2021 the reported number of employed in the mining industry was 7 387 (SGU 2022). If subcontractors are included the number is slightly higher. In 2020 the total number was 7 934 (SGU 2021a).

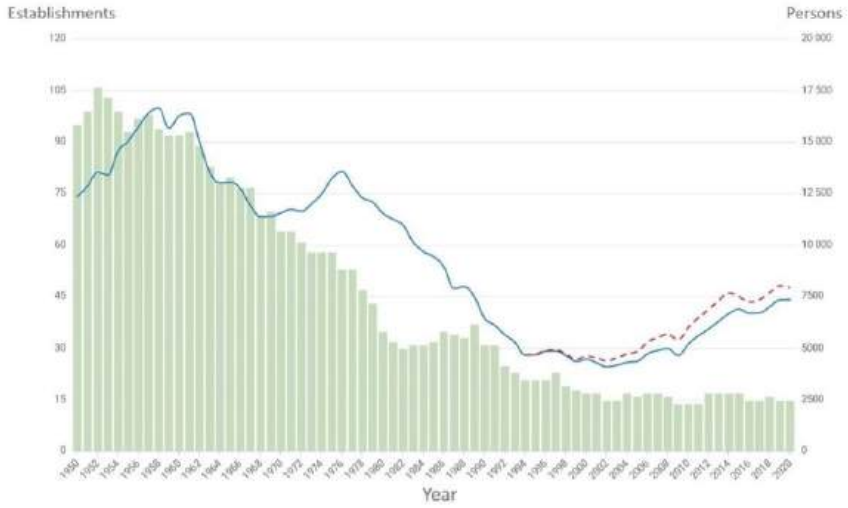


Figure 3. Number of establishments (green) and persons employed in the mining industry 1950-2020. Blue line is reported numbers, red line includes subcontractors (SGU 2021a).

The total number of establishments are 14, 12 mines and two mineral processing sites. 25 % of the workers in 2021 were women (SGU 2022). In the RAMS-statistics produced by SCB 2020 9 189 people were employed in the total mineral industry, including the workforce in mines, quarries and pits (SGU 2022). At the same time SCB reported that in December 2021 the total number of employed persons in Sweden were just over five million, which means that only ca. 0,2 % are employed in the mineral industry. This number is very similar to the number reported from Norway.

2.2.4 Investments

In 2019 the Swedish mining industry invested 6.3 billion SEK which is slightly higher than in previous years. The number amounts to approximately 9% of the total investments by all Swedish industries. Most of the mining industry investments go to fossil-free production.

Since 2018 no new mines have been opened in Sweden. The number of active mines are currently 12 after the Maurliden mine closed down in 2019. However, since the financial crisis in 2009 the total production from Swedish mines has almost doubled. The production increase is mainly attributed to the Boliden Aitik mine but most mines have shown increased production (SGU 2022).

The exploration costs correlate with exploration activities and saw a sharp increase in the beginning of the 2000 due to growing international demands for metals.

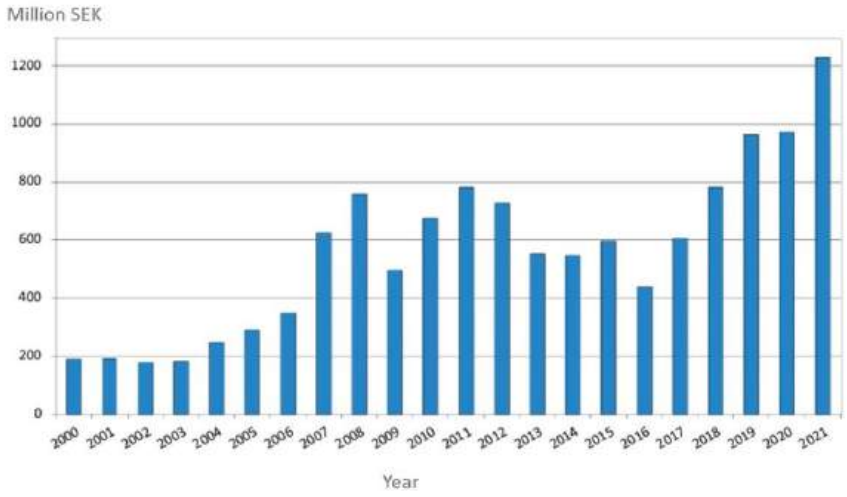


Figure 4. Exploration costs 2000-2021 (current prices) (SGU 2022)

The international exploration activities had started to slowly decline in the last few years but in 2021 saw an impressive recovery of 35% compared to the previous year. Swedish exploration activities had already started to increase again after a minor dip and in 2021 reached a new record level. Exploration costs went up from 970 million SEK 2020 to 1 230 million SEK 2021. During 2021 the number of exploration permits increased to 585 compared to 550 in the end of 2020. Exploration activities are mainly focused around already present mines rather than attempting to find new mines (SGU 2022).

2.2.5 State support of mining

Sweden is currently ranked 10th by the Fraser Institute in their annual survey of mining and exploration companies (Fraser Institute 2020). The attractiveness is based both on mineral potential and on policy perception. This indicates that Sweden has implemented policies and a regulatory framework that is favourable to the mining industry, at least in an international comparison.

Sweden's current mineral strategy was published 2013. At that time Sweden was already ranked among the top ten countries by the Fraser Institute. The strategy's aim was to increase that position showing the State's positive attitude to the mining industry. To implement the strategy nineteen activities were identified. All of those activities have been executed and reported, but so far no new mineral strategy has been decided.

However, Svemin conducted a survey of all the Swedish political parties participating in the upcoming Swedish national election in September 2022 (SveMin 2022b). The survey included 14 statements or policy changes favourable to the mining industry. The results showed that 9 out of the 14 statements were supported by a majority of the political parties. However, the survey clearly showed that the right-leaning parties are much more positive to changing the mining policies in favour of the mining industry (41 yes) than the left-leaning parties (22 yes). Thus, the result of the upcoming election will likely have a profound impact on state support of mining.

There is also an apparent strong public support for the mining industry. A recent report (SOM-Institutet 2020) on a nationwide survey showed that 52 % of the respondents agreed with the statement that the mining industry should be allowed to develop in order to secure the supply of important metals. Only 8 % of the respondents disagreed. However, it should be noted that 40 % of the respondents declared no opinion on this matter. The survey also showed that men are generally more positive to the mining industry than women. Likewise, people living in rural areas are more positive to the mining

industry than people living in urban areas. Local communities who are directly impacted by mines probably have different opinions. The expansion of new and existing mines means some people will have to abandon their homes e.g. the expropriation of the village of Liikavaara. For others, the mining industry will create job opportunities that allows you to stay in the local area.

Most of the operating mines are located in Norrbotten and Västerbotten counties, in areas where Sami interests and rights holds a strong position, particularly traditional reindeer herding. The reindeer herding communities have long been opposed to new mining activities because of the large impact on reindeer and reindeer husbandry. As a response, the Sami Parliament made a statement in 2013, approved by the plenum, calling for an immediate stop of all new mining activities such as new exploration permits, work plans and mining concessions (Sametinget 2014).

Mines also have an unavoidable impact on the environment and Swedish environmental groups have strongly opposed new mines in the area claiming that biodiversity, ecological values and climate will be negatively impacted and that there are risks for pollution of air and water (Naturskyddsföreningen 2015).

2.3 Finland

2.3.1 Mining history

Mining and metal production have historically played a major part in the Finnish industry. The history of mining in Finland goes back at least to the 1500s (Nurmi and Rasilainen, 2015). The Ojamo iron mine in Southern Finland, discovered in 1530, is considered to be the oldest metal mine in Finland. In the early stages, mining operations mostly produced modest amounts of iron and copper. Exploitation of the Outokumpu deposits in Eastern Finland in 1910 can be regarded as the beginning of the modern mining industry in Finland. The pace for opening new mines was high during 1955-1975, diminished in 1975, and was low during 1990–1999, possibly reflecting the economic recession in the early 1990s and low commodity prices. The pace has been increasing since the change of 2000s, several mine projects being on the way.

The selection of metals mined in Finland has changed over time. In the early stages, from the 1500s to the beginning of the 1900s, mining was mostly concentrated on copper and iron, and the amounts produced were small (Nurmi and Rasilainen 2015). In the early 1900s, the amounts of metals mined annually began to increase. Mining of copper started this trend in the late 1920s, followed by zinc in the late 1930s, nickel at the beginning of the 1960s, chromium in the late 1960s, and gold in the late 1980s. However, iron dominated the tonnages mined from the mid-1950s until 1988. By the end of the 20th century, mining volumes of all the base metals (copper, nickel, zinc, lead, cobalt) had decreased due to the closure of several major mines. Only chromium production had continued to increase steadily. Since the beginning of the 21st century, the mine production of base metals has started to increase again. The average annual ore production has increased to an all-time high for chromium, gold, and nickel, and was at its highest in the 2000s for copper and zinc. Iron dominated the total tonnages of metals mined throughout history, but the calculated value of several other metals currently being mined is higher (Nurmi and Rasilainen 2015).

The mines that are operating now, have been established by the regulations of the Mining act (503/1965) or before that (Turja, 2022). The mining act has been reformed in 2011, and all mining operations are now following the regulation of that new act. However, no new mines have yet not been established after the reformation. Prime minister Sanna Marin's government has committed to reform the mining act again, in order to better the standards for environmental protection, securing the prerequisites for mining operations, and to better the acceptability and possibility to participation for locals. This project has already started.

2.3.2 Mining products, value, and export

In Finland the outlook for mining has remained positive due to the demand for raw materials. There are 45 mines in total, of which 9 are metallic mineral mines, and 36 are industrial mineral mines) (Figure 5), In 2020, a total of 48.6 Mt of ore was extracted in those mines (Vasara, 2021).

In 2020, a total of 81.7 million tons of ore and adjoining rock were mined from nine metal ore mines in Finland, of which 32.9 million tons were ore (Pokki, 2021). Of the metal ore concentrates, chrome concentrate consisting of chromite and sulphur concentrate consisting of pyrite, are produced clearly the most in Finland. Gold, platinum, silver and palladium are the biggest precious metals mined in Finland. Furthermore, Finland is the only EU-country producing cobalt, in 2020 the amount being 1559 tons in total. The most important industrial minerals mined in Finland are calcite, apatite, talc, wollastonite, quartz and feldspar, and in 2020 the total amount of those minerals mined was 15.8 million tons.

The industrial production value of mining was 1.7 billion euros during the year 2020 (Official Statistics of Finland 2021). Finland has unique mineral resources in Europe regarding battery production, which is becoming more and more important. The total output of mining activities and activities related to mining (like concentration and downstream plants, and the suppliers of services and machines), the mineral cluster, has been evaluated to be around 22,1 billion EUR, of which 12,2 billion is direct effect (Hokkanen et al., 2020). The mines in Finland are inputting material for refinement, and the sales volume of refinement businesses was around 10 billion EUR in 2020 (Teknologiateollisuus ry. 2021). The Finnish government has established an aim for the year 2035 to be carbon neutral (Programme of Prime Minister Sanna Marin's Government, 2019), and mining has their part in completing this aim.

Even though the volume of domestic mining has multiplied during ten years, the production is not enough to meet domestic demand, and in 2020 3.8 Mt of metallic ore concentrates were imported to Finland (Vasara, 2021).

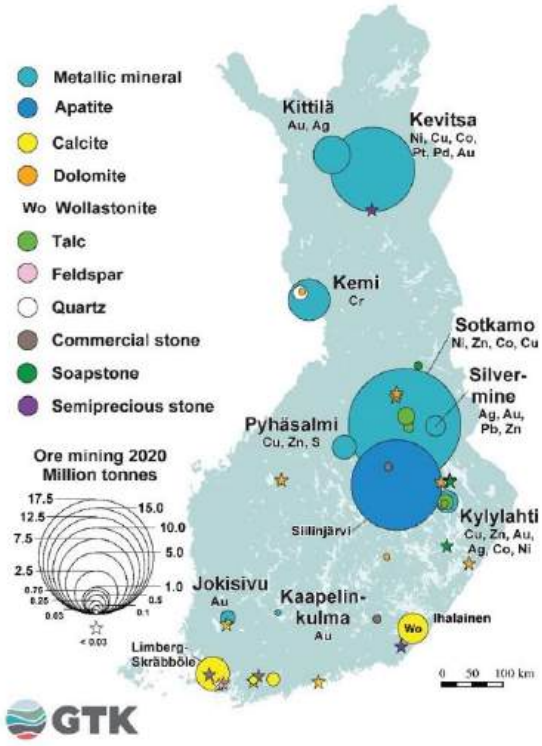


Figure 5. The amount of ore mining in Finnish mines in 2020 (Finnish Safety and Chemicals Agency, National Land Survey of Finland 2020. Map: Geological Survey of Finland)

In Finland, mining and mineral prospecting is controlled by the mining act (Mining act, 621/2011), and the environmental effects are controlled by the nature conservation act (1096/1996). The mining act and the nature conservation act are being reformed, and after that it is forbidden to mine in national parks and nature reserves, and in other nature conservation areas the conditions of mining are made stricter (Ministry of Environment, 2022).

Finnish Safety and Chemicals Agency (Tukes) is the supervising authority of mining, and it controls that the activity and land use required by the mining operations are operated socially, economically and ecologically sustainably (Mining act 621/2011). In addition, every mine established in Finland needs a mining permit, a mining safety permit, and a permit for handling and storing chemicals and explosives from Tukes (Tukes, 2022b). All mines also need an environmental permit from the environmental authorities, and a zoning plan by a local authority is often a condition for opening a mine.

2.3.3 Employment

The number of employees in mining industry has been rising during the last decade in Finland (Figure 6), and in 2020 the 45 mines of Finland were employing 5539 people (Tukes, 2022a). The rise in employment has been bigger in the mining operation supporting activities (Ministry of Economic Affairs and Employment of Finland, 2021; Figure 7). The mineral cluster is employing 87 400 person-workyears by direct and indirect means, of which direct means are 24 600 years (Hokkanen et al., 2020). The regional effects are most visible in Lapland, Kainuu and Satakunta regions. The staff number in the refinement businesses has been around 16 000 during the last years (Ministry of Economic Affairs and Employment of Finland, 2021).

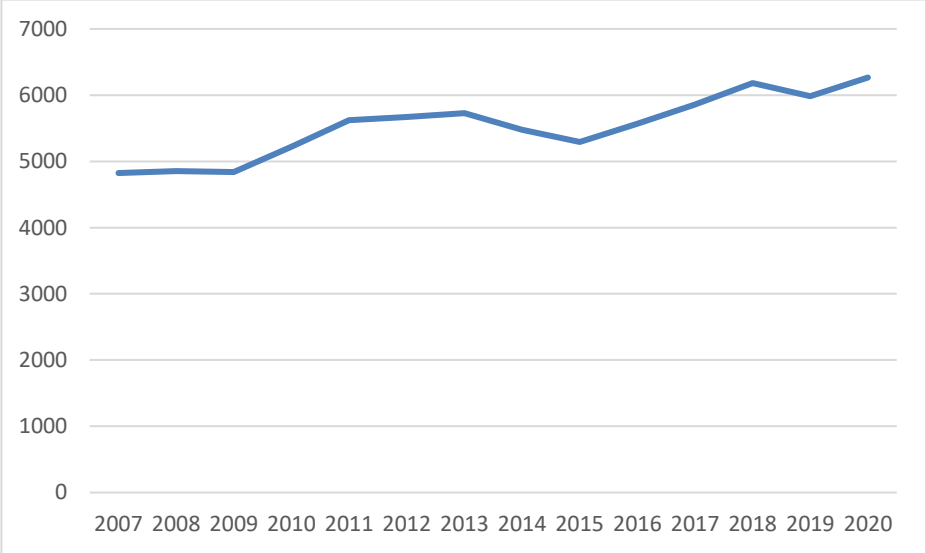


Figure 6. Employment in mining industry in Finland during years 2007-2020 (Official Statistics of Finland 2022a)

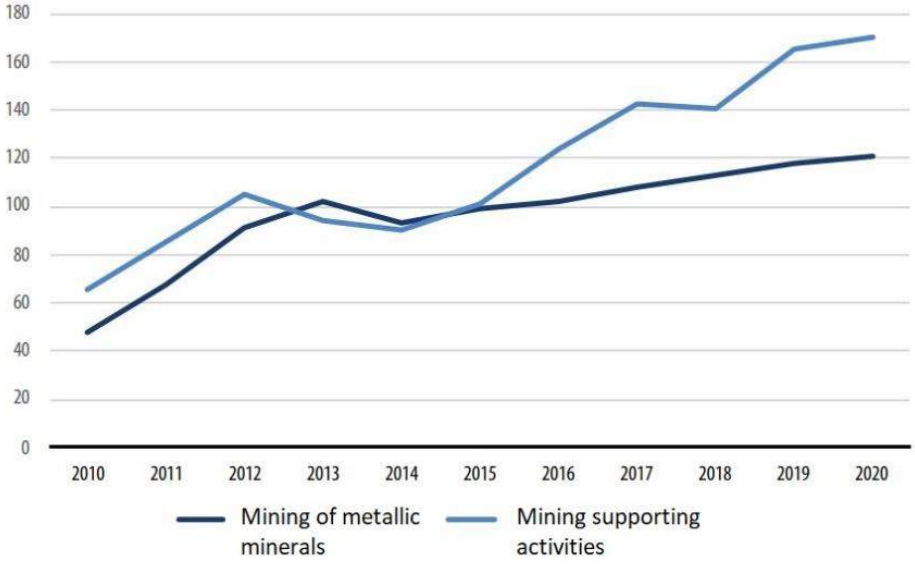


Figure 7. The economic trend of the employment number during years 2010-2020 (Index 2015 = 100) in Finland (Official Statistics of Finland, 2021).

The availability of experts is a global problem of mining industry, since the training programmes have been reduced during the last decades (Finland's Minerals Strategy, 2010). This has led to a twisted age distribution and to a lack of experts in the field. The average age of employees is high, but because of the new investments the demand for them is growing.

2.3.4 Investments

Mining in Finland has been developing during the last years, and new mining areas are being planned continuously; 50 companies were doing mineral prospecting during 2021. Most of them were happening in North-Finland, for example in Lapland. Lapland is an attractive place for new mining activities, since there is sufficient resources, good geological knowledge, a high education level and good infrastructure quality. There are many plans of opening completely new mines, or reopening some of the closed ones (Hokkanen et al., 2021). One of the most significant recent mining projects has been the opening of Sotkamo Silver Oy Silver mine in 2019 in Kainuu (Pokki, 2021).

In the statistical review of mining, 21 companies reported mining from 44 mines (Tukes, 2022a) in 2021 in Finland. The mining companies invested 311 million euros, which is 20% less than in the previous year (Figure 8). The most significant investments were made in the Kevitsa (Sodankylä), Kemi and Kittilä mines. Metal ore, carbonate rock, industrial rock and industrial mineral mining was 47,9 million tons. The change of investments in the ore prospecting since 1995 in Finland and in comparison to the global level can be seen in the Figure 9, and numbers of exploration investments, prospectors, reservation notifications, and exploration claims and drilling information during 2016-2021. The total extraction of the mines was 115.5 million tons (Figure 11). The three largest mines in Finland Terrafame, Kevitsa and Siilinjärvi mined 85% of this (Figure 12).

	2021	2020	2019	2018	2017	2016
Number of mines (REPORTED EXCAVATION)	**44**	45	44	46	44	42
Mine investments (million €)	***311***	392	525	390	303	242
Excavation of ore (million tons)	**47.9**	48.5	44.6	49.0	48.4	43.7
Total excavation (million tons)	**115.5**	115.4	115.1	130.1	120.4	117.2

Figure 8. Mine investments, excavation of ore and total excavation in Finland from 2010-2021 in Finland (Tukes, 2022a)

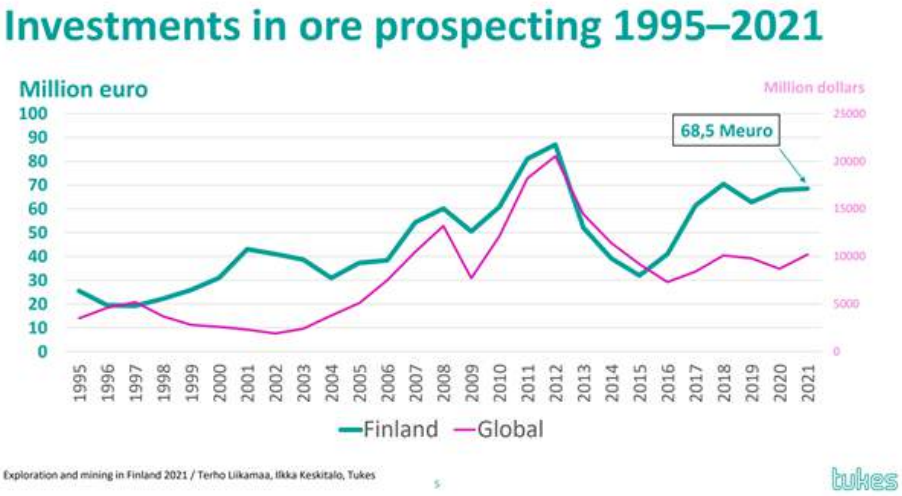


Figure 9. Investments in ore prospecting from 1995-2021 in Finland and a global value for comparison (Tukes, 2022a)

	2021	2020	2019	2018	2017	2016
Exploration investments, reported by prospectors (million €)	**68.5**	68.0	62.8	70.4	61.4	41.0
No. of prospectors	**50**	61	46	44	46	41
No. of reservation notifications filed in Tukes	**75**	92	88	50	96	68
No. of exploration applications (claims) filed in Tukes	**219**	113	149	148	185	98
Total area of reservation, (km2)	**30 000**	41 367	31 802			
Total area of exploration applications (km2)	**5 873**	4 387	3 499	3 573	3 426	2 160
Total area of valid claims/exploration (km2)	**2 072**	1 975	1 869	1 783	1 613	1 700
Drilling (kilometres)	**280**	219	189	219	273	178
• Grassroot	• **34**	• 65	• 39	•34	•40	•20
• Greenfield	• **180**	• 89	• 78	•73	•53	•57
• Brownfield	• **66**	• 65	• 72	•112	•180	•101

Figure 10. Exploration investments, number of prospectors, reservation notifications, and exploration claims, total area of exploration claim and valid claims, and drilling information during 2016-2021 in Finland *(Tukes, 2022a*)

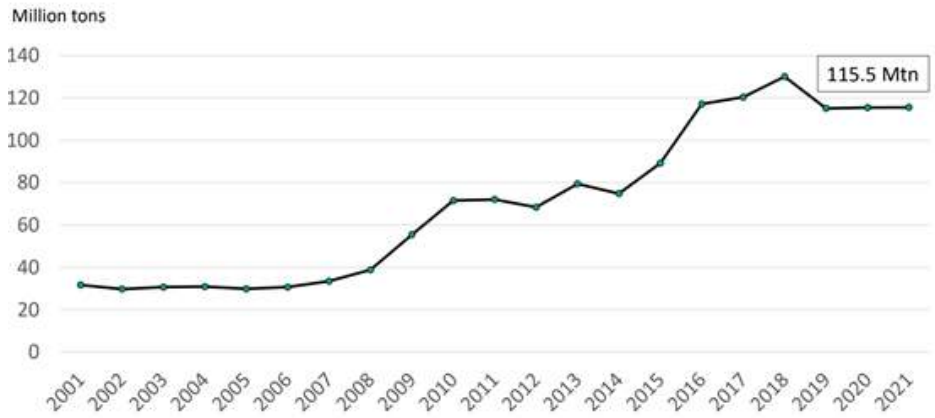


Figure 11. Total excavation of mines in Finland during 2001-2021 (Tukes, 2022a)

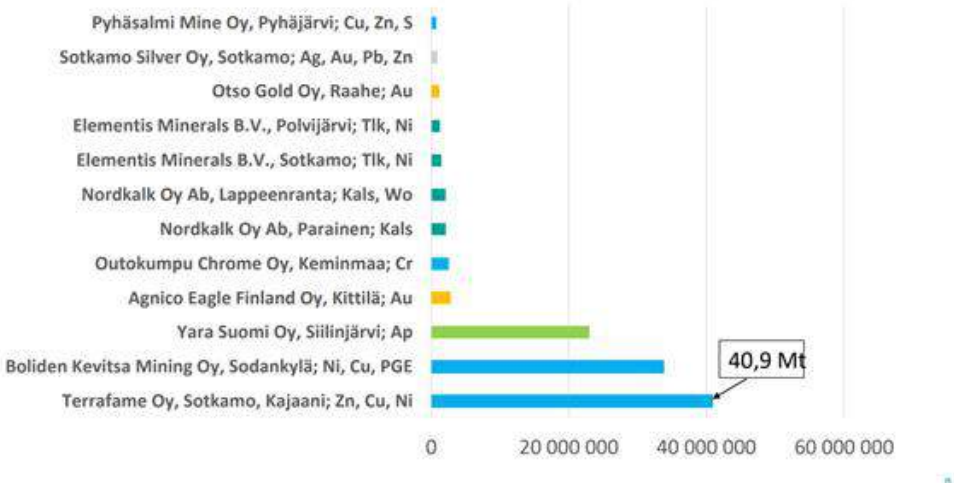


Figure 12. Total excavation of 12 biggest mines with their products in Finland in 2021 (Tukes, 2022a)

2.3.5 State support of mining

Finland has been ranked one of the most attractive countries for mining by mining companies, based on their geologic attractiveness, the effects of government policies, such as regulations, taxation levels and the quality of infrastructure (Finland's Minerals Strategy, 2010; Yunis and Aliakbari, 2021). Finland offers a good working environment for mineral prospecting and mining activities (Finland's Minerals Strategy, 2010). In addition, the attitudes of locals towards mining has been relatively good. Because mining industry is often seen to bring bad effects to the environment, and as a dangerous industry, have the environmental and safety aspects become more central in the operations of mining companies.

The state of Finland supports the infrastructure investments needed in mining activities, but mining is one of the only industries in Finland, where significant number of investments are coming from foreign countries (Finland's Minerals Strategy, 2010). Mining activities are also funded by different tax aids, like energy tax aid and electricity tax aids (Pietarinen and Roslund, 2018).

However, during the last years, investors have been expressing increasing concerns over uncertainty concerning restrictions on land use, legislation becoming more complex, and lengthening of permission processes (Finland's Minerals Strategy, 2010; Yunis and Aliakbari, 2022). The competition on land use and the disputes and restrictions on that bring increasing challenges to all mining activities. Mining companies have to compete for example with nature protection and tourism. But usually, the

land area needed for mines is relatively small, and a modern mine does not release significant amount of emissions.

3. The mining hubs

This chapter goes down to the regional and local level, and first present regional statistical figures on population dynamics and employment in the mining industry. The second part contains information and statistics on the local hub level related to the specific mining company in question.

3.1. Norwegian mining hubs

ArcticHubs project includes four Norwegian mining hubs: Svalbard, Kautokeino-Kvalsund and Varangerfjord in Troms and Finnmark region and Egersund in Rogaland region.

The map below illustrates the importance of the different mining products in the different Norwegian regions, measured by total turnover. Industrial minerals are most important in the northernmost Troms and Finnmark. Metallic ore are mainly found in Nordland region. Rogaland region is dominated by building materials.

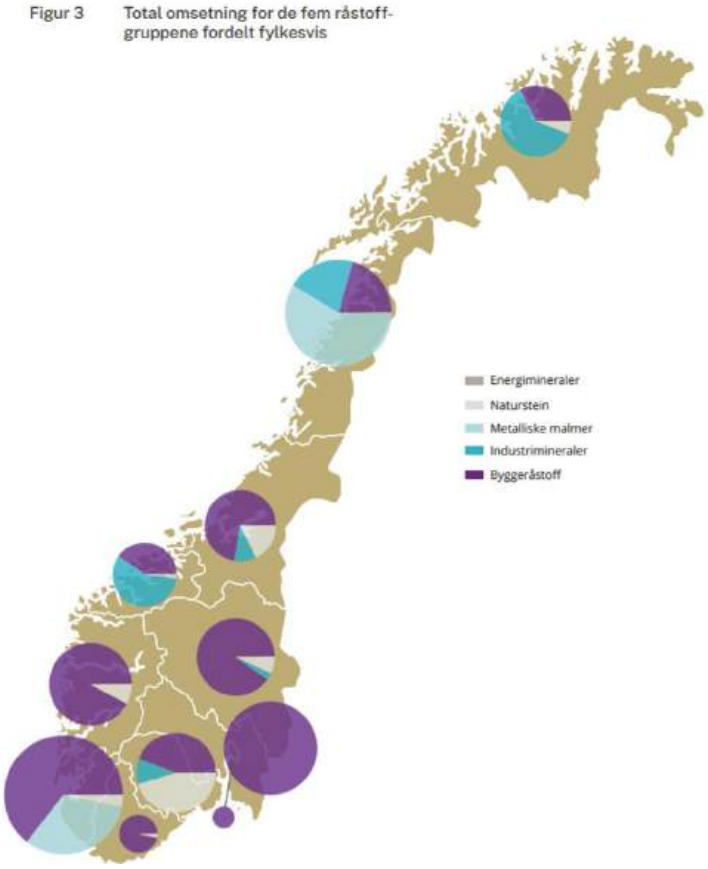


Figure 13. Total turnover for the different mining products in different regions, 2019 (DirMin 2020)

The figure below illustrates the employment in the mining industry in different Norwegian regions in 2020. The southwestern Rogaland is the leading region with 943 employed, dominated by building materials and metals. The Northern region Nordland comes second with 753 employed, and our analyzed region Troms and Finnmark has a modest employment of 374.

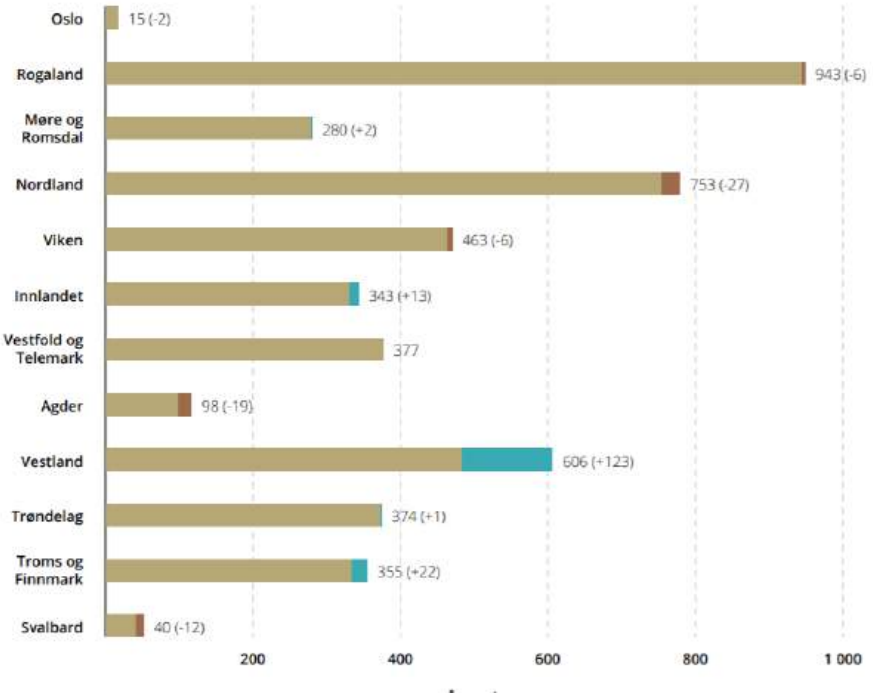


Figure 14. Employment and changes from the previous year, in the mining industry in different Norwegian regions, 2020 (DirMin 2021)

3.1.1 Troms and Finnmark region: Kautokeino-Kvalsund and Varangerfjord hubs

The two northernmost regions Troms and Finnmark merged in 2020, as a result of a regional reform. We will use statistical data from the merged region.

Population dynamics at the regional level

The region had in 2021 a population of 242 000 (SSB statistics 2021). Population dynamics of Troms and Finnmark confirm that the region has experienced a steady population increase up to 2019. This is in line with the rest of the country, mainly driven by immigration, but in contrast to northernmost regions of Sweden, Norrbotten and Finland, Lapland, that has experienced a decline. The development consists of different paths in different parts of the region. The population increase came in the bigger cities, mainly driven by the locomotive Tromsø, but also in Harstad, Alta and Hammerfest. Smaller municipalities along the coast and the inland experienced in the same period a decline. This development follows the centre-periphery dimension of young people in fertile and working age moving to cities while the smaller communities are left with an increasing number of senior citizens.

The region experienced a shift in 2019 when the total population number for the first time went down. The population increase in the cities can no longer compensate for the decrease in rural areas.

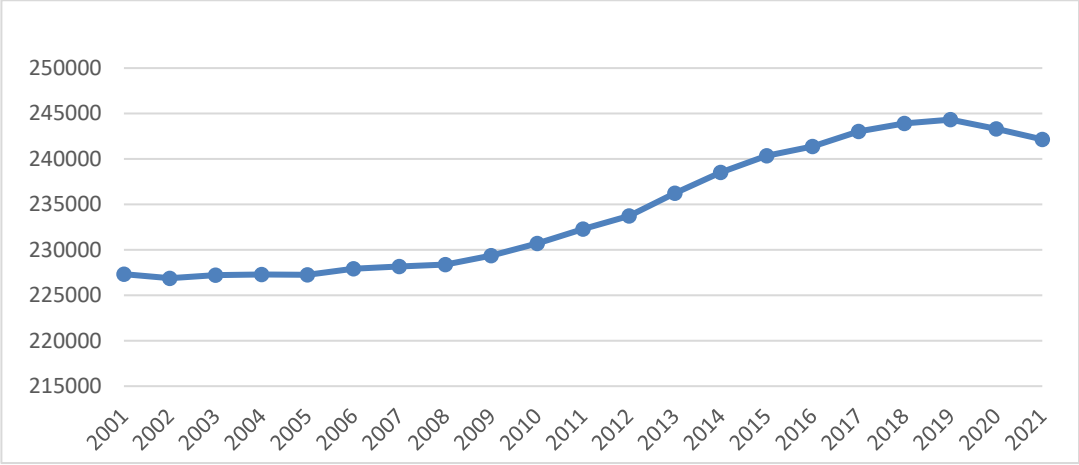


Figure 15. Population dynamics Troms and Finnmark region 2001-2021 (SSB, 2021)

3.1.2 Kirkenes/Varangerfjord hub

Kirkenes town is the center of Sør-Varanger, the easternmost municipality in Norway bordering Russia to the east and Finland to the south. The national interest of keeping the Norwegian population, businesses and presence in the area is high, caused by the strategic position with only border crossing point between Norway and Russia.

As a mining hub, we limit the analysis and use of statistical data to Sør-Varanger municipality. It is appropriate to include a bigger geographical area comprising all the municipalities bordering the Varangerfjord (Vardø, Vadsø, Nesseby and Sør-Varanger) when studying other industries as aquaculture and tourism in this hub.

Kirkenes, located in a side fjord of Varangerfjord is a transport hub in the Barents region, with an ice-free port and all year-round access to the Barents Sea. Kirkenes has a role in the Northern Sea Route with the potential for transport natural resources to Asia. This has generated a market for ship repair, particularly fishing vessels from Russia, and the port is used for bringing in and out Russian crew. This generates retail trade, and the introduction of “visa border zone” in 2012 made travels across the border easier for the local population. The national institutions for Barents cooperation, the Barents Secretariat, is located to Kirkenes. Another important industry is tourism. During winter, local tourist companies offers activities like dog-sledge trips, snowmobile tours, northern light and king crab safaris. In spring /summer the cruise ship tourism and fishing tourism are the main activity. Kirkenes is the end stop of the famous touristic cruise voyage Hurtigruten, generating tourists flying in and out. The covid pandemic and the was in Ukraine has impacted the tourist streams and profitability of tourist-related activities. However, Kirkenes is first and foremost a border town for Barents cooperation and a mining town.

Sydvaranger mine, located at Bjørnevatn outside Kirkenes, has a long history of iron ore mining and processing from 1907. The company town of Kirkenes has a strategic importance next to the Russian border and the state-owned industry kept employment and settlement in the border region. At its peak, a total of 1600 employees worked for the company, and during the whole period of operation 200 million tonnes of iron ore was extracted. The mine closed in 1997 due to low demand and decreasing global iron ore prices, and the Norwegian State was no longer prepared to subsidize an unprofitable company. The global mining boom resulted in a restart of Sydvaranger mine in 2009, now by the Australian company Northern Iron, but went bankrupt in 2015 followed by a new closure. During

this short period, the company extracted and exported 8 million tonnes of iron to Europe, Middle East and China[4]

A new Norwegian initiative based on American investments, planned for a reopening of the mine, but on a smaller scale. In January 2021, Tacora Resources Inc. was announced as the new owner. The company consists of several international investment partners, predominantly US lead, and currently runs a mine in Canada. Indicated reserves are 475 million tonnes of iron ore with the expected annual production of 4 million tonnes. Covid restrictions halted the planning of the startup in Kirkenes, and only a small number of local employees are engaged to look after the facilities and prepare for a new start. Local people question the lack of information on future plans, particularly as the town is badly affected by the sanctions towards Russia, with a considerable business sector relying on Russian customers, particularly within trade and maritime sector. A reopening of the mine could ease the effects of rising local unemployment caused by the politically tense situation.

Over time, the different mining initiatives revealed diverse local consequences affecting the population of the town as well as the landscape with huge landfills. Local opposition to the reopening of the mine is for instance linked to noise and air pollution/dust from heavy transport/traffic and processing as well as fjord, lake and river pollution from the tailings, negatively affecting the marine life and marine-based industries. Recreational and tourist sector is also affected, as well as reindeer herding.

Employment in mining, and the multiple closures and reopening, has affected the population dynamic of Sør-Varanger municipality. The closure of the state owned mine in 1997 lead to a sharp population decrease, but by the reopening in 2009, the figures had started to increase. Again, when the mine closed in 2015, the figures went down, but not so abruptly this time.

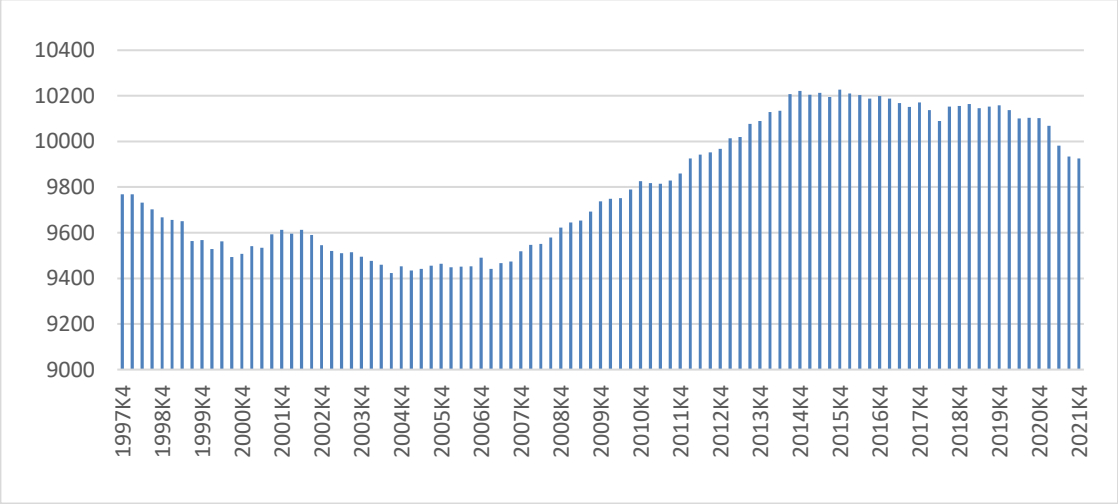


Figure 16. Population dynamics Sør-Varanger municipality

3.1.3 Kvalsund/Kautokeino hub

Kvalsund is a traditional sea Sámi community, which means that the main activity has been a combination of small-scale farming and fishing. These livelihoods have gradually diminished, and people found other work by moving or commuting. Due to more than a hundred years of assimilation policies, outmigration and commuting to neighboring cities, Sámi traditional livelihoods and language gradually impaired, as well as much of the Sámi identity (Minde 2003). With a thriving northern petroleum capital in the neighboring Hammerfest, a substantial part of the Kvalsund population

[4] http://www.sydvarangergruve.no/historie

commutes for daily work. In 2020 the two municipalities merged, confirming that they for some times have been one labour market region.

The territory of previous Kvalsund municipality is extensively utilized as pastures for reindeer husbandry in the spring, summer and autumn. Mining has taken place in the area for shorter periods, last time from 1972-78, and produced 3,1 million tonnes of copper ore. Kvalsund needs new employment, and a more diversified industrial structure as young people leave the area for more opportunities in the cities. Nussir ASA, a new Norwegian mining company, dependent on foreign investments, have since 2006 planned for an opening of a copper mine. Nussir received an operating license from the Government in 2019, supported by the local council but plans for a sea deposit in the fjord and effects on land use utilized by reindeers caused protests from environmental NGOs, the Sámi Parliament Sámi organizations and other user groups. The Nussir project is currently on hold as the planning status of the new area for shipping out the copper, Markoppnes, is unsettled. Since this is a new territory, no previous EIAs have been conducted.

Kautokeino is Norway's biggest municipality when it comes to territory, and the Sámi "capital" with 95 % of its population indigenous Sámi, being one of only two Norwegian municipalities where the Sámi people are in majority. Reindeer herding is the main industry as well as a strong public sector with several Sámi institutions. The trekking patterns of the reindeers to the coast and other municipalities implies that land use changes in all these areas disturbs Sámi reindeer herding. The area Kautokeino-Kvalsund is affected by industrial development, infrastructure development, recreational and tourist expansion and energy projects. Unemployment rates reveal a need to find alternative employment and business development. Kvalsund is used as spring, summer and autumn pastures for reindeer husbandry, some of them with winter pastures within the territory of in Kautokeino municipality.

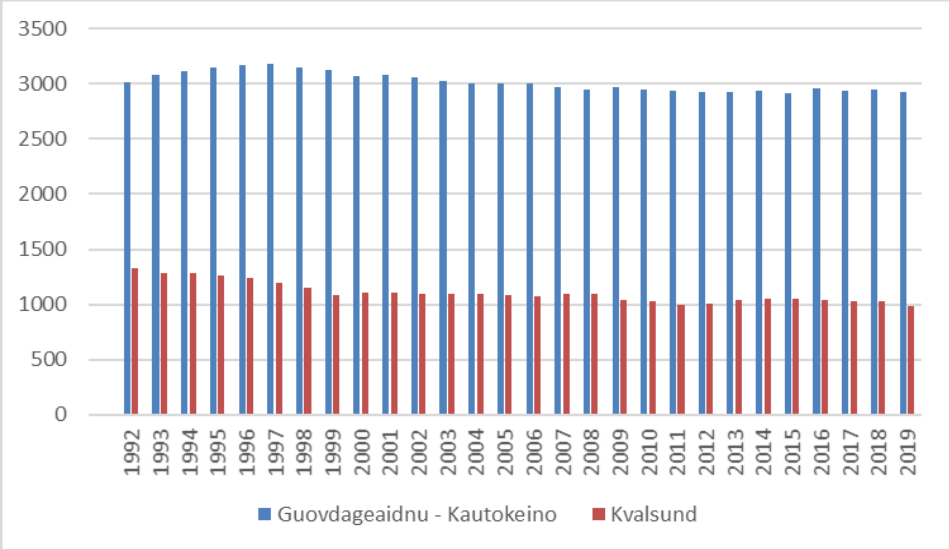


Figure 17. Population dynamics in Kautokeino and Kvalsund municipalities (1992-2019)

Back in 2004, a newly founded Norwegian mining searching company got permission to test bore for copper in the Nussir Mountain in Kvalsund. Copper mining previously took place in Kvalsund, the last time for a few years in the 1970s, but closed down due to low market prices. The global mining boom inspired the new company Nussir, based on Northern Norwegian capital, to start the licencing process for gaining access to the resources. The company presented the draft-planning program in 2010, and public authorities and interest groups had the chance to comment on the document during the process of scrutiny. The company ordered several environmental impact assessment reports from different scientific and consulting specialists to fulfil the obligations of Environmental Impact Assessment (EIA) studies. Kvalsund Municipal Council supported the planning program from the very beginning, and little debate have ensued on the possible adverse effect of the mine in that period. The local politicians

are aware of the needs of the reindeer herders for future herding but do not consider the mine as the end of reindeer herding in the area. The local politicians have instead mainly focused on the project's role in facilitating new local jobs and possible new migration to the area (Nygaard 2016b; Nygaard, Carlsson, and Sletterød 2017). The new mine is estimated to give 150 new jobs, but with the limited available local workforce, employment must be based on migration or commuting. Such an influx of new residents can be a challenge and requires good planning on the part of the municipality and company to encourage permanent settlement instead of extensive "fly-in fly-out" arrangements (Eikeland et al. 2009; Storey 2010). The company got the final license for depositing the waste in the fjord in 2019, but is still not building due to objections from various stakholders like Sami Parliamnet, Reindeer herders, Governor. The company slightly changed the location of shipping out the copper to the industrial area Markoppnes, causing protests as this area was not studied in the EIA.

The Nussir company was originally funded by investors from Northern Norway and presented itself as grounded in the region. Gradually, when they needed more finances to continue with the preparations and the extensive EIA-studies, the company had to look for money elsewhere in Norway and abroad. Nussir today has just over 50 % Norwegian shareholders, and the rest international (banks and investment companies).

Nussir has, during these years of planning and preparing, extended the area of test boring, and increased the number of indicated resources. The figures keep on changing but was in 2022 24,4 tonnes of copper ore[5], a considerable amount of waste rock, and tailings. The tailings deposited in the Repparfjord, will cover an area of 25 million m3 with masses contaminated with Xantat - SIBX, a flotation chemical used during extraction process to separate copper from the waste rock. This is the biggest copper reserve in Norway. The two mines at Ulveryggen and Nussir mountain is planned as an underground mine, the first with a 8 years lifespan, the other approximately 16 years[6] (data from 2017). A feasibility study from February 2022 presented the objective of making the Nussir project the first fully electrified mine in the world.

In August 2021 Aurubis, the potential buyer of the copper production, decided to terminate the memorandum of understanding regarding supply due to insufficient corporate social responsibility, as certain social aspects of the project need to be given even greater consideration. This decision was made after a long youth environmentalist protest camp at the site and active lobbying from the Sami Parliament.

3.1.4 Svalbard

Statistical data from Svalbard is produced separately as the island has a special status.

Population dynamics at the regional level

Svalbard had 2726 inhabitants in 2019. The majority lives in the Norwegian settlement Longyearbyen, a traditional mining community and in the Russian mining settlement Barentsburg. The Norwegian mining activity in Svea closed down in 2020 and the village has presently no permanent residents. A huge restoration project is going on to bring the mining town back to nature. The Russian village Pyramiden is also without a permanent settlement. Hornsund is a Polish polar research station with approximately 10 residents. The special status of Svalbard gives all nationals the right to free entry and work. It is not so easy in practice as housing is limited and mainly owned by the companies and the Norwegian authorities.

[5] https://nussir.no/what-we-do/ore-reserves-and-production/

[6] https://dirmin.no/sites/default/files/driftsplan_tekstdel.pdf

The figure below illustrates the population dynamics with a slightly decrease in the Norwegian population registered on the mainland.

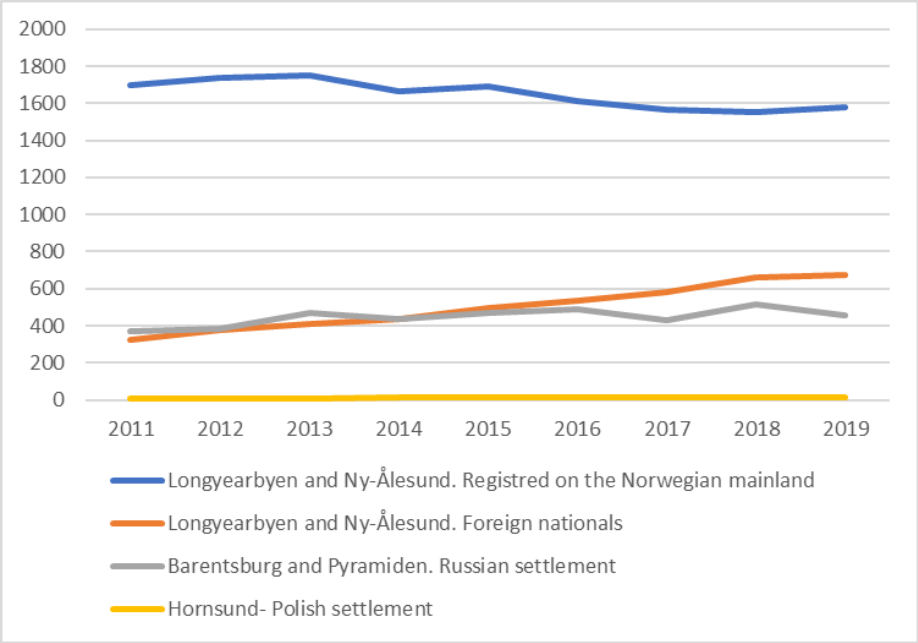


Figure 18. Population dynamics Svalbard 2011-2019 in the different settlements and according to national categories (Source: SSB)

Longyearbyen

The Svalbard treaty from 1920, recognizing the sovereignty of Norway over the Archipelago of Spitsbergen. The signatories were given equal rights to engage in commercial activities on the islands. Only Norway and Russian make use of this right. It is consequently a foreign policy and strategic reason for keeping Norwegian industry and permanent settlement at the Svalbard.

Store Norsk Spitsbergen Kullkompani has a long history and started with the American John Munro Longyear who founded Longyearbyen (Longyear City) in 1906 and sold the mine already in 1916 to the Norwegian Store Norske Spitsbergen Kullkompani (SNSK). The company should play a significant role in securing Norwegian industrial activity and settlement on the island. Several mines have been opened and closed when they were emptied in the Advent Valley and Longyearbyen, and later in Svea. The company started as a privately owned, but the Norwegian state required shares when financial problems occurred with needs for new investments. By 1976, SNSK was a 100 % state owned company. With this, Longyearbyen gradually developed as a family-based community with schools, apartments, hospital.

In 2022, SNSK is the only state-owned mining company left in Norway, but the ultimate closure has been planned for decades, and is now scheduled for 2025. The latest closures are Svea mine closed down in 2016, and the Lucknefjell mine closed in 2018. Only one mine is in production: mine no. 7 in Adventdalen, which still operates on a comparatively small scale. The Norwegian state has initiated a 70 million NOK environmental project, intended to remove all traces of human activity in the Svea and Lunckefjell areas in Svalbard. Buildings and infrastructure are being removed, including roads, tank farm, power station and an airfield[7].

[7] https://afgruppen.com/projects/miljo/rydder-opp-pa-svalbard/

The coal production of today has two main purposes; provide Longyearbyen with energy for heating and electricity, and export to the mainly European alumina steel industry. Both are disputed due to emission and commitments to reach the global and national climate goals. Coal as local energy source will be replaced with renewable energy, most likely hydrogen, or ammonia, but this will not be in place when the last mine close down. Diesel will probably substitute coal in this period. The figure below indicates the fall and modest production and value of coal sales from SNSK during the last couple of years.

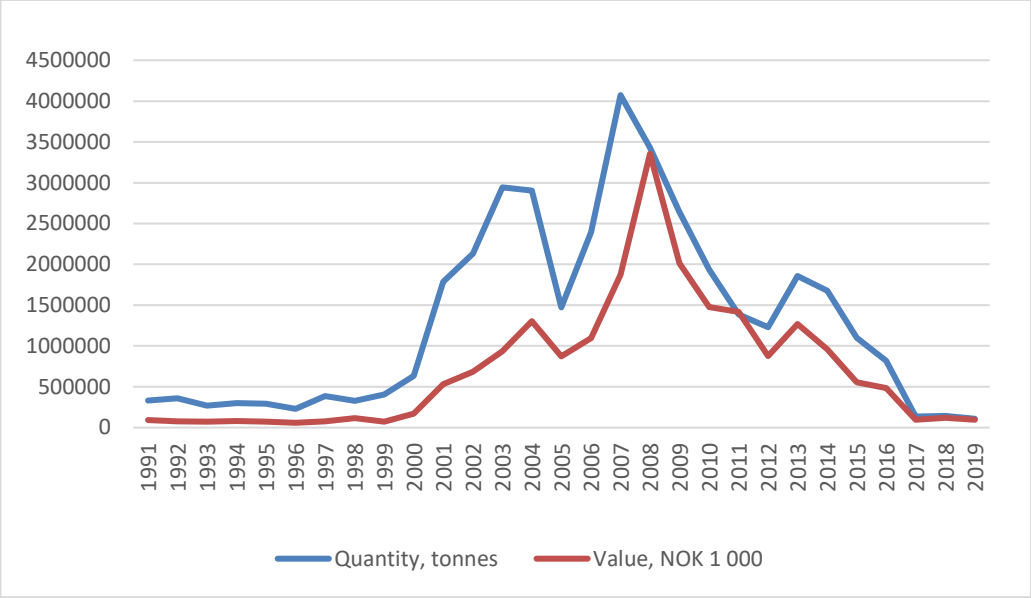


Figure 19. Production numbers in tonnes and value creation in 1000 NOK over the period 1991-2019 (Source: SSB)

Nowadays, Longyearbyen is the centre for administration, service industry, science and tourism. The closed mines and mining legacy will become a tourist attraction itself, boosting the tourism industry severely hit by the corona pandemic.

3.1.5 Egersund hub

Population dynamics

The Egersund Hub covers five municipalities (Eigersund, Sokndal, Lund, Bjerkreim and Flekkefjord). Statistical data shows that around 33 000 people live in the hub area today (source: SSB). The Hub has since 2001 experienced an overall increase in population of about 2000 people, primarily in the Eigersund municipality. Eigersund munipality has the largest population (14 860 as of january 1st 2022) and most people in the municipality reside in Egersund, which is the largest town in the Hub. Bjerkreim has the smallest population (2 789 as of january 1st 2022). Of the five municipalities, only Sokndal has experienced an overall decline in population between 2001 and 2022. Statistical data for population projection estimate an overall decline in population in the hub with around 1000 people by year 2050, but there are significant differences between the municipalities. Egersund is expected to have a stagnat population, Lund and Bjerkreim are expected to have an increase of 5,7 % and 11,2 % respectively, wheras Sokndal and Flekkefjord are expected to have a decline of -12,6 % and -7,2 % respectively.

Population dynamics show that the hub experienced a significant increase in population between 2006 and 2016, when the population went from a relatively steady number of around 31 100 people to over 33 400 people. Since 2016, there has been a decline in population. This is likely linked to a decline in employment rate for people living in all of the municipalities that started in 2014 (mining sector alone

and in total for all industries). In 2014, 52,1 % of inhabitants in the hub area were employed, of which 3,7 % were employed in the mining sector. In 2021, these numbers were 49,8 % and 3,0 % respectively.

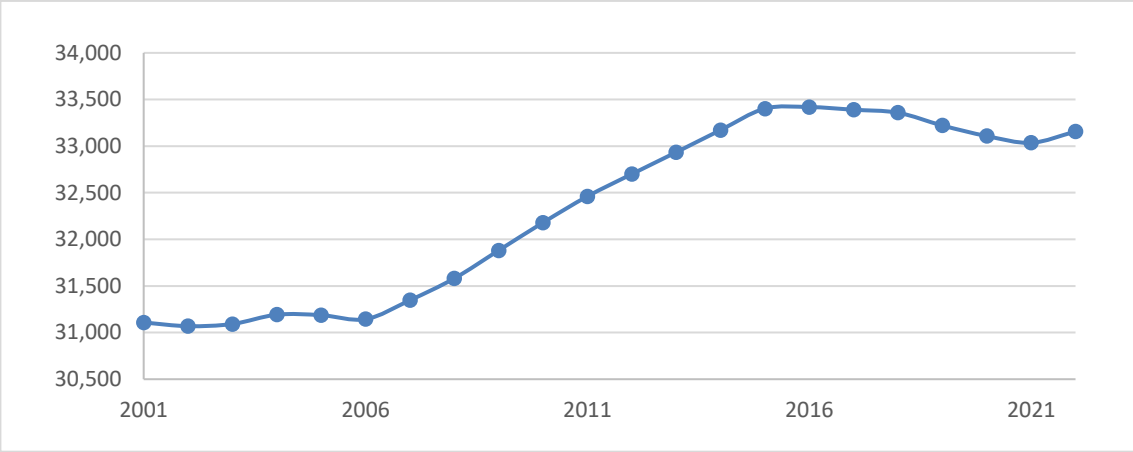


Figure 20. population dynamics Egersund Hub 2001-2022 (Source SSB)

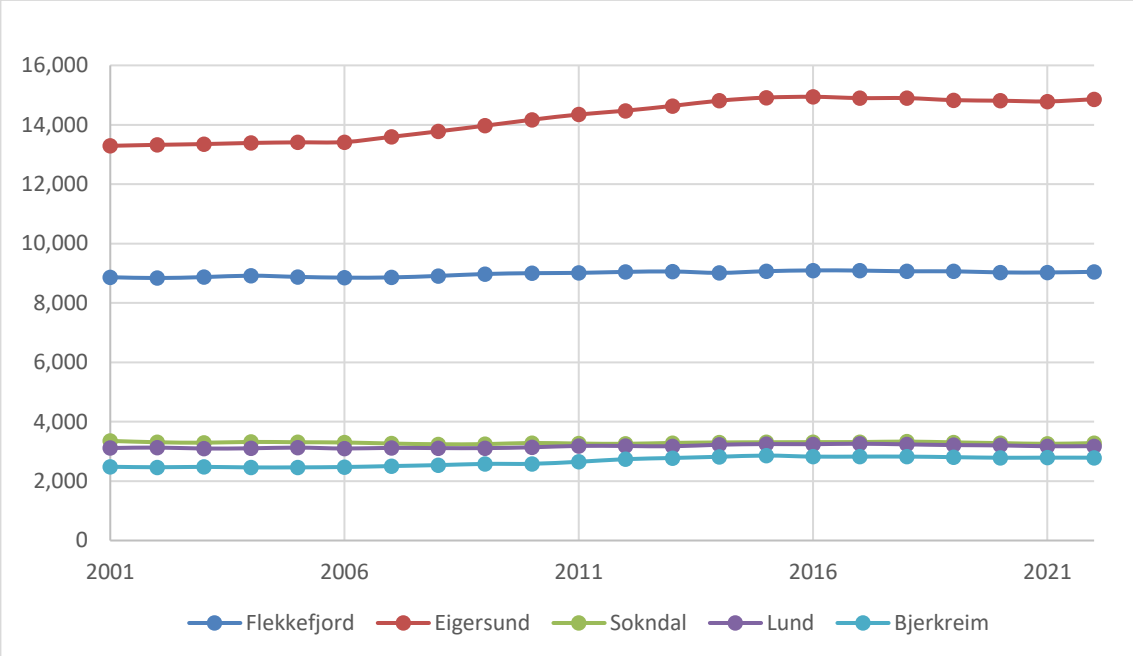


Figure 21 Population dynamics split between municipalities in the Egersund Hub 2001-2022 (Source: SSB)

Employment

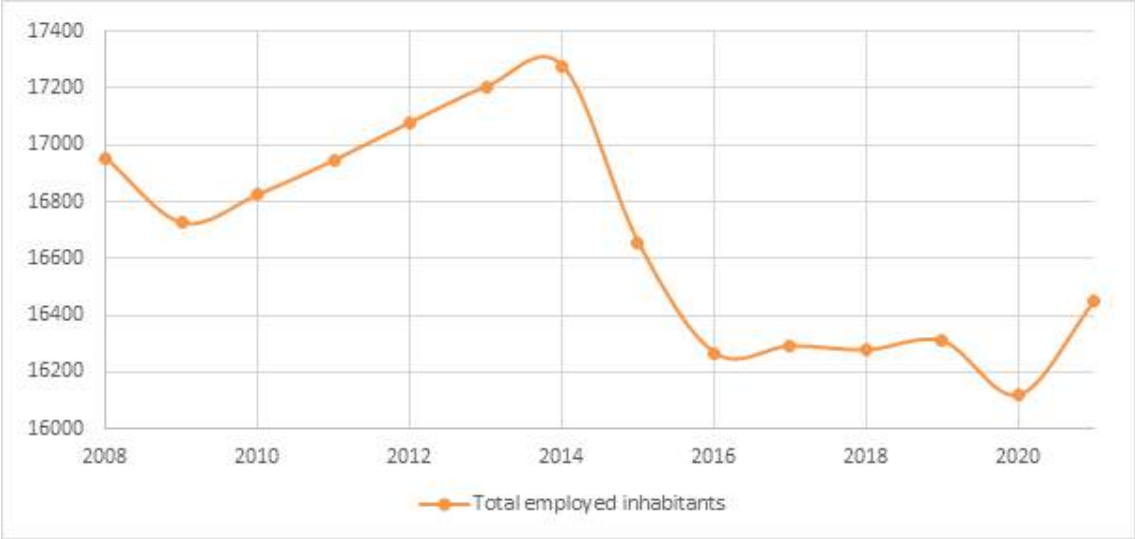


Figure 22. Number of employed inhabitants in all sectors *(Source SSB)*

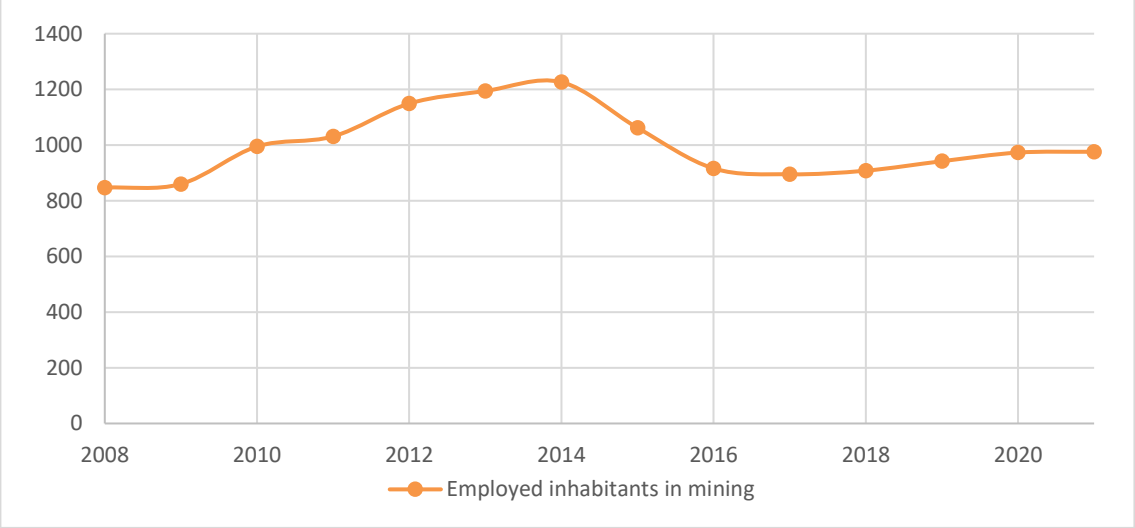


Figure 23. Number of employed inhabitants in mining (Source SSB)

Egersund hub

The Egersund mining hub is located in southern Norway. The hub is geographically defined by Magma Geopark which is a UNESCO Global geopark covering 2320 km2 and five municipalities (Eigersund, Sokndal, Bjerkreim and Lund in Rogaland County, and Flekkefjord in Agder county).

Egersund is the largest town in the area with a population of about 15 000 (SSB, Q4 2021, Eigersund municipality). The town was officially founded in 1798, but several archaeological findings indicate settlement from the early Bronze and Iron ages. Mining is not the main industry in Egersund. In fact, Egersund's economy is largely based on marine activities and fishing. Most of the mining activities are located in other areas of the Hub. The municipality of Sokndal, for instance, has the highest level of employment in the mining industry in all of Norway compared to the number of inhabitants.

Magma Geopark has more than 300 years of mining history involving around 100 abandoned and 8 active mines. The active mines are extracting sand and gravel, aggregates, dimension stones and ilmenite ore. The abandoned mines were extracting feldspar, quartz, molybdenum, wolframite, mica and ilmenite. The main active mines/quarries are Titania, Rekefjord East and West, Hellvik, Egersund Granite and Espedal gravel.

Magma geopark, also known as the Rogaland anorthosite province, consists of anorthositic and noritic intrusions that were deposited between 920-930 million years ago. The Magma Geopark area contains large ore deposits containing phosphorus apatite, vanadium rich magnetite, ilmenite and possibly nickel. Anorthosite massifs are known to host ore deposits such as ilmenite and are considered excellent sources for high-quality rock aggregate and dimension stone. The exploitation of anorthosite for industrial mineral products is growing and the potential for future production of aluminum and other important constituents from anorthosites is substantial.

Rekefjord Stone AS is the largest producer of natural stone and building materials (construction aggregates) in the hub area. Production started in 1964 and today there are two quarries: Rekefjord East (0.54 km2) with an annual production of 0.8-1.2 million tons gabbronorite/norite, and Rekefjord West (0.46 km2) with an annual production of 1.0-1.2 million tons anorthosite/ansit. The rock is extracted as blocks and crushed stone and 99 % of the products are shipped and sold to Denmark and Germany. Since 1964 around 60 million tons of rock has been extracted from these quarries. Both Rekefjord East and West each have around 15 million tons of remaining reserves according to the current mining license. The company has 27 employees and 45 subcontracted employees and a turnover of 250 million NOK.

Titania is by far the largest mine in the Hub area and with the longest history of mining. The company was founded in 1902 and is one of the main producers of ilmenite (titanium) in the world. Titania supplies raw material (titanium oxide) to the pigment industry and accounts for around 6-8 % of the world's global production. The ilmenite ore currently mined was discovered in 1954 and is one of the world's largest. Titania has open pit mines and production facilities at Tellnes in Sokndal municipality, and shipping facilities in the Jøssingfjord. Titania has enough resources to continue production for the next 100 years. Average annual production is around 800,000 - 850,000 ton ilmenite concentrate and 20,000 ton magnetite, in addition to some sulfur. The mine has a spatial extent of around 1,5 km2 and the company employs around 220-250 people. The mine is owned by Kronos World Wide Inc, American. Kronos Titan AS in Fredrikstad is a subsidiary of Titania. The facility in Fredrikstad processes the black ilmenite concentrate produced by Titania to make white pigment (titanium oxide), which is used in paint, varnish, papir, plastic, cosmetics and foods. Titania also delivers significant amounts of ilmenite concentrate to TiZir in Tyssedal.

Titania has experienced issues with their tailings deposits and environmental NGOs. For instance, Titania used to deposit tailings on the seafloor in the Jøssingfjord (1960-1983) and Dyngadjupet (2,2 tons of tailings, 1984-1993), but from 1983 there were several demonstrations from environmental organizations demanding that deposition on the seafloor had to stop. This initiated research and evaluations of the environmental impact of depositing tailings on the seafloor. Many scientists and subject matter experts argued that deposition on the seafloor was the better choice and pointed out all the negative impacts of land deposition. Nevertheless, the pressure from the environmental organizations was so strong that the government decided that Titania had to deposit their tailings on land. Tailings are now pumped into a large tailings dam near the mine and every year about 2 million tons of tailings are produced. The tailings dam is around 1 km2 wide, and grows around 2 meters in height every year. Studies have shown that after around 20 years of depositing tailings on land, the tailings dam has caused major environmental issues and these issues will continue to grow even if the deposition of tailings stops. Mobilized nickel is continuously seeping into the surrounding area and the tailings dam was recently re-categorized from impact class 0 to impact class 4 (highest impact class) due to newly discovered instabilities. Titania is now looking into new alternatives for tailings deposition.

3.2. Finnish mining hubs

3.2.1 Population dynamics at the regional level

Lapland is the largest and northernmost province of Finland (Figure 24), but the area is very sparsely populated. The total area of the province is 100 366 km^2 (National Land Survey of Finland, 2021), but the population is only 177 161 (Official Statistics of Finland, 2022b), and hence the population density is 16/km^2. Lapland has been experiencing a population decrease since 1993 (Figure 25). Locally, the migration flow has been centred from the country side to the cities (Rovaniemi, Kemi, Tornio), but also the birth rate has been decreasing. This development follows the centre-periphery dimension of young people moving to cities, while the smaller municipalities are left with an increasing number of senior citizens (House of Lapland (2021).

However, during recent years, and perhaps because of the Covid-19 pandemic, the population of Lapland has been somewhat increasing, by bringing new inhabitants to the region (House of Lapland, 2021). Work and study related migration has somewhat been replaced by security and leisure-based motives. Together with the biggest town Rovaniemi, also smaller, mainly tourism-driven, municipalities, have got new inhabitants to the region. However, still more than half (56,8%) of the population live in the city area (Official Statistics of Finland, 2022b).

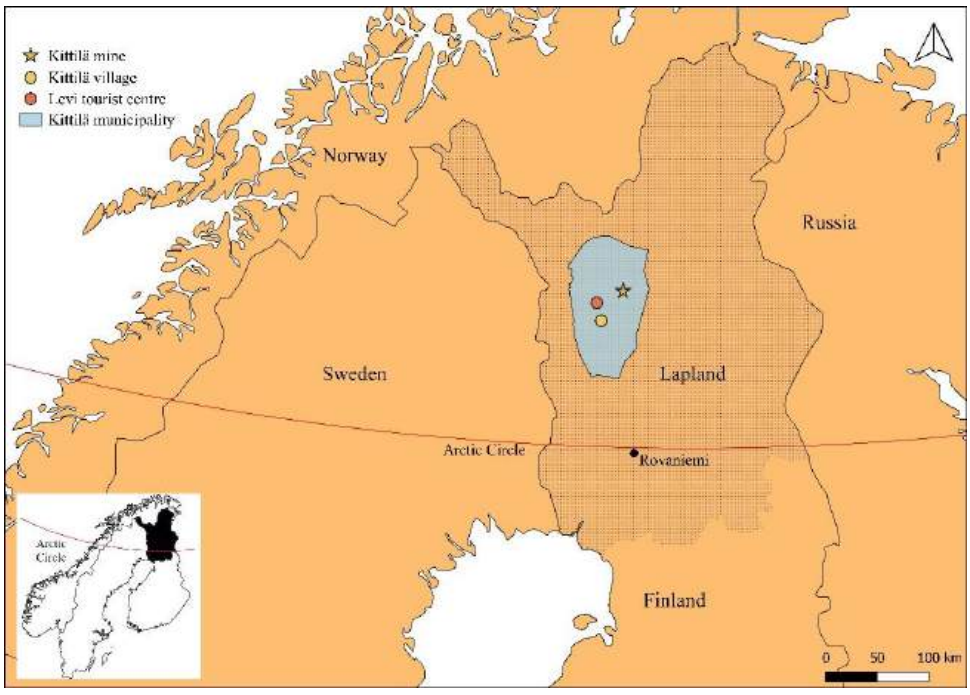


Figure 24. Location of the Kittilä mine, Kittilä village, and Levi tourist centre. Lapland highlighted with gray. Data: National Land Survey of Finland (2022). Map: Arctic Centre, University of Lapland.

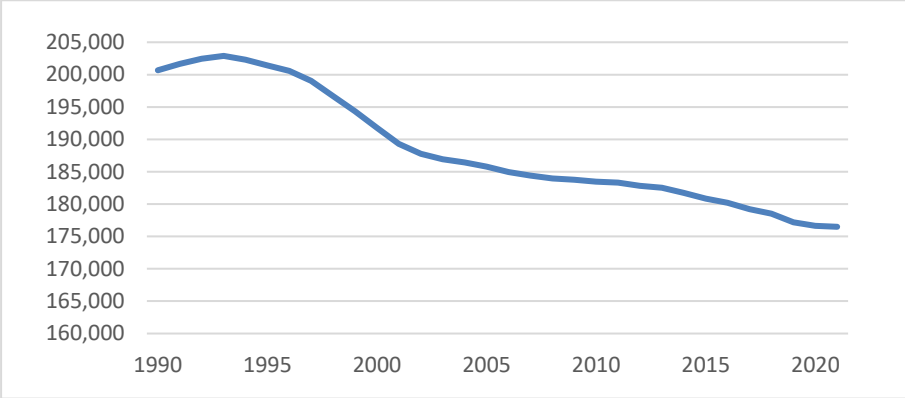


Figure 25. Population of Lapland from 1990 to 2020 (Official Statistics of Finland, 2022b).

3.2.2. Employment at the regional level

Lapland has gained more employment in mining during the recent years, due to the increased investments to mining industry, like in the Kittilä mine. The Figure 26 illustrates the employment in mining industry in Finland (blue line) and in Lapland (red line) from years 2007 to 2020. The growth in the employment in mining industry has been quite steady from 2007. Figure 27 shows the employment in mining by different regions. In Lapland the number of employees in mining industry is clearly the highest in Finland. In Kittilä hub, both mining and tourism important to the municipality, have big effects to other livelihoods of the area, increasing employment (Kittilä municipal board, 2019). During the last decade, the total sales volume of the businesses has tripled in Kittilä.

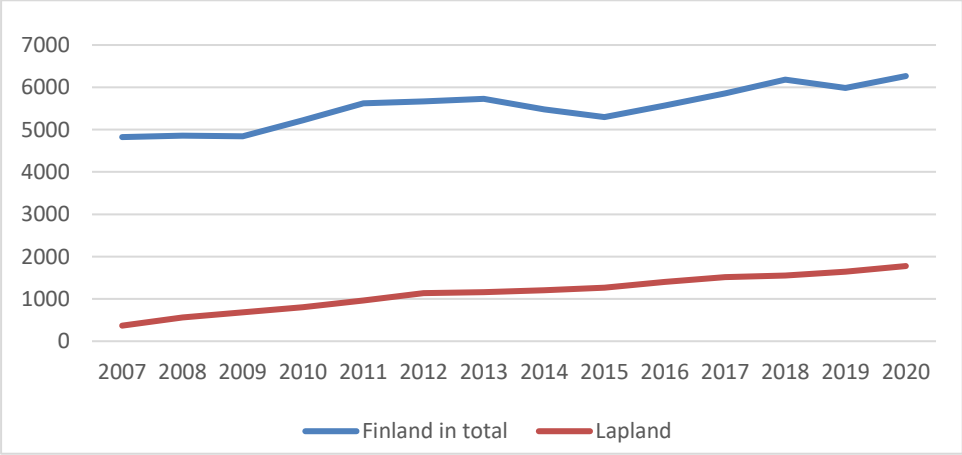


Figure 26. Employment in mining 2007-2020 in Finland and in Lapland (Statistics of Finland, 2022)

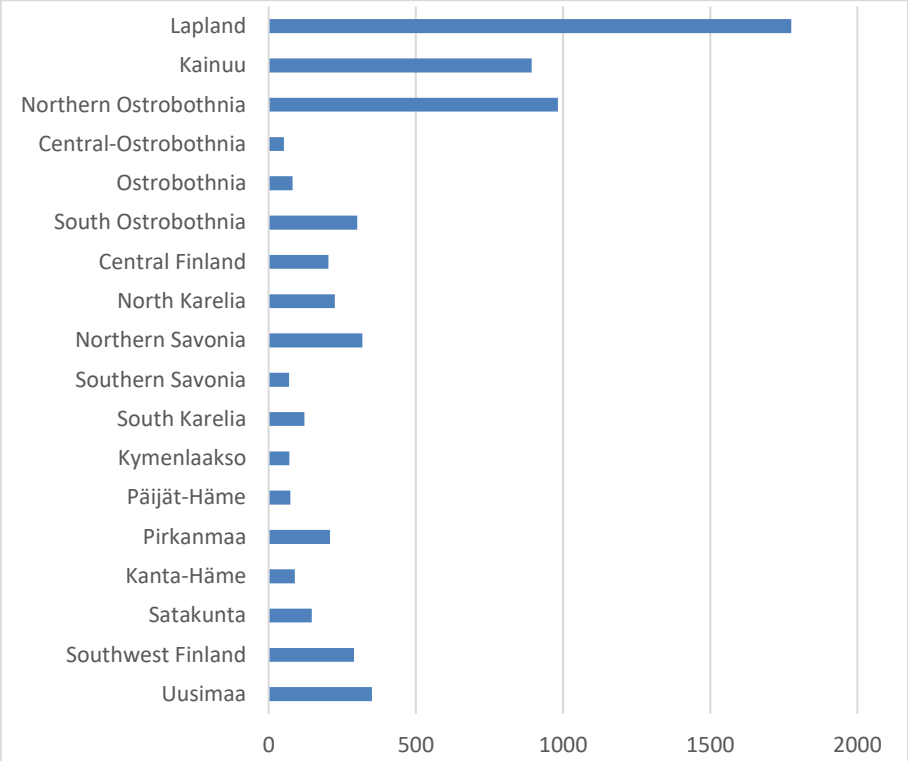


Figure 27. Employment in mining by region 2020 in Finland (Statistics of Finland, 2022)

3.2.3 Kittilä hub

In the region of Lapland there are three metallic mineral mines; Kittilä gold mine, Keminmaa chromium mine, and Sodankylä mixed-mineral mine. In addition, there is an industrial mineral mine in Tornio, and an amethyst mine in Pelkosenniemi. Kittilä hub covers the municipality of Kittilä, which is located in the western part of Lapland in Northern Finland, about 170 km north of the Arctic Circle and the town of Rovaniemi (Figure 24). Kittilä is very sparsely populated, the population of the municipality is 6526 (Official Statistics of Finland, 2022c) in over 8000 km^2 (National Land Survey of Finland (2021).

The main livelihoods of the lively municipality are tourism and mining, and the development in Kittilä has been quite rapid during the last decades. Levi ski resort is one of the biggest ski resorts in Finland, and the mine of Kittilä is the biggest gold mine in Europe. Kittilä has been gaining more population quite steadily from the turn of the 21st century (Figure 28). Compared to its size, Kittilä is offering relatively much employment possibilities (Kittilä municipal board, 2019), and the employment of Kittilä has been rising since the mid 1990's (Figure 29). Kittilä's population is expected to decrease only by 3% by year 2040, which is noticeably lower compared to other similar sized municipalities in Lapland. Also, the demographic dependency ratio is in better shape in Kittilä (where it is 57,9) than in most of the municipalities in Lapland (Kittilä municipal board, 2019; Official Statistics Finland, 2022c). The Kittilä gold mine is the biggest private employer in the Kittilä municipality with around 460 employees and 500 contractor personnel (Agnico Eagle 2022a). Employment in mining has affected the population dynamics of Kittilä municipality (Figure 30; Wyche al. 2015; Agnico Eagle 2022a). There has also been another mine in Kittilä, the Outokumpu Oy-owned Pahtavuoma copper mine, during the years 1974-1993.

Kittilä mine is located in the Kittilä municipality, 50km from the village of Kittilä. The mine belongs to the Suurikuusikko deposit is one of the largest known gold deposits in Finland, and the Kittilä Mine is currently the largest operating gold mine in Europe (Agnico Eagle, 2022a). The mine produces about

7000 kg of gold every year, and the mineral reserves of the mine contain 4,1 million ounces of gold. Around 16 kilometers of new tunnels are developed every year in order to keep sufficient ore production available. The processing plant is processing 6000 tons of ore per day, and the processing is done by grinding, flotation, pressure oxidation and carbon-in-leach circuits.

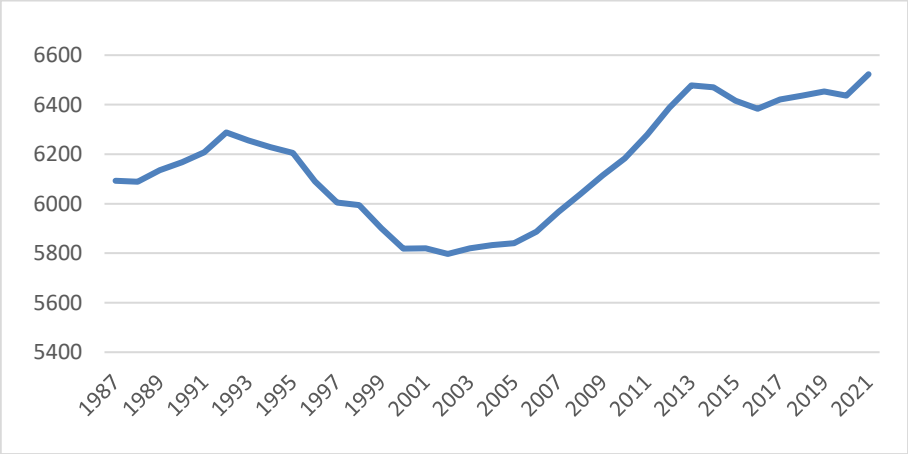


Figure 28. Population changes in Kittilä during 1987-2021 (Official Statistics of Finland, 2022b)

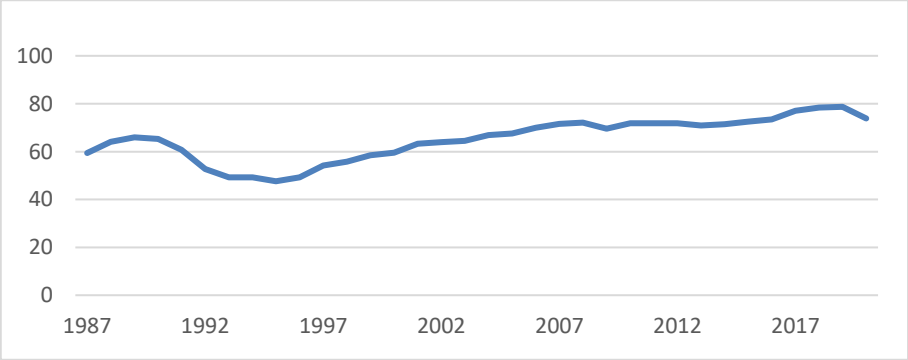


Figure 29. Kittilä employment rate (%) from 1987 to 2019 (*Official Statistics of Finland, 2022a)*

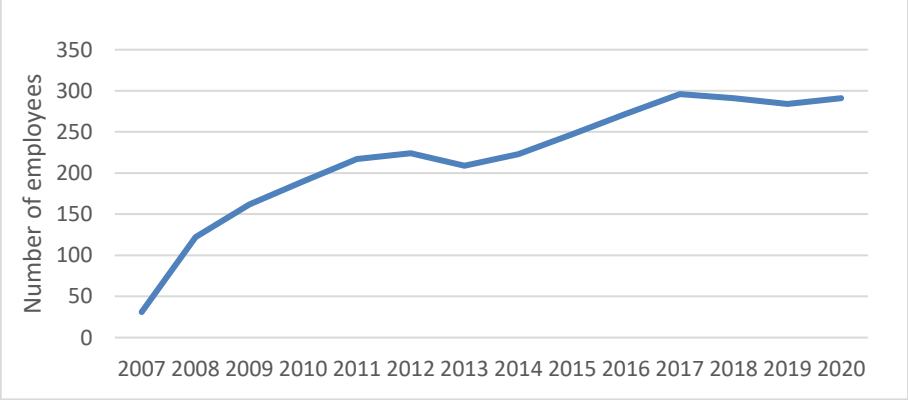


Figure 30. Number of employees in mining industry in Kittilä during 2007-2020 (Official Statistics of Finland 2022a)

The Suurikuusikko area is located at the Loukinen river catchment area, which drains to Ounasjoki river, near the Levi fell (Agnico Eagle, 2022a). The mining site is located at the lower reaches of Seurujoki river catchment, which drains further to Loukinen river. The Kittilä municipality area is sparsely populated, the nearest village being about 1 km to the east of the mine, but the nearest residential houses are located about half a kilometer from the mine site. The principal land uses near

the mine site are reindeer herding, forestry, and some agriculture. The mine area is surrounded by a natural wetland area with 1–2-m thick peat deposits. In some places, there are quaternary, low-permeable sandy and gravelly till deposits. The area is classified as subarctic and the annual mean temperature is − 1 °C. The annual mean precipitation is about 500–600 mm and evaporation 200–300 mm (see Turunen et al., 2020) The region around Kittilä mine is mainly mafic volcanic and sedimentary rocks of the Kittilä Greenstone Belt, and the work is focused on a 4,5 km segment of the Suurikuusikko Trend, that hosts the gold mineral reserves (Figure 31). The closest nature protection areas are Loukisen latvasuot-swamps and Ounasjoki river, which belong to the Nature2000 protection areas. The Pallas-Ylläs National park is located around 40 kilometers west from the mine. (Wyche et al., 2015; Turunen et al., 2020; Malinen 2016).

The mining company, Canadian-owned Agnico Eagle Finland Oy, started the construction of the mine in 2006, the gold extraction commenced in 2008, and the mine achieved commercial production in 2009 (Agnico Eagle, 2022b). The underground mining started 2010, and since open pit mining at Kittilä was terminated in 2012, the mine is now only operating underground, with a mine lifetime estimated through 2034. The mine covers 192 square kilometers in total, stretching 25 kilometers along the major gold-bearing shear zone, Suurikuusikko trend. The mine area includes six gold deposits. Agnico Eagle is constantly doing mineral exploration in the area to find new deposits. Kittilä mine is investing heavily, and developing their operations all the time. Agnico Eagle Finland oy has big investments plans of 200 million euros, and the mine is to be extended north, south and at depth (Kittilän municipal board, 2019; Agnico Eagle, 2022b).

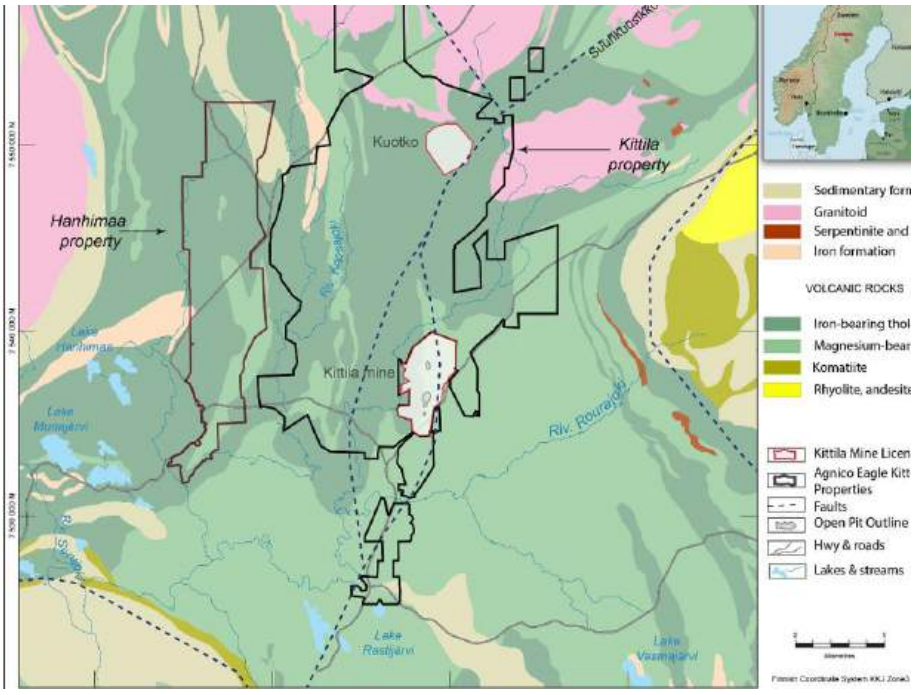


Figure 31. Regional geology map of the Kittilä mine (Agnico Eagle, 2022b).

The nearest village of the Kittilä mine is located 1km east of the mine, and the nearest houses are located about half a kilometer from the mine site. The principal land uses near the mine are reindeer herding, forestry, and some agriculture. In Finland, Kittilä gold mine is often referred as a good example of mining operations, as there have not been major conflicts with other livelihoods, and the majority of the locals accept the mine (Wyche et al., 2015; Malinen, 2016; Turunen et al., 2020).

3.3. Swedish mining hubs

Mining activities constitute a significant part in all four hubs in Sweden. The Gällivare hub is designated specifically as a mining hub with forestry and indigenous components. In Gällivare Boliden AB and LKAB each operate large mines. The Malå hub has forestry as it focus activity but here Boliden operates several mines with Kristineberg being the most significant. Malå is also a hub with an indigenous focus. In the Gran hub reindeer husbandry is impacted by the Kristineberg mine but all hub work here come from the indigenous perspective. The focus hub theme in Jokkmokk is also indigenous, but the debate following the proposed Kallak mine has a significant impact on all indigenous matters. Figure 32 show the mining areas of specific focus in the Swedish hubs.

Representatives of the mining industry or the government often emphasize the relative small areas of mines in comparison with other forms of land use especially reindeer husbandry. Swemin (the Swedish Association of Mines, Mineral and Metal Producers) compares the area of mines and limestone quarries, 175 km^2, with that of the reindeer husbandry area, 247 280 km^2, giving the impression that the mining industry has a small impact over all. We have instead chosen to define the hub by looking at available data on the impact on reindeer. The minimal disturbance distance from the mines is estimated to be 15 km (Åhman and Skarin 2014) which is the basis for the hub extensions for each mine (Figure 32). These estimated hub areas will also include the major population areas, the immediate mining infrastructure (e.g. transportation) and the effect on biodiversity other than reindeer.

Figure 32. The location of the Swedish mining hubs Gällivare, Jokkmokk and Malå. The extent of the mining hubs are shown in purple (15 km from mining/industrial sites). All three hubs are also indigenous and forestry hubs. The indigenous Gran hub is located adjacent to the Malå hub and partly affected by the Kristineberg mine.

3.3.1 Population dynamics of the Norrbotten and Västerbotten regions

Norrbotten and Västerbotten counties are the two provinces forming the northernmost part of Sweden. They are also the two largest provinces of Sweden, covering 23,9 % and 13,4 % respectively of the country's total area. However, both counties are very sparsely populated. The total area of Norrbotten county is 97 242 km^2, but with a population of 249 693 (Regionfakta 2022), giving a population density of only 2,6/km^2. The total area of Västerbotten county is 54 664 km^2, with a population size of 274 563 (Regionfakta 2022), giving a population density if 5/km^2.

Norrbotten has experienced a population decrease of 2,6 % since 2000 while Västerbotten has seen an increase in population by 7,4%. However, in both counties there are big differences in population developments between coastal regions and inland regions as people over time tend to move to the major cities by the coast. As a comparison, Sweden as a whole has a population density of 25,7/km^2 and the country has experienced a population increase of 18% since 2000.

At the hub level we have used data from Gällivare municipality, Jokkmokk municipality and Malå municipality. They are all typical inland municipalities in the two northern counties.

Gällivare municipality had a population of 17 449 in 2021 which is 19,6% lower than 1996. The situation in Jokkmokk municipality is similar with a population size of 4780 (2021) which is 26,6% lower than 1996. Likewise, in Malå municipality the population is 3 034 (Ekonomifakta 2022) down by 22,9% since 1996.

3.3.2 Regional employment figures mining

In Norrbotten county there are a total of 115 514 employees (Regionfakta 2022). The mining industry is an important provider of work opportunities where the mining company Luossavaara-Kiirunavaara Aktiebolag (LKAB) has 3525 employees in the county or 3,1% of the total employees rendering it a fourth place on the list of largest employers in the county. The other major mining company Boliden Mineral AB has 925 employees in the county or 0,8% of the total employees which is number 16 on the list of largest employers in the county. Number 12 on the list is SSAB EMEA AB which is a Steel producer which is linked to the mining industry. 1175 people from the county or 1% of total employees are working for the company. It is worth mentioning that 16 out of the 25 largest employers are either municipalities or government agencies.

In Västerbotten county there are a total of 123 849 employees (Regionfakta 2022). The mining industry is also an important provider of work opportunities in this county. Boliden Mineral AB is the fifth largest employer in the county. 2025 persons or 1,6% of the total number of employees in the county are employed by the company. In Västerbotten 13 out of the 25 largest employers are municipalities or government agencies.

As stated above, as hub level data we have used data from Gällivare municipality, Jokkmokk municipality and Malå municipality.

In Gällivare municipality the total number of employees are 5925. The largest employer are the municipality itself but as number two we find LKAB where 1175 persons are employed or 12,9% of total employees in the municipality. The third largest employer is Boliden Mineral AB where 925 persons or 10,1% of the total employees in the municipality. The employee numbers are identical to the Norrbotten County numbers showing that all employees from the county working for these two mining companies are all concentrated to Gällivare municipality.

In Jokkmokk municipality there are a total of 1235 employees. 31,8% of those are employed by the municipality itself. There are currently no mining industry operating in the municipality.

In Malå municipality there were 1511 persons working within the area of Malå municipality (2018). There used to be several operating mines in the municipality but currently there are no active mining companies in the municipality. The largest private employer in the municipality are Bennys gräv AB with 175 employees (Ekonomifakta 2020). The company is working with ore transports within mining areas. In 2015 ca. 30 company employees worked in Kristineberg, 25 in Björkdalsgruvan and ca. 15 in Maurliden (Entreprenad 2015). At that time 100 persons were employed by the company. The Kristineberg mine is located in Lycksele municipality directly on the other side of the border to Malå municipality. Boliden Mineral AB has 175 persons employed in Lycksele municipality and we assume that they are mainly working in Kristineberg. Boliden has no statistics on the individual mines but are

instead referring to the overall Boliden area which includes Kristineberg as well as two other active mines.

3.3.3 Gällivare hub

The Gällivare hub area defined by the municipality boundaries is dominated by the mining industry. Gällivare is also defined as an indigenous and forestry hub. There are 10 500 people living in the town of Gällivare and 17 500 living in the municipality. With a municipality size of 16 800 km^2 the population density is 1 p/km^2. Gällivare is also part of the traditional lands of Sami people and the town of Gällivare is the meeting point of the four reindeer herding communities of Gällivare, Girjas, Baste Čearru, and Unna Tjerusj (Figure 33).

Two major mines are located in or near the town of Gällivare also making the area a hub for mining activities. The Malmberget iron mine operated by LKAB is located directly in north end of Gällivare (Figure 33). Malmberget has been in operation since the 1700 and lay the grounds for the establishment of Gällivare as a town on lands, until then primarily used by Sami. Currently, this mine is expanding into urban areas[8]. Whole neighborhoods are being torn down and residents are forced to relocate. Part of the future plans for the Malmberget mine include the major establishment of the HYBRIT and the first fossil free steel production system in the world. A demonstration site for fossil free production of direct reduced iron (sponge iron) will be established in Gällivare at the LKAB mining site Malmberget. The plant should be completed in 2026 and produce 1.3 million tonnes of direct reduced iron. By 2030 the production should be increased to 2.7 million tonnes per year. To provide energy for the project, Vattenfall AB will construct the world's largest site for production of hydrogen gas also in Gällivare. The site is located within the lands of Baste Cearru. Much additional press and documentation exists for this project. Further south in Norra Svartbyn near Boden but also on the lands of Gällivare Reindeer Herding Community (RHC, sameby in Swedish) the The Swedish company H2GS AB (a project named H2 Green Steel) plans to establish another steel plant based in hydrogen gas with plans to start production in 2024.

On the south side of Gällivare, Boliden AB operates the Aitik mine and processing plant, established in 1968. Today, mining is carried out in two open pits and the ore is processed in an adjacent advanced and effective equipment enrichment plants for crushing and sorting minerals. This efficiency of the plant has made it possible to also explore adjacent mining sites. From processing plant the metal concentrate is transported on railway to Bolidens smelter, Rönnskärsverken, in Skelleftehamn where final products of copper, gold and silver is produced.

The Aitik mine has grown into the largest open pit copper mine in Europe covering an area of approximately 50 km^2. The Aitik mine is mainly producing copper, but also gold and silver. The Aitik mine employs 770 people and many more are employed in jobs related to the mine. Aitik is expected to be in operation until 2029 but a number of expansions of the existing mine are planned and proposed which is expected to prolong operations with the Liikavaara expansion being first in line. This proposal calls for an open pit mine with the copper ore being transported to the near Aitik processing plant. To secure this project Boliden AB purchased properties in the two villages of Sakajärvi and Liikavaara. The mine will have significant additional impact on reindeer husbandry in Gällivare RHC in terms of additional habitat loss and increased fragmentation of grazing lands. Several EIS-reports and court documents exist for the project. An additional proposed expantion of the the overall Aitik operation include the underground Nautanen mine located within the lands of Baste Cearru.

[8] https://samhallsomvandling.lkab.com/sv/malmbergetgallivare/tidplan-malmberget-gallivare/

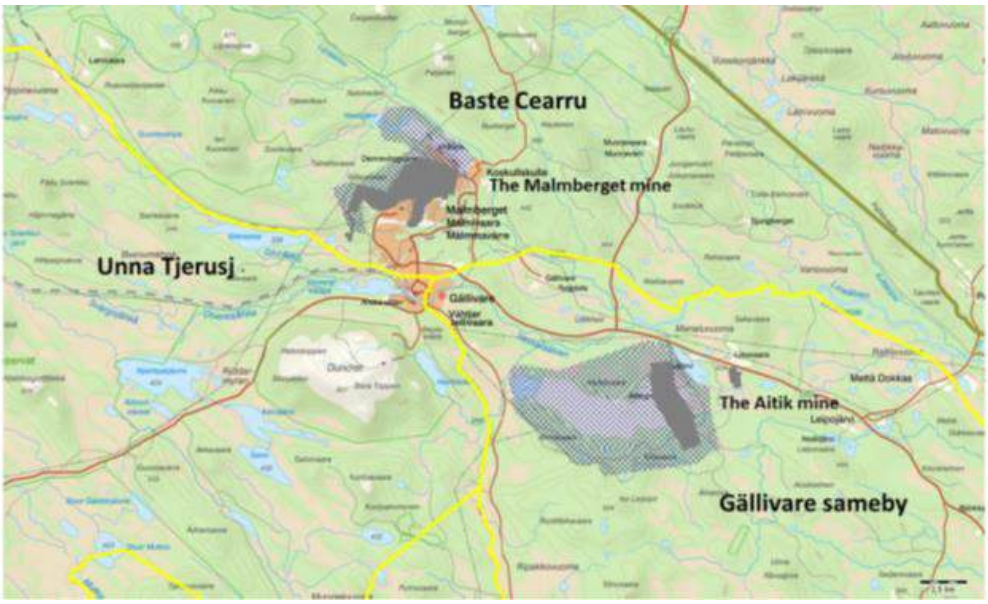


Figure 33. The townsite of Gällivare and mines

Figure 33 shows the townsite of Gällivare, which is located between the LKAB operated mine Malmberget and the Boliden AB operated mine Aitik. Liikavaara, the approved expansion of the Aitik mine is seen directly east of Aitik. Gällivare is also the meeting point of the three RHCs: Gällivare, Baste Čearru, Unna Tjerusj. The Europa highway E10 which run through the wintering area of Gällivare RHC and the railway line forming the western boundary of the RHC lead to significant reindeer mortalities.

3.3.4 Malå hub (Kristineberg)

Malå town and municipality is located in the county of Västerbotten. The population of the municipality is around 3000 with 2000 residing in the town. The size of the municipality is 1727 km^2 making the population density 2 p/km^2. The Malå hub represents a complex land-use situation where mining, forestry, wind power developments, and infrastructure projects all overlap with the land use needs of Sami reindeer husbandry. Malå is identified as a mining, forestry and indigenous hub. From the forest industry perspective, we have defined the hub by the Setra sawmill located in the town of Malå and its timber procurement area (se forest hub report). From the indigenous perspective the Malå hub is defined by Malå forest RHC, covering and area of 7713 km^2. The western year around grazing lands (åretruntmarker) are located in Malå, Sorsele and Lycksele municipalities. Winter grazing lands go all the way to the coast of Bay of Bothnia. The RHC has 100 members and 11 reindeer herding companies. The maximum number of reindeer are set to 4500. On the other hand, from the mining perspective the hub is defined by a series of mines and the transportation corridor from the westernmost mine of Kristineberg to the final processing plant at Rönnskärsverken in Skelleftehamn (Figure 35). All mining operations are operated by Boliden AB.

Mining and prospecting have a long history in Malå RHC and has over time led to losses of grazing land from direct impacts from the mines, as well as impacts related roads and mining associated traffic. Malå RHC considers lands in and around the mines in Kristineberg, Storliden, Maurliden and Kankberg completely lost (Figure 34). Herder's observations as well as GPS data all indicate reindeer avoidance of areas around the mines. The recent closing of the Maurliden mine offers promising opportunities for restoration of lost grazing lands. On the other hand, the old, closed mines of Näsbergfältet, Rakkejaur and Adakfältet have not yet been restored, and are still considered lost grazing lands.

The main mining project and the focus mine in the hub is the Kristineberg mine operated by Boliden AB and established in 1940. A considerable additional impact of the actual mining operations, is that all ore is transported by truck to the processing plant at Rönnskärsverken on the coast. According the

Boliden summary report (2020), the Kristineberg Mine produces ore from polymetallic mineralization's of Volcanogenic Hosted Massive Sulphide type. The mineralisation's have been explored to a depth of 1400 m, along a 3 km plunge between 900 m and 1250 m depth and takes place mainly by cut and fill methods. The production capacity of the mine is 750,000 tonnes per year making the Kristineberg mine the largest tonnage contributor to the Boliden Area Operations process plant. The expansion mine Rävliden 5 km west of the Kristineberg Mine was added to the mine's Mineral Resources in 2015. In 2020, the mine produced 541kt of mineralised material grading 0.6g/t of gold, 45g/t of silver, 0.52% of copper, 5.73% of zink, and 0.34% lead. Since operating started in the 1940 the mine has produced 32.6 Mt of mineralised material in total, with average grades of 1.2g/t gold, 37.8g/t silver, 1% Copper and 3.8% zink.

The Kristineberg Mine is connected to Boliden and Skellefteå to the west by highways 370 and 95. A local all-weather sealed road links the main Malå 370 highway to Kristineberg. Total driving distance between the BAO Processing Plant and the Kristineberg Mine is approximately 95km. This complex land-use situation calls for innovative participatory tools to provide an effective and inclusive dialogue in search of solutions.

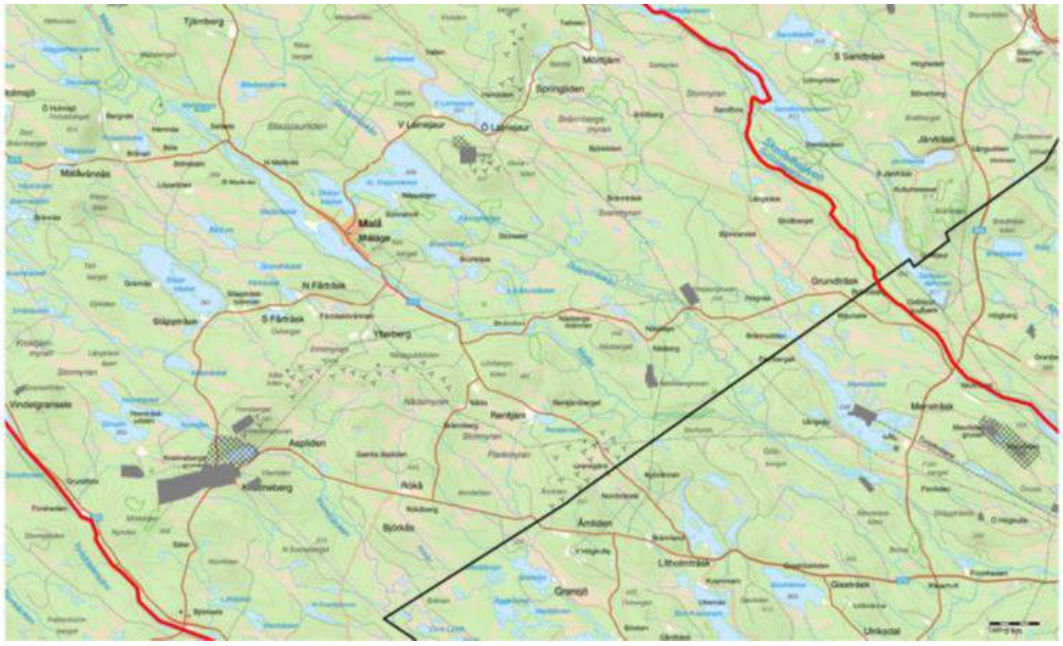


Figure 34. A number of active and abandoned mines surround the town of Malå. The largest and most active area is around the Kristineberg mine, operated by Boliden AB south west of Malå. The area is also characterized by active forestry throughout the area. The area has four wind power establishments Ytterberg, Åmliden, Storliden and Jokkmokksliden.

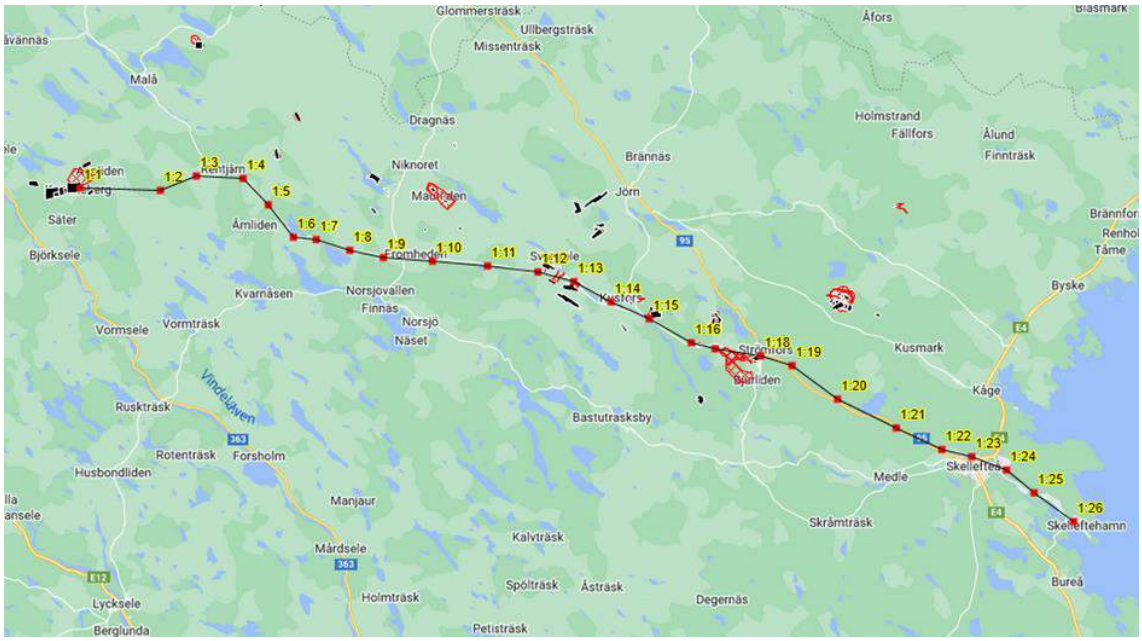


Figure 35. Schematic map showing the location of the Kristineberg mine in the west and the Maurliden, Renström, Kankberg mines along the transportation corridor to the final processing plant Rönnskärsverken in Skelleftehamn. West of the Boliden mine the transportation corridor leaves Malå RHC and enters the neighbouring Mausjaure forest RHC.

3.3.5. Jokkmokk hub

The small town of Jokkmokk, population of 2 700, is located in Jokkmokk municipality with a population of 4 766. The municipality covers 19 477 km^2 making it the second largest in Sweden but with a population density of only 0.25 p/km^2. Jokkmokk is one of the most prominent places for Sami culture. Thus, the hub is foremost defined by the indigenous traditional land use that includes reindeer husbandry, hunting and fishing. Young Sámi from the whole of Sapmi go to Jokkmokk for education, and here is also the principal museum of Sami culture Ájtte, which is both an arena for research and information center for mountain tourism. Ájtte is now identified as the Jokkmokk hub center. Jokkmokk is also the meeting place for several Sami reindeer herding communities (RHC) and located in the heart of their wintering areas. The three mountain RHCs are Sirges with 15 500 reindeer, Jåhkågasska with 4500 reindeer and Tuorpon with 9000 reindeer. In addition, the forest RHCs Slakka and Udtja have grazing land nearby. The Jokkmokk RHCs have a special agreement of their common use of their winter grazing areas.

Other land uses in Jokkmokk include forestry and tourism. But, energy production from the river Luleälven may be the most pronounced and impacting land use form in Jokkmokk. This river system is heavily regulated for hydroelectricity with 6 of the 10 largest hydroelectric plants in Sweden producing. The river produces 16.7 TWh, which is 25 % of all hydropower produced in Sweden. The damming of the rivers has long-standing impacts on how reindeer husbandry can be carried out. Before the hydroelectric époque the lakes constituted the backbone of the reindeer migrations facilitating long range movements to and from winter grazing areas in the boreal forests all the way towards the coast of Bay of Bothnia. As these lakes now have turned to water reservoirs with unstable ice conditions the reindeer migration routes have been forced to adjacent forestlands. Consequently, hydropower development has made reindeer husbandry more dependent and affected by forestry activities. The hydropower époque lasted from 1910 when work begun in the Porjus area until about 1970 when the last lake was dammed. The impacts of these exploitation remain today. Forestry has an even longer history in the Jokkmokk area and intensive activities are still ongoing today. There are some 5 000 km^2 of forest lands available for harvesting, while the 2 650 km^2 are formally protected making about 35%

of the forests are formally protected (Figure 36). Yet, forestry is considered the most impending threat to reindeer husbandry by most reindeer herders. Commercial forestry is ongoing throughout the unprotected area. Productive forest lands owned by Sveaskog AB, the National Property Board Sweden, SCA AB, Jokkmokk forest common and small private landowners provide jobs and income.

Today there are no active mines in the Jokkmokk area. There is however, a long-time, ongoing dialogue and conflict around the establishment of the Kallak mine (Gallok in Lulesami language). Since the first exploration license was granted in 2006 by the Mining Inspectorate the conflict between opponents and proponents have divided Jokkmokk. The conflict has gained significant international attention and is considered one of the most important environmental issues in Sweden today. In 2021, UNESCO stated that the mine would cause significant negative impacts on the Laponia Heritage site. The RHCs has been heavily engaged in the conflict. The proposed mining site is in Jåhkågasska Tjiellde and Sirges RHCs would have the major transportation corridor through its lands. The question of allowing this mine or not has been dividing and to some extent paralyzed the Jokkmokk community for long.

The Kallak iron ore deposit located approximately 40 km west of the Jokkmokk townsite and 80 km southwest of the major iron ore mining center of Malmberget in the Gällivare hub. According to Beowulf Mining reports test drilling in Kallak has produced magnetite concentrate at 71.5 % iron content. The mining site is located directly adjacent to the river Luleälven and near major hydroelectric power stations. Luleälven provides drinking water for major cities and villages downstream. Kallak was discovered by The Swedish Geological Survey (SGU) in the 1940s. The first exploration licence for Kallak was awarded by the Mining Inspectorate of Sweden in 2006. Drilling was conducted at Kallak North and South between 2010-2014, a total of 131 holes and 27,895 m. For Kallak North and South combined, indicated a mineral resource of 132 Mt grading 27.8 % iron.

Beowulf Mining claims that the Kallak mine has the potential to create 250 direct jobs and over 300 indirect jobs in Jokkmokk sustained over a period of 25 years or more. Furthermore, they state that the mine has the potential to generate SEK 1 billion in tax revenues, considering the case where 70 % of the mine's workforce are based locally, with annual tax revenues of SEK 40 million. These tax revenues would help to develop and sustain public services and infrastructure in Jokkmokk. These figures are however, highly contested.

On March 22, 2022 the minister of enterprise and innovation announce the government's decision to grant a processing concession for the Kallak iron ore deposit. The highly disputed case is however far from resolved.

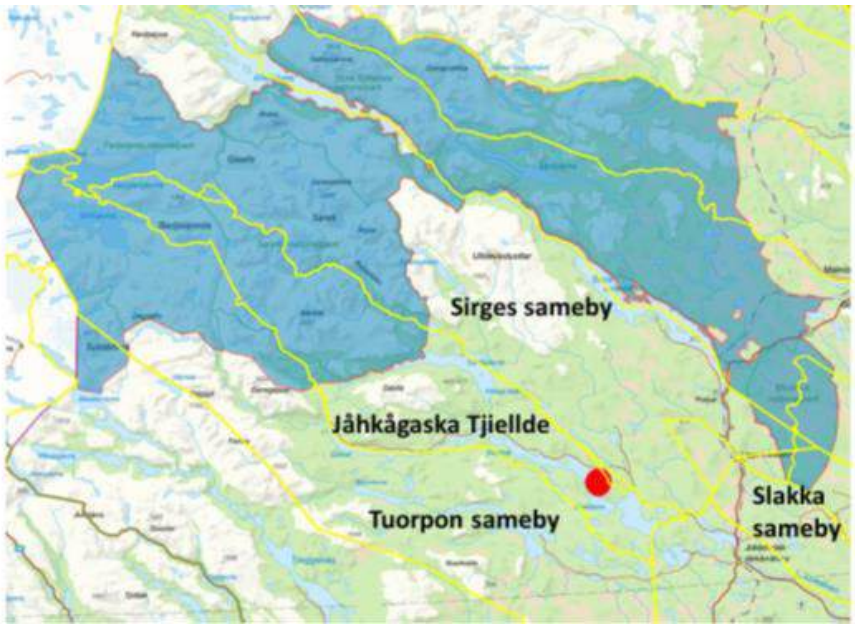


Figure 36. The three reindeer herding communities (RHCs) operating in the Jokkmokk hub include from the north Sirges, Jåhkågaska and Tuorpon. The town of Jokkmokk is the meeting point of several RHCs. Just west of Jokkmokk is the controversial and much debated proposed mine Kallak located (red dot). The National Parks Sarek, Padjelanta, Stora Sjöfallet and Muddus forms the UNESCO World Heritage site Laponia (in blue).

3.4. Italy Learning case - Val Germanasca hub

The character of the Germanasca Valley Hub in the Western Alps is both linked to the mining resources and to the history of the Waldenses (religious group born in 1173 in Lyon, France with the conversion of merchant Waldo, founder of the movement) marked by persecution and the fight for their own identity. The Hub illustrates a long-term interaction between the local population and mining companies in the case of mines of both industrial and cultural/educational/tourism interest.

After centuries of the intense mining, an ambitious project for rediscovery the abandoned talc mines led to the birth on 1993 of the "EcoMuseum of Mining". Later a new Geoscience educational project "ScopriAlpi" (DiscoverAlps) was built for showing the magnificent internal geological structure of the Alps, within a new proposed UNESCO Global Geopark. In the meanwhile, IMERYS TALC ITALY is still managing the talc mining activity in the Chisone and Germanasca valleys in the province of Turin. The company produces about 32,000 t of talc and 21,000 t of aggregates annually and it has a workforce of more than 80 employees. The local mining activity involves the whole Germanasca valley, since the talc extracted from the Rodoretto mine in the municipality of Prali undergoes its first screening in the sorting station before it is transported to the Malanaggio facility in the Porte municipality, where it is crushed, dried or decontaminated, milled and packaged according to its end use and the customers' needs.

Mining Hub

Company: IMERYS Talc Italy S.p.A. (from 2011 – in progress). Before IMERYS the Talc exploitation was in charge of Rio Tinto Group and of Soc. Talco-Grafite Val Chisone.

Ownership: Multinational

Location: Germanasca valley: Rodoretto Mine (Municipality of Prali), Malanaggio dressing plant (Municipality of Porte).

Activity: underground talc mine *(*Fig. 37). Operation method: *"underhand cut and fill".*

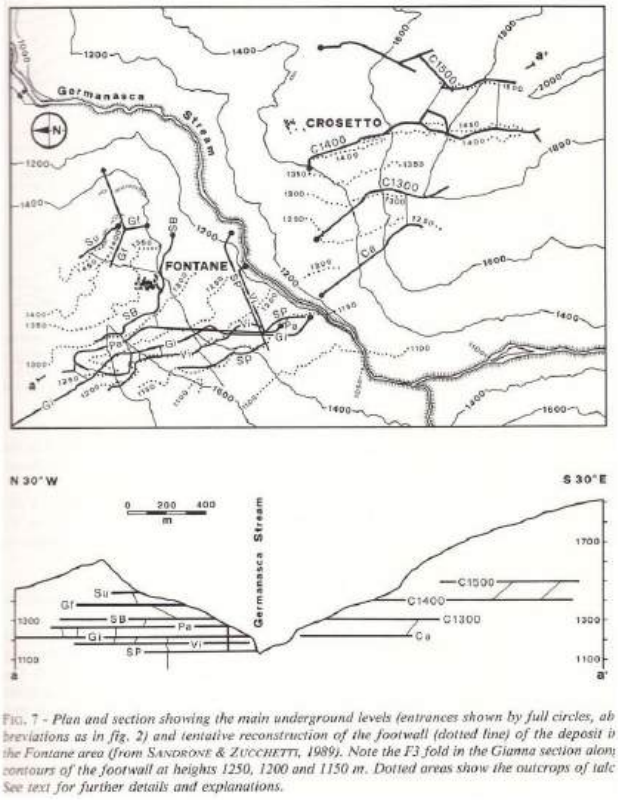


Fig. 7 - *Plan and section showing the main underground levels (entrances shown by full circles, abbreviations as in fig. 2) and tentative reconstruction of the footwall (dotted line) of the deposit in the Fontane area (from Sandrone & Zucchetti, 1989). Note the F3 fold in the Gianna section along contours of the footwall at heights 1250, 1200 and 1150 m. Dotted areas show the outcrops of talc. See text for further details and explanations.*

Figure 37. plain and section showing the main underground levels.

Spatial extent: access to the current mine through a 2,5 km tunnel. 1,2 km of new access drift are excavated every year, along the talc vein.

Natural resources: reserves estimated in 265,000 ton and resources estimated in 570,000 ton of talc ore to be excavated in 7-8 years. Geological exploration in progress for additional resources.

Employment expected: 80-man years (mine + dressing plant + administration at Italian level)

Production: **28,000-ton** average annual talc (in the past up to 36,000 ton/y).

Waste production: 20,000 ton of operating residues expected per year (140-160,000 ton in 7-8 years). 70% of operating residues will be used for filling in underground yards (at present several test activities are in progress). 7,000 t of rock waste (from tunnelling) expected per year (used as filling material).

Permits:

- Mining rights to operate till 2032 (probably it will be renewed due to the potential high volume of talc to be exploited.
- Authorisation for extractive waste management and landfilling (2 different active extractive waste facilities)
- Authorisation to discharge in surface water the treated water

Data collection

The following section refers to different data gathering inherent to the Prali municipality, a representative area of Germanasca Valley. These data were collected for the period 2017-2021, which was inevitably conditioned by the restrictions to stem the sanitary emergency due to Covid-19. The

choice of concentrating on this municipality is twofold: first, Prali is characterized by a ski area that attracts a local catchment area, mostly from the city of Pinerolo and from the province of Cuneo; secondly, Prali is a municipality that incorporates, in respect to all the Germanasca area, characteristics linked to both the tourist aspect and the mining activity. Given these reasons, we chose to concentrate our analysis on this municipality.

Social data

These data were collected from the national social-demographic database ISTAT that provides very accurate information. There is not any specific aspect to underline, since the municipality of Prali, analysed individually with respect to the Germanasca Valley as a whole, shows an almost constant trend for all the analysis variables.

Table 3. Prali social-demography data 2017-2021

Residential Data

These data were collected thanks to questions addressed directly to the municipality of Prali. These data could show hypothetical increase or decrease in the urbanization of this area and in this case, they show a slight rise in the number of first houses, while the number of second houses remains almost unchanged.

Data variables	Fonte	N year	2017	2018	2019	2020	2021
n. of tot. residents	ISTAT	5	242	243	252	252	251
n. of female residents	ISTAT	5	113	113	118	117	119
n. of male residents	ISTAT	5	129	130	134	135	132
n. of employed residents	ISTAT	2		102	107		
n. of unemployed residents	ISTAT	2		121	124		
average income from self-employment (€)	ISTAT	1	12.542				
average salary as an employee (€)	ISTAT	3	15.483	14.994	15.927		
n. of residents without educational qualifications	ISTAT	3		2	3	3	
n. of residents with primary school license	ISTAT	3		54	52	45	
n. of residents with secondary school license	ISTAT	3		84	87	71	
n. of residents with high school license	ISTAT	3		83	85	104	
n. of residents with a degree	ISTAT	3		6	10	14	

Table 4. Prali residential data 2017-2021

Data variables	Fonte	N year	2017	2018	2019	2020	2021
n. of first houses	Comune di Prali	5	124	125	134	133	131
n. of second homes	Comune di Prali	5	131	133	126	132	133
n. of houses rented to seasonal workers							
n. of tot. vehicles	ACI	4	284	281	289	299	
n. of cars and motorcycles	ACI	4	219	217	223	228	

Economic data

Economic data are inherent to the employment situation in the municipality of Prali and they were collected from both regional (Rupar Piemonte) and national databases (ASC.Istat and MES). Unfortunately, the available information stops at 2019, so it is not possible to understand the impact of Covid-19 restrictions on the workers' situation, even if the Gross Regional Product suggests an economic growth until 2019 and then a slight decrease in 2020. It could be useful to know the data related to 2021, that would better explain the path across the pandemic period

Data variables	Fonte	N year	2017	2018	2019	2020	2021
n. of local business units (no accomodations)	Rupar Piemonte; ASC.Istat	3	26	29	33		
n. of farms	Comune di Prali	1			6		
n. of tot. workers	Rupar Piemonte; ASC.Istat	3	88	98	104		
n. of employees	Rupar Piemonte; ASC.Istat	3	28	31	32		
Gross regional product (€)	MEF	4	2.650.648	2.752.116	3.039.098	2.953.471	
Value added - contribution of agricultural sector to the GDP							
Value added - contribution of tourism sector to the GDP							

Table 5. Prali Economic data 2017 - 2021

4. Discussion and conclusions

This report showed that important differences at the local level exist when it comes to positive and negative impacts of the mining industry (Table 6). The sector itself is developing according to different patterns in the countries: consistently with the fact that Sweden and Finland are considered more friendly and attractive for the mining business, we saw that the production and the number of people involved in the industry are higher comparing to Norway, and that there are important plans for expansion and the development of new plants in Swedish and Finnish hubs. In northern Sweden we also found important innovation project like HYBRIT, even if it does not come without controversial and conflictual aspects, as mentioned in the introduction. The sector is generally less important in Norway, where two hubs, Kautokeino-Kvalsund and Varangerfjord, have currently no mining activities at all (even if reopenings are expected in the near future) and one hub, Svalbard, is almost at the end of a process for the full ceasing of the mining activities.

Differences can be found in the mine-induced population dynamics: as Varangerfjord example shows, the closure of a mine can determine a sharp decline in population. Quite the opposite, Svalbard hub seems to represent a virtuous example of how mining activities can be cease when they become unprofitable without affecting the local population. As we saw, the number of employees in the mining sector strongly decreased and will decrease further, but the population stayed relatively stable, as the numbers of employees in other sectors, like research and tourism, increased. Furthermore, the positive case of Kittilä illustrates the opposite and demonstrates that mining can contribute to invert, stop or at least reduce the outmigration from remote and sparsely populated areas.

However, as noted in the introduction and shown by Varangerfjord case, a major issue should be considered when evaluating the positive impacts on employment and demography: mines are subject to sudden closures because of bankruptcies and/or unprofitable global prices, and they are almost never locally owned. This means that local interests, such as stable jobs for local residents, could be easily overlooked by the company. On the other hand, strong local oppositions have proved to be able to stop mining projects that were considered harmful: this is the case of Kautokeino-Kvalsund, where environmental NGOs and Sami organizations took action against the reopening project, managing to put it on hold and causing the potential copper buyer to withdraw. Local opposition, however, is not always effective: notwithstanding negative impacts over reindeer herding, plans for further expansion of the existing extraction activities or for new plants are numerous, especially in northern Sweden.

One of the possible mitigation initiatives could be the recovery of land to restore pastures but, as the cases of Näsbergfältet, Rakkejaur and Adakfältet show, it is often not implemented. Very important is, at this regard, the process currently going in Svalbard for the complete removal of a mining plant and related infrastructure to restore nature.

All the examples recalled here and the ones that were illustrated in the report, beside the strong differences that makes each context specific and in need of tailored solutions, point to one important conclusion: the meaningful involvement of local groups, indigenous and non-indigenous, is fundamental to avoid negative impact on other livelihoods such as reindeer herding and tourism. Beside the cultural loss, the disappearance of other activities could endanger the possibility of a sustainable future in the area: as a matter of fact, the mine will, sooner or later, shut down and if the area is too dependent on it for job and services provision it could be hard for the local population to re-organize and thrive. A well-balanced management is crucial during the lifetime of the mining activity too, especially when it comes to housing and welfare services, to avoid rising prices, overload and inconsistency between the offer and the needs of residents, and to limit environmental degradation as much as possible. Furthermore, and in spite of the strong power imbalance between big international companies, often attracted and supported by State policies and strategies, and local communities, if a mining company fails to obtain SLO the level of conflict could affect or even paralyze the activity. Is therefore essential to set up involvement and participation processes since the very

beginning of the planning phase and to stay accountable, keeping on providing a fair share of benefit to local population.

Table 6. Summary of key characteristics in the mining hubs

Characteristics	Kautokeino-Kvalsund	Varangerfjord	Svalbard	Egersund	Malå	Gällivare	Kittilä
N. of mines currently operating	0	0	1 (closure planned in 2025)	8	1	2	1
population dynamics		Strong population decline after closure in 1997, increase in 2009 and lighter decrease in 2015 with new closure					Population growth since the beginning of 2000s thanks to employment opportunities in tourism and mining
employment	150 esitimate new employees	1600 employees at industry peak. Now few local employees	97 in 2019 vs 410 in 2008	Titania: 220-250 Rekefjord Stone: 23 + 15-25 new with new licence		Aitik: 770+	460 employees + 500 contractor personnel
products	copper. estimated production of 24,4 (per year?) + tailings	Iron. For reopening: expected 4 million tonnes/year	Coal	sand and gravel, aggregates, dimension stones (natural stone produced by Rekefjord Stone: 600.000 m^3/year +	zinc, copper, silver and gold	LKAB: Iron Aitik: copper, gold and silver	Gold (7000 kg/year)

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		(reserves: 475 million tonnes)		recent additional licence of additional 60 million tons) and the ilmenite ore (Titania produces 800,000 - 850,000 ton ilmenite concentrate and 20,000 ton magnetite, in addition to some sulfur)			
ownership	(owner from 2006, has operating licence in 2019 but reopening is on hold) Nussir ASA. Norwegian but dependent on foreign investments	(for potential reopening) Tacora Resource Inc. International, mostly US	Norwegian state	Titania (Kronos World Wide Inc, American) is the main one. Others: Rekefjord East and West, Hellvik, Egersund Granite and Espedal gravel	Boliden AB	LKAB Boliden Minerals AB Aitik	Agnico Eagle, Canada
conflicts	Environmental NGOs and Sami groups are against: negative effects on reindeer herding; shipping area location; fjord tailing deposit	Noise, air pollution, water pollution (fjord, river and lake). Tourism, reindeer herding and sea-based industries are negatively affected		Environmental NGOs protested against seafloor tailing deposit in the 80s and the waste deposit was moved to the land, but this turned out to be vvery harmful too. new solutions are under research	reindeer herding	reindeer herding	No major conflicts and good acceptance by local population
opportunities	New employment opportunities for young people who now outmigrate	Ease unemployment caused by sanctions against Russia				HYBRIT project for fossil-free steel	

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[1] ***Deliverable Type:***
R: Document, report (excluding the periodic and final reports)
DEM: Demonstrator, pilot, prototype, plan designs
ORDP: Open Research Data Pilot
DEC: Websites, patents filing, press & media actions, videos, etc.
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[2] ***Dissemination Level:***
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1. Background and introduction – the Arctic hubs project and tourism

The Arctic has been viewed as an exotic and remote location that offers scenic landscape including the aurora borealis, glaciers, ice and snow, and vast expanse of wilderness. The Arctic is also associated with reindeers, skiing, sledding and Santa Claus. These attractions, coupled with the thawing ice caps due to climate change, resulted to the rapid growth of the tourism industry due to the ease of accessibility; and especially due to the so-called 'last-chance' tourism to experience the polar ice caps and the pristine location (Grimsrud, 2015; Chen et al 2020).

Tourism in the Arctic is rapidly growing and leads to land use development pressures (Kajan,2014: p. 490). With the increasing tourism, the United Nations World Tourism Organization (UNTWO) developed the "2030 Agenda for Sustainable Development and Sustainable Development Goals". It aims to promote responsible, sustainable, and universally accessible tourism to balance economic growth and the demands of inclusive development and environmental sustainability. Tourism needs to identify the best possible use of the available resources, preserving crucial biological processes and assisting in the preservation of the region's natural heritage and biodiversity. Additionally, tourism should preserve host communities' lives and cultural assets, traditional values, and sociocultural authenticity in order to promote intercultural tolerance and understanding. Tourism should provide sustainable, long-term economic operations that properly distribute socioeconomic benefits to all stakeholders, especially the local host communities (Glomsrød,2021: p. 155).

According to the Òlafsdòttir (2021), all three pillars of sustainability must be taken into account when analyzing the tourism industry: social sustainability, which entails balancing the needs of the local community with those of tourists, distributing benefits fairly, and avoiding adverse effects on locals; environmental sustainability, which is essential, particularly when it comes to nature-based tourism and tourism in protected areas, as it is frequently the case with Arctic destinations; and economic sustainability.

Rempel, J. M. (2012) also approaches the topic on sustainable development in tourism similarly with Òlafsdòttir (2021), beginning with the premise that locals must be involved in tourism management. The area under consideration is suited for ecotourism and particularly appealing for wildlife-related pursuits including hunting, fishing, and wildlife observation. Local people engage in all of these activities, and the area's economy is linked on the exploitation of natural resources including forestry, mining, and fishing. Although tourism could be an interesting and sustainable industry to "diversify and improve local economy," planning is required to prevent or, at the very least, reduce potential negative impacts over the natural environment and local communities and cultures. The author also emphasizes the importance of provision of trainings for tour guides and boat operators.

The increase in tourism activity in Arctic is expected to not only, increase jobs, income and revenue, but also, as a way to preserve cultural and historical traditions; and improve transmission of the Artic's way of life to tourist and visitors. Tourism indeed has a lot of potential and can be synergistic with traditional livelihood in the area. However, tourism can also have negative socio-cultural impacts, such as pollution, rapid development of tourism related infrastructure, etc. It is in this context that this study is being conducted as the WP3.1 **aims to analyse the impacts of existing and new economic activities in the Arctic**. In this paper, we focus on the tourism industry in the Arctic, particularly the 10 tourism hubs from Arctic countries, such as: Faroe Islands, Finland, Greenland, Iceland, and Norway, and two learning hubs in Italy.

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Tourism is defined as activities of persons traveling to and staying less than a year in a location outside their usual environment where the purpose of the trip is leisure, business and other purposes (UNSNA 2015). Ideally, in this paper we would compare key characterisics to analyse the socio-economic impact of tourism industry in the Arctic, such as:

- Income from tourism i.e. and Gross Regional Product (GRP) in the tourism industry
- Accommodation for visitors (overnight stays, hotels and other accommodation)
- Passenger transport (air, railway, water, road),
- Number of tourism enterprises
- food and beverage-serving industry
- Cultural industry including heritage sites
- No. of people employed under tourism activities,
- Educational level
- Tourism income and other country/Arctichub specific tourism characteristics.
- Conflicts/issues

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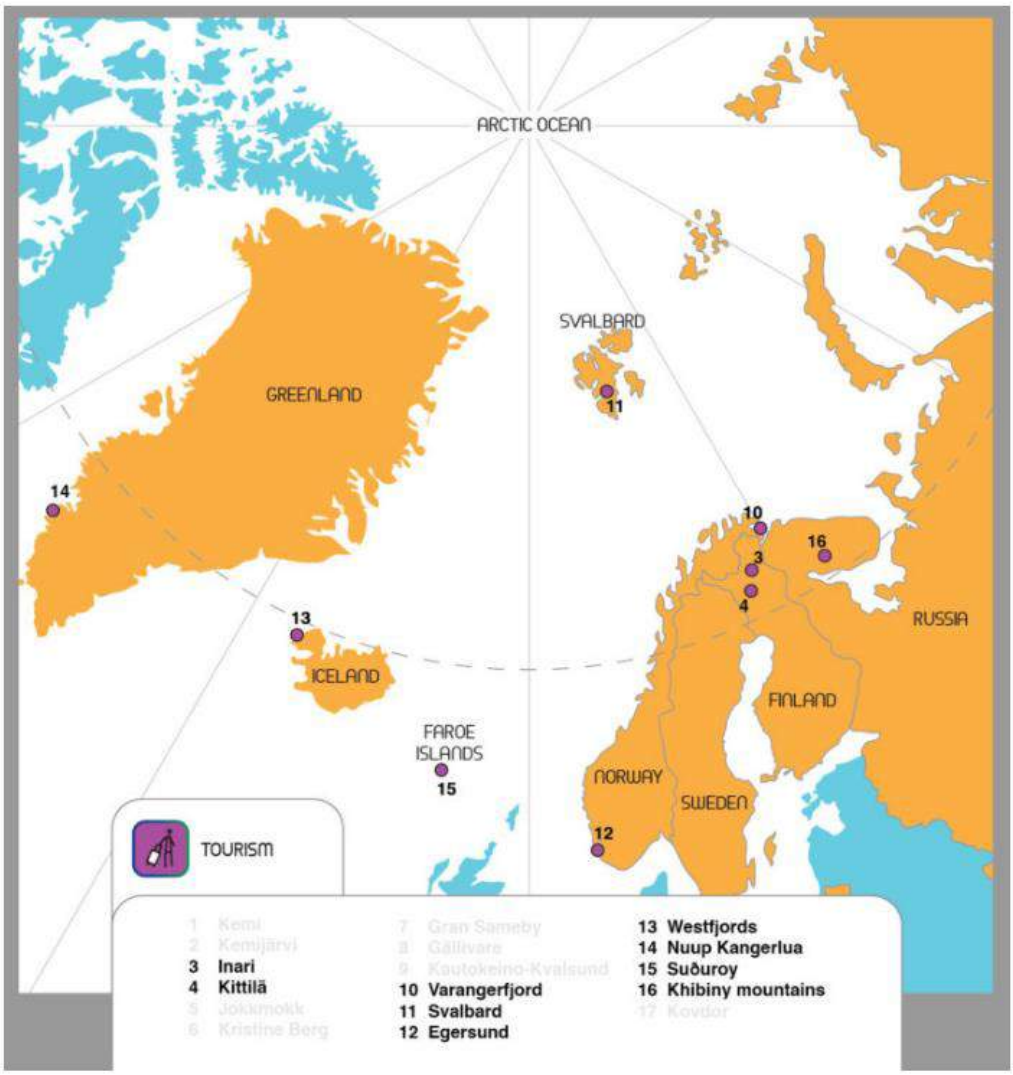

[3]

[3] The Russian partner withdraw from the project in December 2021, and data on the Russian mining HUB will be excluded from this report.

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2. Overview of the tourism industry in the Arctic European countries

This chapter will provide an overview of the tourism industry and its importance in the five Arctic countries, such as: Faroe Islands, Finland, Greenland, Iceland and Norway.

2.1 Faroe Islands

2.1.1 Brief description

The Faroe Islands, or the Faroes, are an archipelago of 18 islands in the North Atlantic, approximately midway between Iceland and Norway. Land area is 1399 square kilometers, and the population was 53.641 per January 1st 2022. Politically, the Faroes are an autonomous nation within the Danish Kingdom, together with Greenland. The Faroes were settled sometime between 300 and 800 AD, by Celtic and Norse settlers, and belong to the Norse cultural tradition with their own language, Faroese, and a distinct culture. The Faroese landscape is dominated by mountain pastures, which are grazed by sheep, also giving the islands their name, *Føroyar*, meaning "Sheep Islands".

2.1.1.1 Population dynamics

Suðuroy, is the southernmost island of the Faroes. Population in Suðuroy per January 1st 2022 was 4.684 people which is 8.7% of the total Faroese population. The land area of Suðuroy is 165 square kilometers which is 11.8% of total land area. The island is divided into seven municipalities and 15 settlements (see Figure 1).

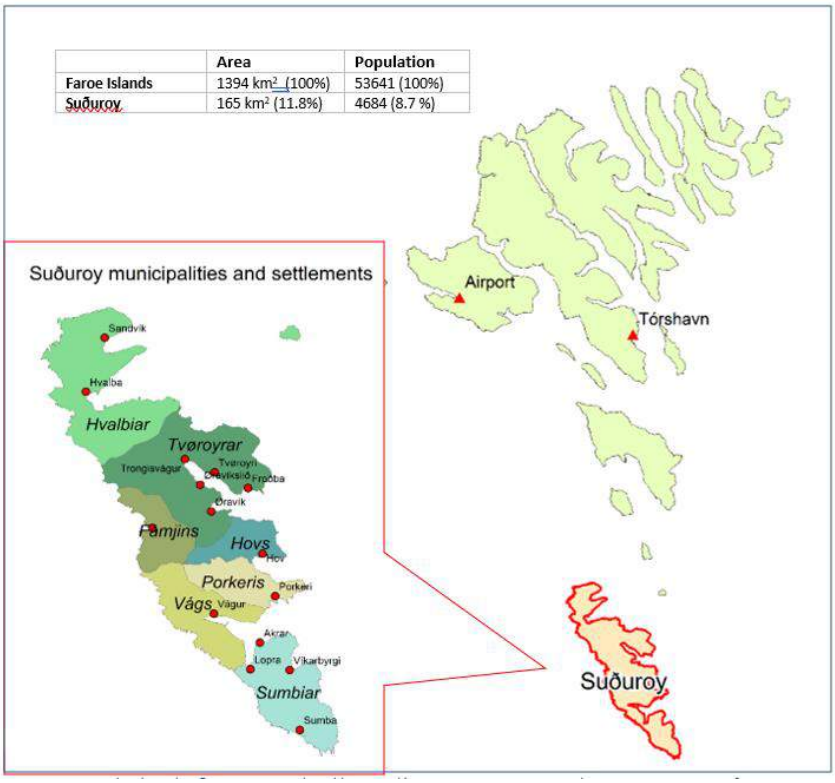

Figure 1. Faroe Islands and Suðuroy. Map produced by Bogadóttir 2022. *Source: Umhvørvisstovan, www.us.fo*

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2.1.2 The Faroese economy – from fisheries to aquaculture and tourism?

Traditionally, the Faroese economy has been dominated by industrial fisheries, and fish and fish products still make out between 90 and 95 percent of export value and 20% of GDP (GFI 2022). In recent decades, initiatives have been made to promote new industries. New industries are perceived as necessary to modernize, strengthen and diversify the Faroese economy and society, for instance by creating more diverse employment opportunities and so on. In the Faroes the new industries that have emerged and which are increasingly dominating in Faroese society, are aquaculture and tourism. Aquaculture has become a very important element in the Faroese economy during the past decades, and in recent years aquaculture has accounted for around 40% of export value. As is seen in Figure 2, industrial fisheries do however still dominate. In comparison, tourism was estimated to be around 2% of GDP before Covid19.

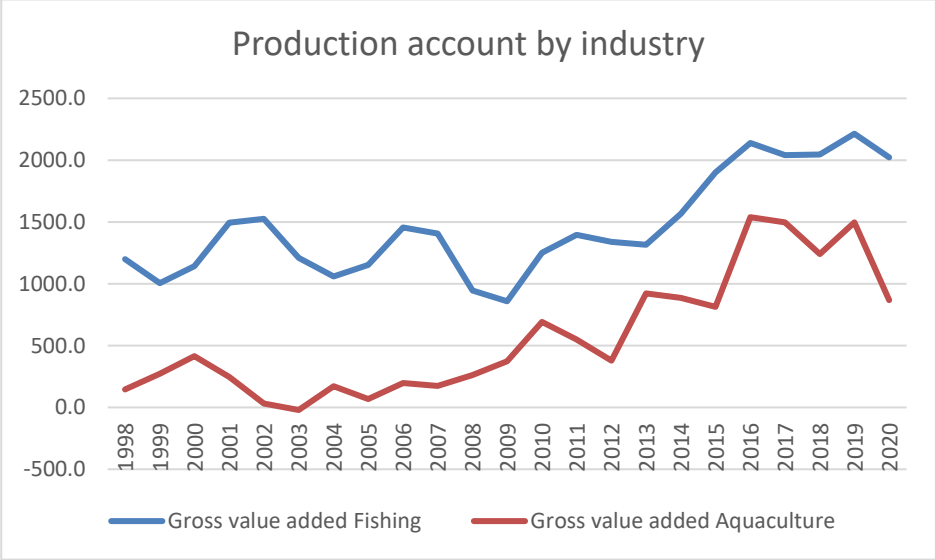

Figure 2. Production account by industry showing fisheries and aquaculture. *Source: Statistics Faroe Islands*

Suðuroy is today considered a peripheral region of the Faroes, but during first half of the twentieth century, Suðuroy was the center of the transformation of the Faroes from a relatively self-sufficient peasant society to a modern industrial fisheries nation. During this period, from the late 19th century to the middle of the twentieth century, Suðuroy experienced high rates of population growth (Figure 3). After World War II Suðuroy lost its prominent position as the center of the Faroese fisheries economy to the northern region, and population growth stagnated. Suðuroy experienced population decline after the severe economic crisis that hit the Faroes in the early 1990s, and although population has remained relatively stable during the past two decades, with an upwards trend in recent years, the population is ageing. Average age for men in 1985 was 35,5 years and 36,3 for women. In 2022 the average age is 42,4 years for men and 43,6 for women (Figure 4 and 5), while the average age in the Faroes was 39,5 in 2021.

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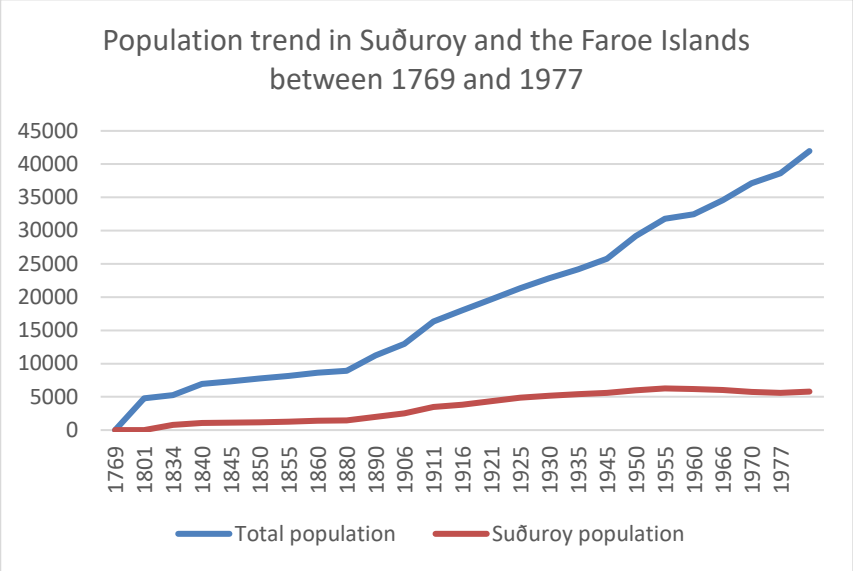

Figure 3. Historical population figures for Suðuroy and the Faroe Islands. *Source: Statistics Faroe Islands*

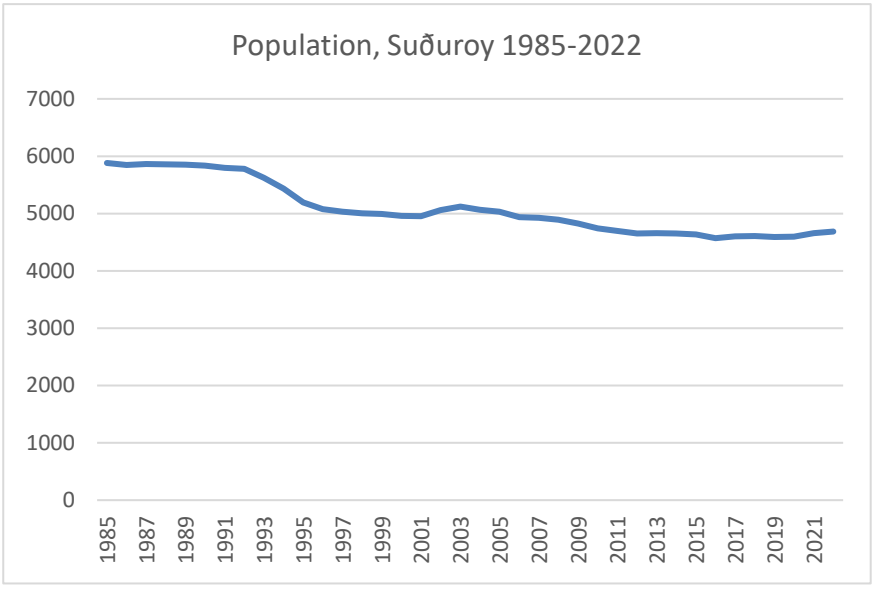

Figure 4. Suðuroy population 1985-2022. *Source: Statistics Faroe Islands*

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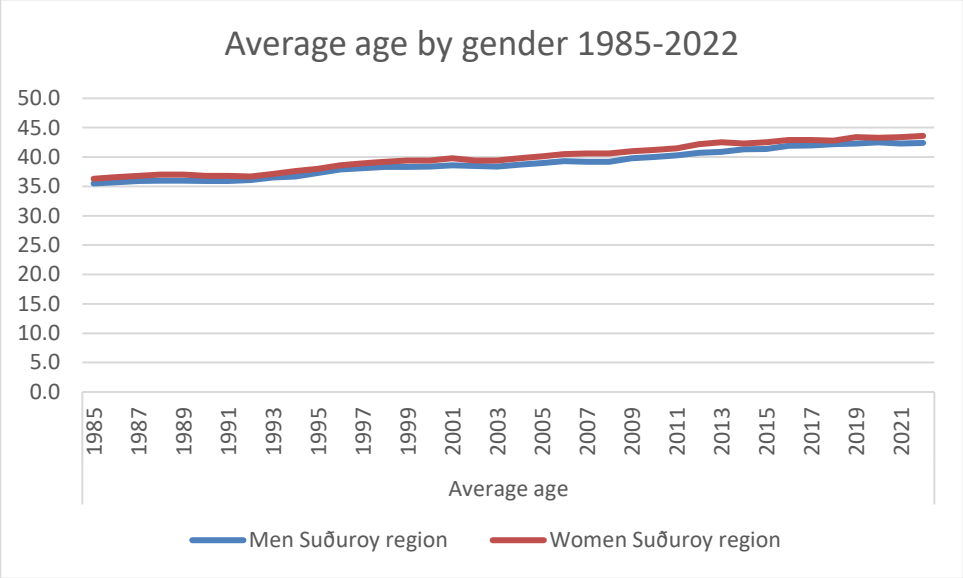

Figure 5. Average age by gender, Suðuroy region, 1985-2022. *Source: Statistics Faroe Islands*

2.1.3 Socio-economic change and the new global industries

The changes in the Faroese economy mean that aquaculture and tourism now have a big influence on society, and the Faroes may indeed be seen as a "hub" for tourism and aquaculture. The recent success of the pelagic fisheries and aquaculture industries have meant that economic growth rates have been very high, and during the past years population growth in the Faroes has been rapid (Figure 6), but Covid19 and the new political situation with the Russian invasion of Ukraine has exposed the vulnerabilities of the Faroese economy. However, with its isolated position and small size, and the great economic reliance upon only one key resource (fish), the Faroes are part of a peripheral region, and outmigration especially of young and educated people is an issue that has received much attention and concern. As can be seen in the historical population statistics, one trend that has been ongoing since the 1950 is the outmigration of women (Figures 6 and 7), something which is characteristic of most peripheral areas in the North and the Arctic. Although figures are missing for the years between 1935 and 1960 for the Suðuroy region, the trend is similar there with a balance between both genders

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up until the Second World War period, and after that a steady increase in the gender imbalance, which continues today (Figures 8 and 9).

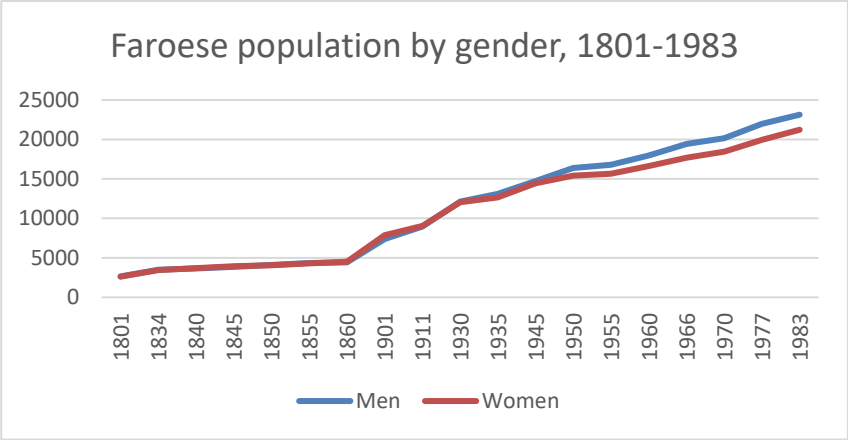

Figure 6. Total Faroese population by gender 1801-1983. *Source: Statistics Faroe Islands*

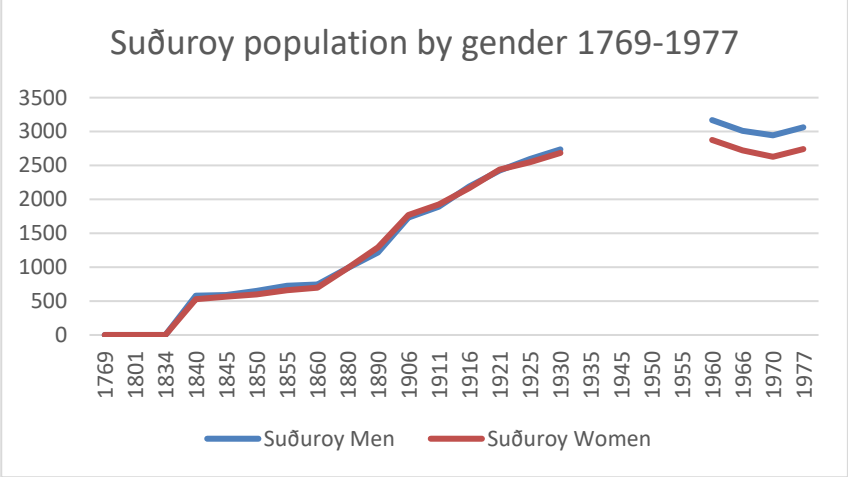

Figure 7. Suðuroy population by gender 1769-1977. *Source: Statistics Faroe Islands*

The gender ratio between men and women for the whole country per January 1st 2022 was 27.799 men and 25.842 women per January 1st in 2022 (Figure 8). This discrepancy is often discussed as a "deficiency" of almost 2.000 women in Faroese society. In Suðuroy, the gender balance is slightly more skewed than in the country as a whole. Per January 1st in 2022 the number of women was 2.211 and the number of men was 2.473. In 1985, the ratio was 3.044 men and 2.838 women (Figure 9).

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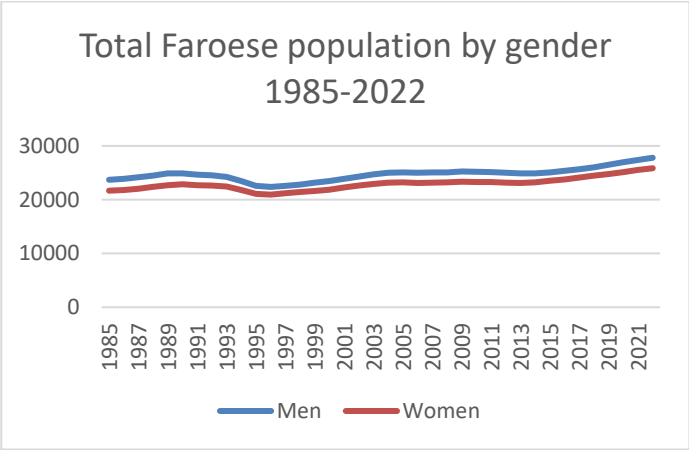

Figure 8. Total Faroese population by gender 1985-2022. *Source: Statistics Faroe Islands*

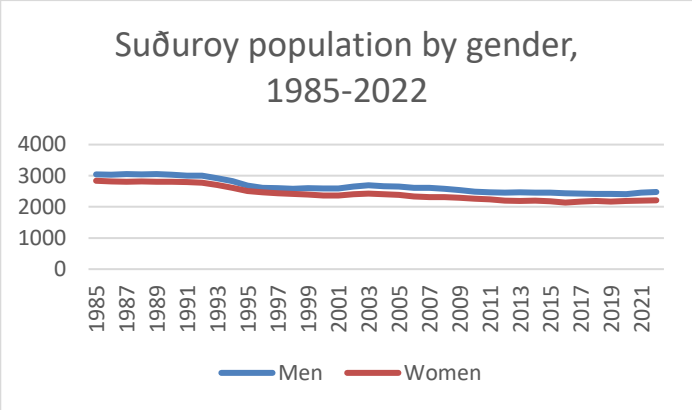

Figure 9. Suðuroy population by gender 1985-2022. *Source: Statistics Faroe Islands*

In summary, the general trend over the past decades for Suðuroy is that the population is ageing and has declined, and that the gender balance shows that it is in particular women that move away. The past decades have also seen great changes in the traditional fisheries industry, and this again has had a great impact on the local communities in Suðuroy. At the turn of the century, the fisheries industry as well as the aquaculture industry in Suðuroy was still mainly locally owned and controlled, with a large number of fishing vessels and fish processing plants. Today, the fisheries industry has become centralized, and ownership is to a large extent non-local. As the aquaculture and tourism industries are growing rapidly in the Faroes and in the whole Arctic region, the local communities in Suðuroy are struggling to become part of these industries in ways that benefit the local community

2.1.4 Tourism Industry

2.1.4.1 Passenger transport (air, railway, water, road)

As is the case in the region as a whole, the number of tourists coming to the Faroes has increased rapidly in recent years. Total passenger transport numbers have been increasing, with a downturn after the financial crisis in 2008/2009, but have grown rapidly in the last decade. In 2019, before

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Covid19, the number was 472,877, and during the first year of the pandemic numbers went down to 202,208. In 2021, the trend is upward going again with a total of 274,414 passengers (Figure 10). Passenger arrivals to the Faroes continue to increase in 2022.

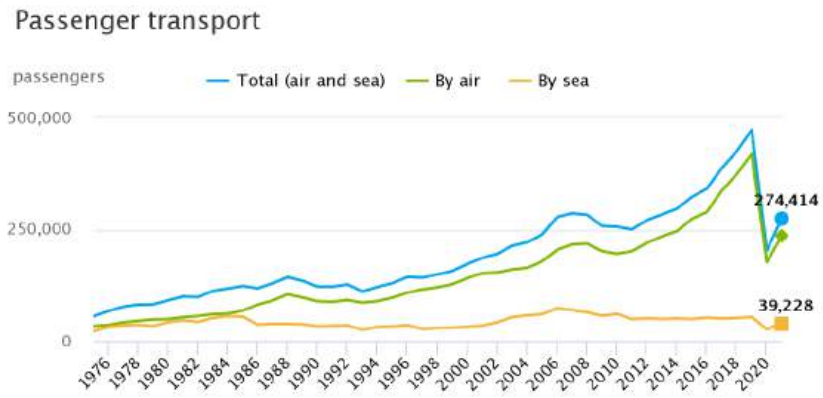

Figure 10. Passenger transport to the Faroe Islands. *Source: Statistics Faroe Islands*

In 2013, Visit Faroe Islands embarked on a strategic plan to market the Faroe Islands, with the aim of increasing tourist numbers, and making tourism a "third leg" of the Faroese economy. Income from tourism was estimated to 784 million Danish Kroner in 2019 (VFI 2019), the year before the pandemic. This conscious strategy together with the general global increase in tourism is clearly visible in the figures of passenger transport, and the numbers of overnight stays (Figures 11 and 12).

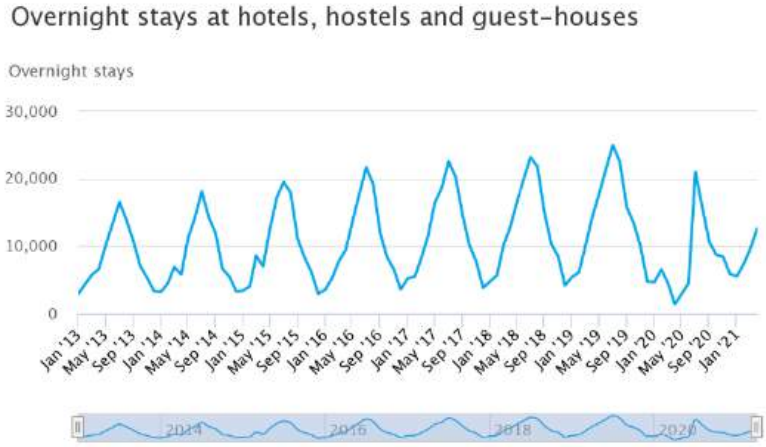

Figure 11. Overnight stays in the Faroes. *Source: Statistics Faroe Islands*

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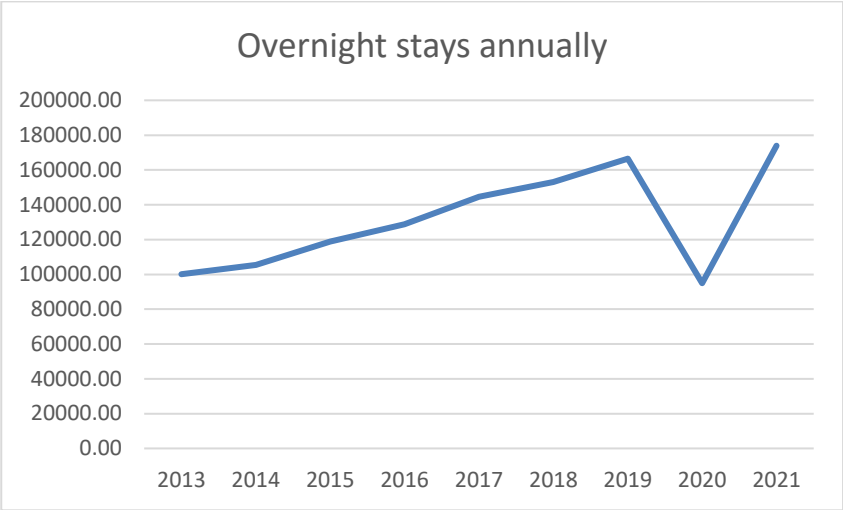

Figure 12. Overnight stays annually for the Faroes. *Source: Statistics Faroe Islands*

2.2 Greenland

2.2.1 Brief Description

Greenland, the largest island in the world with an inland ice cap occupying 80% of the dry land, is situated in the Arctic region on American continent. Politically, Greenland is within the Danish realm thus more in connection with the EU than to countries on American continent. With the lowest population density in the world (0,14 pr km2 of ice-free area) and with access to tundra wilderness and pristine nature in the Arctic, Greenland is focusing on attracting adventure tourists to the country.

2.2.1.1 Population dynamics

Greenland is divided into four municipalities and one National Park that are managed by Self-government of Greenland.

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Population in Greenland by january 1st, 2021

KOMMUNE KUJALLEQ	
Narsaq	1,392
Igaliku	39
Qassiarsuk	69
Narsarsuaq	138
Qaqortoq	3,037
Saarloq	24
Eqalugaarsuit	96
Qassimiut	16
Nanortalik	1,169
Aappilattoq	97
Narsarmijit	73
Tasiusaq	63
Ammassivik	40
Alluitsup Paa	201

KOMMUNEQARFIK SERMERSOOQ	
Nuuk	18,800
Qeqertarsuatsiaat	181
Kapisillit	42
Paamiut	1,247
Arsuk	82
Tasiilaq	1,916
Sermiligaaq	210
Isertoq	58
Kulusuk	216
Tiileqilaaq	93
Kuummiit	254
Ittoqqortoormiit	361

QEQQATA KOMMUNIA	
Sisimiut	5,622
Itilleq	73
Sarfannguit	91
Kangerlussuaq	463
Maniitsoq	2,486
Atammik	184
Napasoq	84
Kangaamiut	302

KOMMUNE QEQERTALIK	
Aasiaat	3,035
Akunnaaq	64
Kitsissuarsuit	60
Qasigiannguit	1,071
Ikamiut	78
Qeqertarsuaq	838
Kangerluk	11
Kangaatsiaq	534
Attu	207
Iginniarfik	74
Niaqornaarsuk	242
Ikerasaarsuk	98

AVANNAATA KOMMUNIA	
Qaanaaq	619
Savissivik	72
Siorapaluk	41
Qeqertat	26
Upernavik	1,076
Upernavik Kujalleq	207
Kangersuatsiaq	140
Aappilattoq	161
Tasiusaq	259
Nuussuaq	191
Kullorsuaq	437
Naajaat	41
Innaarsuit	159
Nutaarmiut	58
Ikerasaarsuk	2
Uummannaq	1,428
Niaqornat	36
Qaarsut	167
Ikerasak	252
Saattut	238
Ukkusissat	151
Ilulissat	4,710
Oqaatsut	33
Qeqertaq	113
Saqqaq	151
Ilimanaq	52

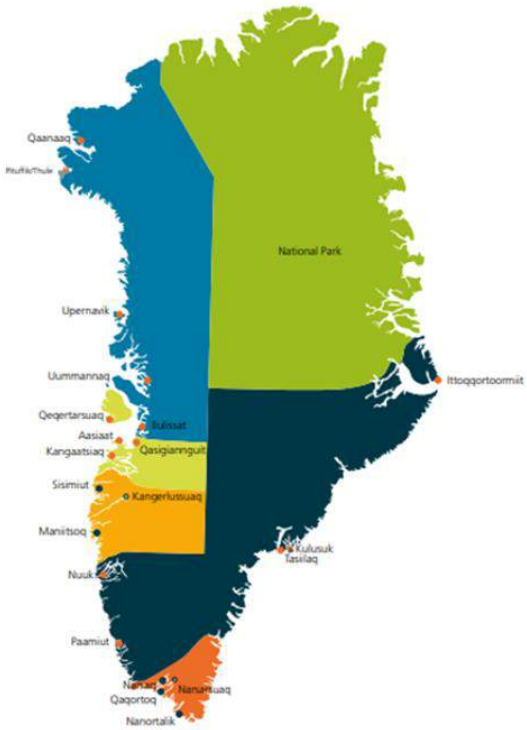

Figure 13. Number of inhabitants in town and settlements in Greenland. Figure to the right is showing Greenland divided into municipalities and National Park. Nuuk and fjord-system is in Southwest Greenland on Northern tip Sermersooq municipality (dark blue area). *Source: Greenland in figures 2021.*

2.2.2 Tourism Industry

Tourism has been a key justification for the demanding efforts to develop the aerodrome infrastructure in Greenland. In Nuuk, the capital of Greenland, and in Ilulissat, “capital of tourism”, airports are expanded to international airports, and a new domestic airport constructed in Qaqortoq in the south. When the work is finished by 2024-25, the passenger capacity are planned to be highly improved and a key justification for the effort is to attract more tourists.

With better access to Greenland, tourism industry could flourish, but is the full infrastructure ready for larger amount of tourist? Further development of the tourism industry could provide more jobs and income to create more sustainable socio-economic growth in the country. On the other hand, if the increased tourism is not managed well by investments in infrastructure, targeted to tourism or the development internally in Greenland is not fast enough, the income from tourism could go to foreign multinational companies that can develop destinations in Greenland with revenues taken out of the country.

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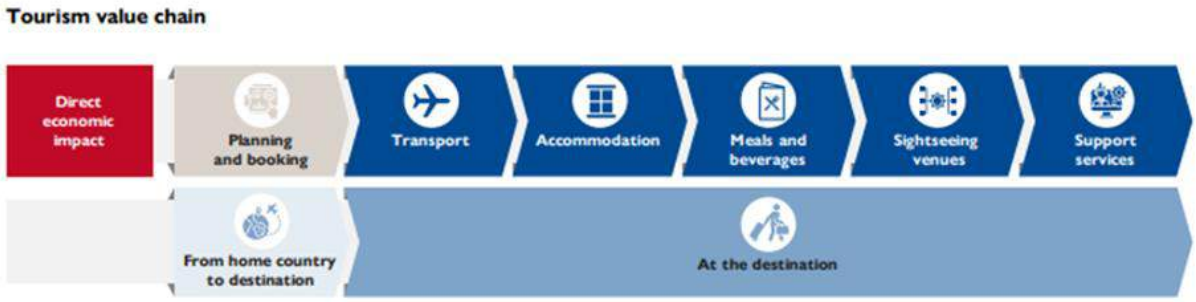

Figure 14. Simplified tourism value chain. The entire chain must be developed to get most of the tourism economically. *Source: GrønlandsBanken annual report 2021.*

Investment on entire tourism value chain (Figure 14) would ensure a stable flow of tourists and ensure a long-term economic viable tourism in Greenland. The investments should include structures that prevent erosion of lands and historical sites, that could sustain tourism for the future generations and important not to forget local infrastructure such as health care system, handling waste and transport etc. to benefit the Greenlandic society that is part of "Support services" in the tourism value chain.

The governmental transport commission stated back in 2011 that when a tourist spends 1 DKK in Greenland, then half or 0,50 DKK would be an income for the country.

Another important investment is the education of residents. The population of Greenland is around 56.500 with approximately 2.000 unemployed. The unemployed individuals are scattered along the coast in towns and settlements, which makes it difficult for cross-regional mobility of the workforce.

Before we look deeper into the tourism it is important to know about the cultural history of Greenland;

Several cultures that have lived in Greenland between 2500 BC until now. The known different cultures are: Saqqaq, Independence, Dorset and Norse cultures, all of them specialized in arctic climate environments. The cultures lived in different time periods spanning in time from 4500 - 500 years ago but with some overlaps where different cultures lived together in the country -see Figure 15 (Greenland National Museum & Archives: www.nka.gl)

Thule people, the ancestors for current living Greenlanders, were specialized in hunting sea mammals, migrated from Canada around year 1200. The last known migration from Canada took place in 1860. (Visit Greenland: Migration to Greenland - [Visit Greenland]). The Thule culture came to Greenland from around Qaanaaq area and traveled with umiaq (small boat), dog sledge and qajaq (kayak).

Danish colonization of Greenland began in the 18th century and became an integral part of Danish Realm in 1953. Greenland was granted self-government in 1979 and gained increased self-rule in November 2008. Denmark still have control over foreign affairs, security, and financial policy in

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consultation and on behalf of Greenland Self-Rule Government. Greenland is member of Overseas Countries and Territories Association of EU[4].

Upon arrival to Greenland the tourist will see crowded airports, busy fishing ports and modern buildings and international car brands, educational institutions, cafés in larger towns but the smaller towns have the primary source of income in settlements is still from fishing and hunting with was the "original" identity of Greenland (Visit Greenland).

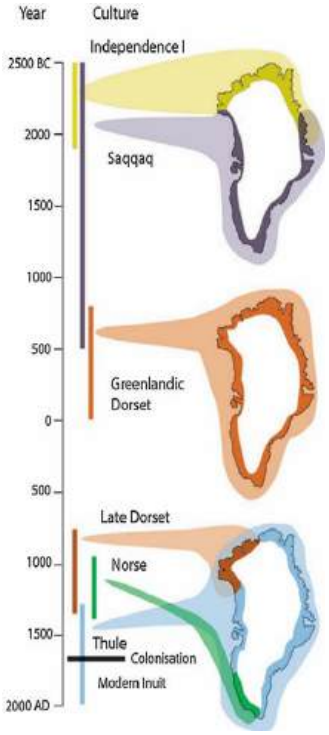

Figure 15. Map of Greenland showing different cultures who lived in Greenland with time scale. *Source: Madsen et al. 2020*

2.2.2.1 Income from tourism

Gross Domestic Product (GDP) are used for Greenland with indications of income from tourism are shown in the table below. It is evident that GDP has grown and that the Gross investment has been increasing even during the covid-19 pandemic.

[4] www.cia.gov/the-world-factbook/coutries/greenland

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Table 1. Trends in Gross Domestic Product (GDP) in Greenland between 2015-2020.

Trends in GDP	2015	2016	2017	2018	2019*	2020*
			Current prices			
GDP, million DKK	16,814	18,224	18,829	19,296	19,970	20,124
Per capita, 1,000 DKK	299	326	337	345	357	359
Annual growth in per cent	5.4	8.4	3.3	2.5	3.5	0.8
			2010-prices, chained values			
GDP, million DKK	14,312	14,983	14,990	15,084	15,426	15,481
Per capita, 1,000 DKK	254	268	268	270	276	276
Annual real growth in per cent	-2.5	4.7	0.1	0.6	2.3	0.4

Source: https://bank.stat.gl/NRE10 **Preliminary figures*

Note that figure from 2019 and 2020 are preliminary.
Source: Greenland statistics.

Table 2. showing Gross Domestic Product (GDP) on supply and demand in Greenland between 2015-2020

Supply and demand	2015	2016	2017	2018	2019*	2020*
			Current prices, mio. DKK			
Gross Domestic product	16,814	18,224	18,829	19,296	19,970	20,124
Imports of goods and services	7,654	8,214	8,193	8,745	10,225	9,828
Supply	24,468	26,438	27,022	28,042	30,195	29,951
Household consumption	6,677	6,828	6,928	6,944	6,983	7,150
Government consumption	7,432	7,717	7,986	8,325	8,755	8,991
Gross investment	4,040	4,464	4,447	4,195	6,253	6,493
Exports of goods and services	6,319	7,429	7,662	8,578	8,205	7,318
Final demand	24,468	26,438	27,022	27,934	30,053	29,951
			Period to period real growth in per cent			
Gross Domestic product	-2.5	4.7	0.1	0.6	2.3	0.4
Imports of goods and services	1.7	11.0	-3.5	2.4	14.5	-2.8
Supply	-1.1	6.7	-1.1	1.2	6.1	-0.7
Household consumption	0.2	1.5	0.9	1.5	-0.1	1.6
Government consumption	-0.6	1.8	1.7	3.0	4.4	-2.1
Gross investment	10.2	10.9	-4.1	-6.9	53.3	5.9
Exports of goods and services	-9.9	15.2	-3.8	3.6	-10.4	-6.2
Final demand	-1.1	6.7	-1.1	1.2	6.1	-0.7

Source: https://bank.stat.gl/NRE11 **Preliminary figures*

Note that figure from 2019 and 2020 are preliminary.
Source: Greenland in Figures 2022.

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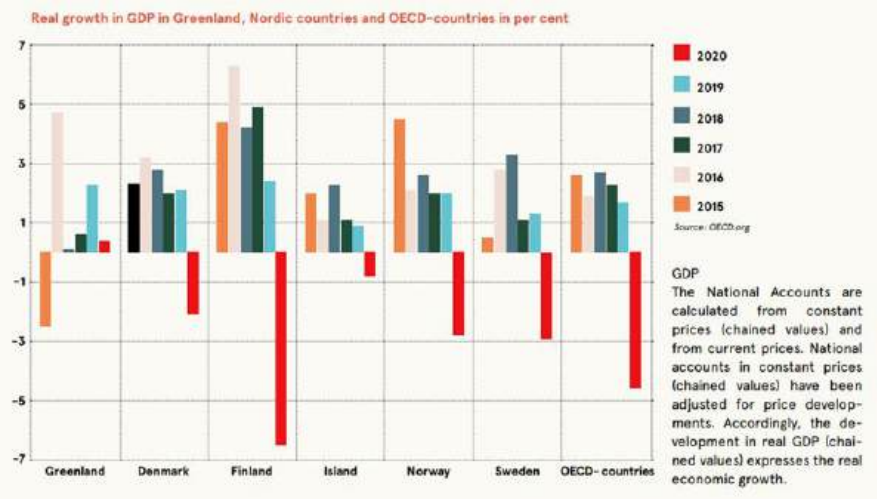

Figure 16. showing real growth in GDP in Greenland, Nordic countries, and OECD-countries in per cent between 2015 to 2020. *Source: Greenland in Figures 2022.*

If we compare the GDP growth in Greenland to Nordic and OECD-countries, Greenland has done better in year 2020 during the pandemic.

The government has invested more on protection of the environment but less on recreation, culture, and religion over the time. By finding a balance in investments on both on culture and protection of environment would benefit the tourism in the long term, where development on sites and cultural development are essential for tourism in Nuuk.

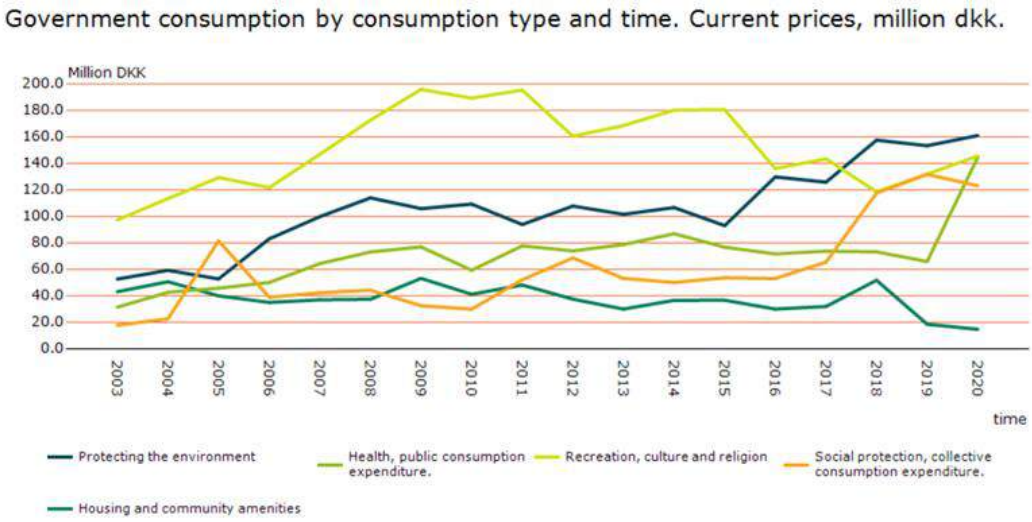

Figure 17. showing selected areas of consumption in Million DKK over time.

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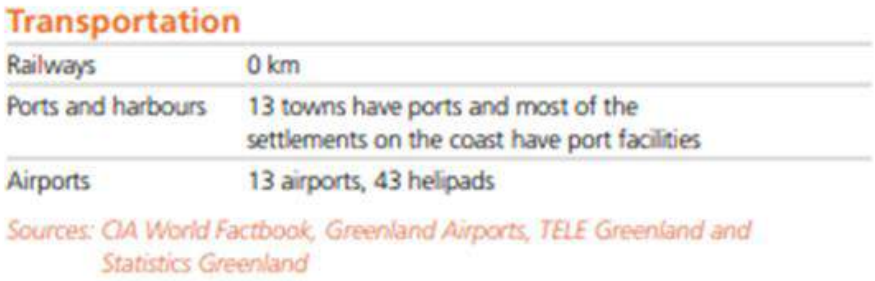
2.2.2.2 Passenger transport (air, railway, water, road)

Since Greenland is an island, with no international commercial sea routes except cruise ships, nor connecting roads or railways between towns and settlements, the tourists can choose between 6 international airports of various sizes as arrival destinations in different areas in Greenland from abroad: Kangerlussuaq, Nuuk, Ilulissat, Kulusuk, Nerlerit Inaat and Narsarsuaq. From these airports the passengers can be transported by airplanes, helicopters, and boats to other destinations in Greenland. Only Kangerlussuaq airport has the runway to support larger airplanes (>50 pax).



Transportation

Railways	0 km
Ports and harbours	13 towns have ports and most of the settlements on the coast have port facilities
Airports	13 airports, 43 helipads

Sources: CIA World Factbook, Greenland Airports, TELE Greenland and Statistics Greenland

Figure 18. showing means of transportation in numbers in Greenland. *Source: "Greenland in figures 2021", statistics Greenland.*

There are planned changes of airports facilities both for international and domestic flights within 5 years; The landing strips of Nuuk and Ilulissat will be expanded to increase the number of direct international flights and closing Kangerlussuaq for international civilian flights and reducing Narsarsuaq airport to a helipad. A new airport in Qaqortoq will be build get in use will serve as the new junction in South Greenland. Around ~85% of all passengers in South Greenland have a destination to Qaqortoq.

The aim of new structure in air traffic should make the more seat available and streamline to reach the destination easier for the international and domestic flights that could bring the cost of tickets down in the long run and bring more tourists to Greenland. Domestic tourism is not accounted for in this survey.

Passenger traffic by Air

	2015	2016	2017	2018	2019	2020*
Domestic traffic by plane	166,688	184,307	184,133	192,905	197,038	87,672
International traffic by plane	198,921	212,540	214,103	218,590	217,173	124,762
Helicopter traffic	41,239	41,239	27,064	32,040	28,790	20,189

** Preliminary figures*

Source: Greenland Airports

Figure 19. showing passenger traffic in total in Greenland between 2015 – 2020 (2020 preliminary numbers). *Source: "Greenland in figures 2021". Greenland Statistics.*

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International passenger number (shown in Figure 20.) indicate that the vast majority of arrivals is through Kangerlussuaq airport. Few fly directly to other destinations than Kangerlussuaq. This will change once the extension of the airports are done by 2024-2025.

Figure 20. showing number of international airplane passengers between 2008 – 2021 are shown below from following towns; Nuuk, Kangerlussuaq, Ilulissat, Kulusuk, Nerlerit Inaat. Note that the Government of Greenland introduced a travel ban limiting travel to and from Greenland on the 20th of March 2020 due to the covid-19 pandemic. This was partly lifted on the 15th of June 2020. The ban was fully lifted on the 21st of July. On December 30'th 2020 The Government of Greenland introduced a travel ban limiting travel to and from Greenland. *Source: Greenland statistics.*

The accommodation capacity in Kangerlussuaq is limited, so most of the passengers arriving to Kangerlussuaq have other final destinations along the coast. Few direct flights arrive to Nuuk today compared to flights to Kangerlussuaq. The flights to Kangerlussuaq have a far more capacity of passengers according to Table 3.

Table 3. Number of international flights in different airports in West Greenland:

Year	Place	Flights	Capacity	Passengers
2018	**Ilulissat**	179	6701	3176
	Kangerlussua	372	98587	73020
	Narsarsuaq	68	7157	4442
	Nuuk	261	9007	4418
2018 Total		**880**	**121452**	**85056**
2019	**Ilulissat**	150	5593	3186
	Kangerlussua	332	88827	72360
	Narsarsuaq	60	6622	4665
	Nuuk	252	8713	4766

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2019 Total		**794**	**109755**	**84977**
2020	**Ilulissat**	10	372	54
	Kangerlussuaq	193	53148	30125
	Narsarsuaq	8	523	202
	Nuuk	133	4882	1770
2020 Total		**344**	**58925**	**32151**
2021	**Ilulissat**	15	476	50
	Kangerlussuaq	240	63470	37606
	Narsarsuaq	33	1849	384
	Nuuk	127	4513	1684
2021 Total		**415**	**70308**	**39724**

Source: Greenland statistics (specialized table for this report).

The interest in cruise tourism in Arctic has been increasing over the years, until the covid-19 pandemic stopped the traffic in 2020. The cruise season in Greenland will reopen during the summer of 2022.

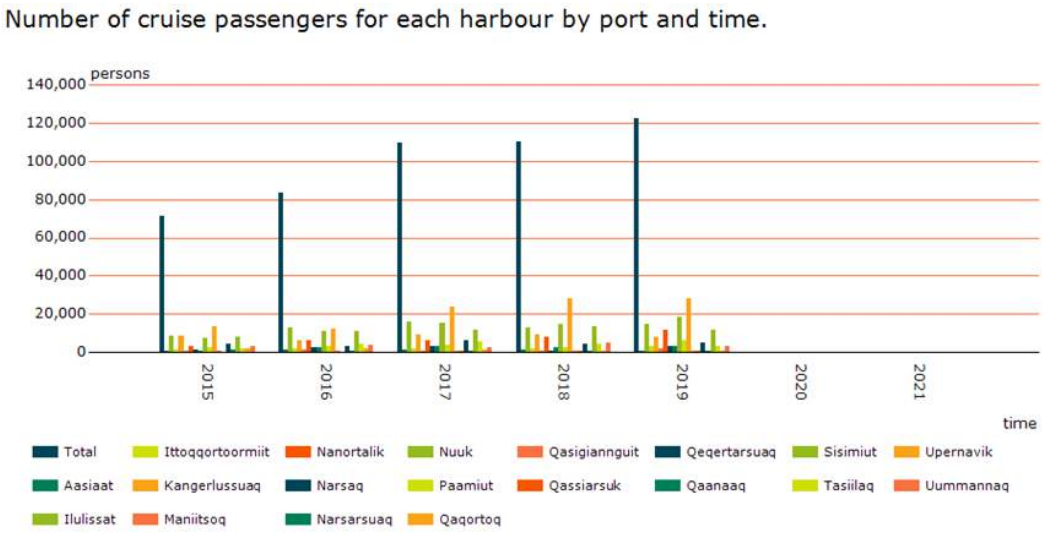

Figure 21. showing the base for the cruise statistics from the tax payment reports to the Tax Agency of Greenland. On the 1st of June 2015 charging passenger taxes was discontinued, however cruise ships continue to report number of passengers to the Tax Agency of Greenland. The number of unregistered passengers is estimated based on (i) harbor dues for nearest port calls for the same ship or; (ii) as 80% of vessel maximum number of passengers. Note that in 2020 and 2021 the calls in the ports of Greenland were all cancelled due to COVID-19. Source: Greenland Statistics.

The cruise ships visit different parts of Greenland; the figure above show which towns are visited the most. The main port of call is Qaqortoq in Southwest Greenland, likely due to its southern location nearest Iceland or USA. Nuuk receives second or third most arrivals of cruise ships in Greenland, being located along the coast north of Qaqortoq. The number of passengers has almost doubled nationally

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since 2015, while passenger arrivals in Nuuk has more than doubled between 2015 and 2019 due to a larger number of ships calling Nuuk and also vessels of larger passenger capacity. Cruise ship passengers are often of German and US origin.

Table 4. Cruise passengers by nationality in Greenland

Greenland	2015	2016	2017	2018	2019
Total	25049	24244	38182	45739	46633
Argentina	-	13	26	18	20
Australia	448	485	1230	3589	1756
Austria	448	256	586	467	671
Belgium	106	108	681	539	445
Brazil	13	8	30	35	50
Canada	1198	1043	2153	2209	2989
Chile	-	41	39	54	23
China	280	638	690	411	651
Croatia	-	-	8	10	11
Czechia	-	16	8	24	15
Denmark	577	357	540	505	738
Finland	11	64	63	65	36
France	736	574	1504	1907	2011
Germany	9822	7084	13418	14311	13658
Greece	-	1	6	5	14
Hong Kong	32	5	20	31	74
Hungary	2	-	13	15	22
India	18	10	10	30	9
Israel	32	7	16	58	66
Italy	70	86	82	119	366
Japan	66	97	58	23	81
Luxembourg	82	24	134	51	64
Mexico	13	5	20	69	100
Netherlands	174	122	422	660	707
Norway	167	121	194	230	234
Poland	13	39	47	53	36
Russia	49	157	46	71	145
Spain	38	40	68	101	165
Sweden	105	97	82	205	129
Switzerland	551	533	1080	1113	1241
Turkey	-	12	5	29	26
United Kingdom	1228	2051	3272	5094	3925
USA	2212	1309	9453	10939	13235
Other	283	406	641	1177	1205
Unregistered*	6275	8435	1537	1522	1715

**The number of unregistered passengers is estimated based on (i) harbor dues for nearest port calls for the same ship or; (ii) as 80% of vessel maximum number of passengers.*

The cruise ship business has apparently focused their seasonal timing. In 2015 and 2016, they arrived also in April, but have since been absent and arrive later in Spring with their main season in the Arctic

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summer of July, August, and September. This could be due to the main school holiday periods of Germany in these months (depending on region) or simply due to weather and ice conditions along the Greenland West coast.

2.2.2.3 Food and beverage-serving industry

Most of the food sold through the grocery sector is imported from Denmark. Sheep farms in Southwest Greenland and a few cattle farms produce not enough meat to supply the whole country's meat consumption. The traditional sea mammal hunting is restricted, but fishery of shrimp, Greenland halibut, and cod is the main income and export commodity of Greenland. The seal meat production is for private consumption, and little utilized commercially.

There are only few local breweries of beer, and one soft drink and beer factory has monopoly on the bottles sold within the country (except for Qaanaaq and East Greenlandic towns that can buy canned soft drink and beer). Up to 98% of the bottle are returned to the factory for refilling.

The figure below indicates that food industry revenue is highly variable while it is stable for beverage industry revenue, however dwarfed by the food sale. Apparently, the covid pandemic had a negative impact on the income for 2020, although data from 2019 and 2020 are preliminary figures.

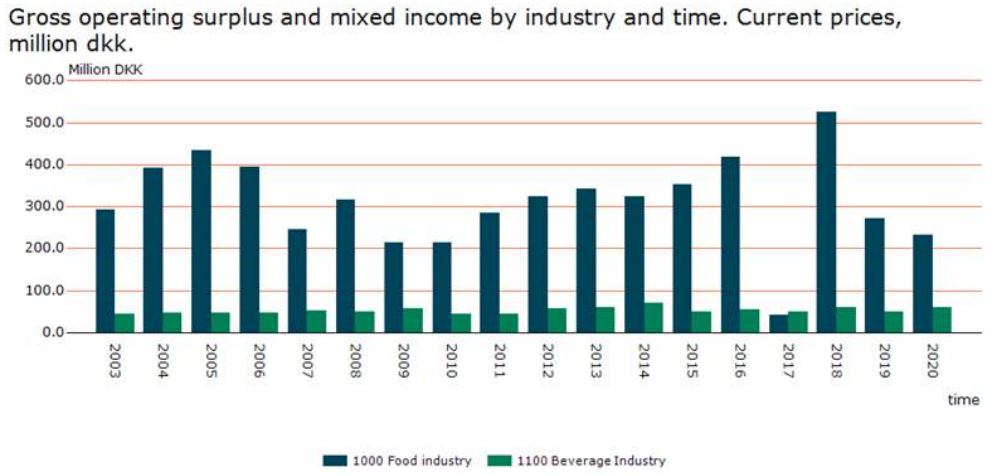

Figure 22. showing food and beverage industry incomes. Figures for 2003-2018 are final figures and 2019-2020 figures are preliminary figures. It is not possible to simply aggregated chained value by level, see publication for further details. *Source: Greenland Statistics.*

Other available data for Greenland on food and beverage-serving sector includes accommodation services (Table 5). It is apparent that the accommodation, food, and beverage-serving sector has increased turnover and in added value over time before the pandemic. Accommodation and food service activities have been increasing until 2019.

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Table 5. Turnover and added value in different among different industries in Greenland.

	Turnover					Value added				
	2015	2016	2017	2018	2019	2015	2016	2017	2018	2019
	DKK 1,000					DKK 1,000				
Fishing and other related industries	5,729,736	6,977,154	6,224,469	6,494,871	6,781,961	2,386,148	2,882,822	2,525,500	2,695,476	2,796,470
Mining	122,029	86,640	97,166	99,172	91,531	-243,846	-135,965	-98,222	-55,167	-85,186
Manufacturing	364,948	407,793	404,584	416,615	461,299	140,803	161,078	166,686	172,420	188,065
Construction	1,982,769	2,214,644	2,399,430	2,426,327	2,747,406	808,629	884,934	975,278	1,020,293	1,111,064
Wholesale and retail trade; repair of motor vehicles and motorcycles	5,934,433	6,290,202	6,365,904	6,475,615	6,666,066	1,080,841	1,205,839	1,237,068	1,236,012	1,243,748
Transportation and storage	2,137,238	2,282,779	2,469,311	2,672,727	2,617,665	1,072,534	1,152,573	1,194,697	1,332,636	1,363,158
Accommodation and food service activities	341,176	399,271	424,461	431,151	421,966	162,518	192,068	199,066	198,380	209,378
Information and communication	1,080,767	1,141,759	1,125,630	1,099,730	1,094,277	599,084	690,124	641,502	615,166	572,719
Financial and insurance activities	542,528	554,137	606,680	489,460	507,391	242,127	214,466	367,728	309,676	349,292
Real estate activities	418,194	428,508	460,059	448,897	477,424	311,369	325,926	331,687	340,202	363,102
Professional, scientific and technical activities	249,701	256,411	284,336	292,288	328,752	152,732	170,767	187,068	187,422	204,958
Administrative and support service activities	481,276	490,809	524,143	475,415	428,545	153,687	144,413	165,458	180,157	171,127

Source: https://bank.stat.gl/ESERESBAL, https://bank.stat.gl/ESENGL

Source: Greenland in figures 2021.

2.2.2.4 No. of people employed under tourism activities

The number of employees of the tourism sector is not recorded separately in the national statistics, but the table below includes tourism related sectors such as “hotels and restaurants”. The majority of employees of hotels and restaurants are Greenlanders (567), subsequently from Asia (122) and Denmark (102). For Asians in Greenland in general, most work within the sector, while the portion of Danes in the business is insignificant for the total Danish population.

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Table 6. Employment by nationality in different industry such as Hotel and restaurants.

Main employment by industry and nationality, 2019

	Total	Greenland	Denmark	Other Nordic countries	Europe	Africa	America	Asia
	Number of main employed persons in average per month							
Total	**26,991**	**23,730**	**2,726**	**92**	**66**	**7**	**21**	**348**
Fishing, hunting & agriculture	**4,402**	4,106	202	9	2	1	0	82
Mining and quarrying	**93**	60	29	2	2	0	0	0
Manufacturing	**229**	199	28	1	0	0	0	1
Electricity and water supply	**451**	383	65	1	2	0	0	0
Construction	**2,025**	1,692	302	11	13	0	1	5
Wholesale	**3,078**	2,760	240	5	4	2	2	66
Hotels and restaurants	**800**	567	102	2	5	1	1	122
Transportation	**2,079**	1,809	228	25	3	2	1	11
Business activities	**1,938**	1,481	393	12	11	0	3	36
Public administration and service	**11,238**	10,121	1,044	22	23	2	8	16
Other industries	**389**	337	44	0	0	0	3	5
Activity not stated	**272**	215	49	3	0	0	2	3

Source: https://bank.stat.gl/AREBFB7

Source: Greenland in figures (2021).

2.2.2.5 Educational level

Three different educations within tourism are available on vocational level in South Greenland. Any resident in Greenland living in Greenland the past 5 years can obtain universal free education with a monthly stipend.

Recipients of social benefits

	2016	2017	2018	2019	2020
Recipients of public benefits	6,063	5,787	5,086	4,760	4,702
Recipients of unemployment and maternity benefits	2,916	2,944	2,566	2,333	2,111
Recipients of age pension	3,999	3,789	3,770	3,820	3,943
Recipients of early retirement pension	2,248	2,280	2,385	2,390	2,407
Recipients of housing subsidies	4,418	4,113	3,940	3,820	3,720
Recipients of child benefits	3,573	3,488	3,880	3,679	3,591

Sources: https://bank.stat.gl/SOE004, https://bank.stat.gl/SOE006, https://bank.stat.gl/SOEAPE1, https://bank.stat.gl/SOEFPE1, https://bank.stat.gl/SOEBS01 and https://bank.stat.gl/SOEBT01

Figure 23. Unemployment and other recipients of social benefits. Source: Greenland in figures 2022.

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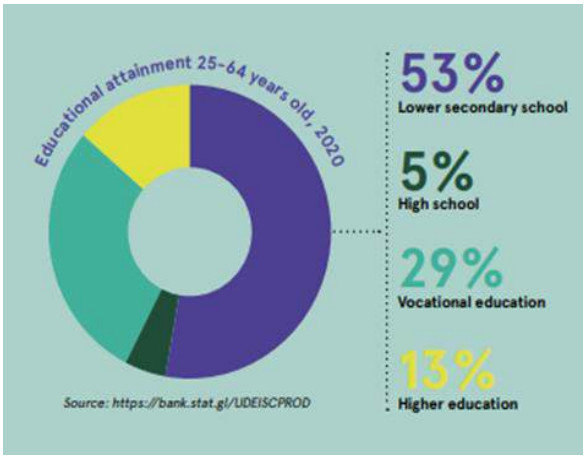

Figure 24. Educational level of Greenlandic population. Source: Greenland in figures 2022.

Three different educations within tourism are available on vocational level in South Greenland. Any resident in Greenland living in Greenland the past 5 years can obtain universal free education with a monthly stipend.

The rate of Greenlanders between the age of 25-64 attaining an education is low compared to Nordic countries.

Education and reschooling of population could be needed to be able to meet the expected higher activities in tourism by 2025 when the construction of larger airport capacity completed. Few years ago, authorities expressed a need of at least 400 certified guides along the coast. For 2022, 298 certifications have been issues for the vocational guide education in Greenland in Campus Kujalleq. Some guides get an education within tourism or hospitality abroad and others work without a formal education or have another education than within tourism or hospitality. Different courses such as trophy hunting and guiding and so on are conducted depending on the needs in different towns to train guides over the years. The educations were designed to fulfill the Greenlandic needs with collaborations with local tourism actors. The tourism educations should ensure the Greenlandic need of local guides in the long term and sustainable tourism (Nielsen & Oldenburg, 2021). For many years, foreign guides were imported to cover the seasonal needs, but there is a general increase in local employments with more trained guides and many get all-year jobs (personal observation).

Since the jobs in tourism are mostly seasonal in Greenland, not everyone who completed an education within tourism will work as a guide and prioritize a year-round job. Many have taken an education within mining, but with low mining activities in Greenland recently, these persons could potentially be reschooled to maintain the services related to tourism e.g. boat driving.

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Educations attained within tourism in Greenland by 2022

- 79 persons have completed an Academy Profession Programme in Hospitality and Tourism Management since 2009
- 121 have completed Arctic Guide education since 2013
- 98 have completed Adventure Guide education since 2016

Figure 25. Number of students that have completed an education within tourism in Greenland. Note that the numbers represent education completed not number of persons. One person can get all of the educations and count as three persons. *Source: Nielsen & Oldenburg, 2021.*

For tourism, the businesses in focus are "Accommodation and food services activities" and "Culture, recreational and support services". The number of companies in accommodation and food services has been stable over time, while the number of companies within culture and recreation increased until the pandemic and then decreased heavily, likely due to reduced activities in the tourism sector.

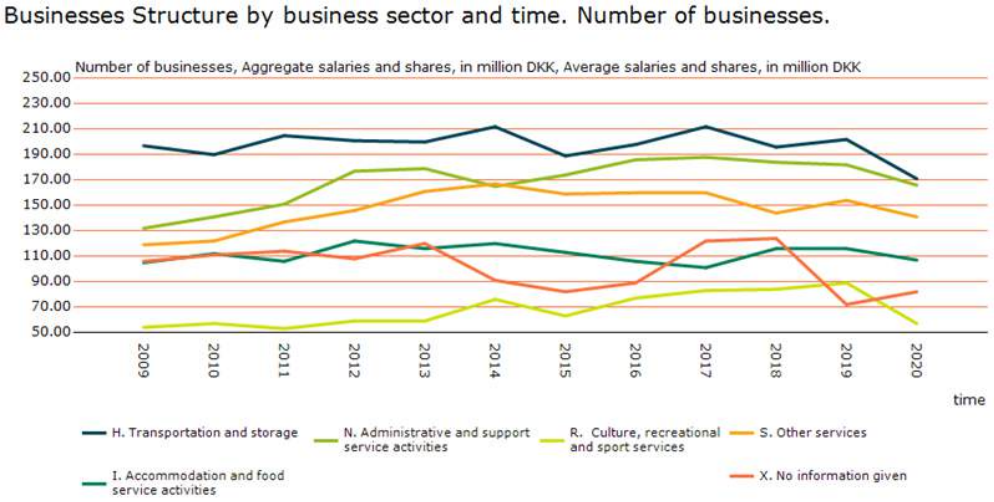

Figure 26. Number of businesses in Greenland over time. *Source: Greenland statistics*

The employment in of the permanent residents in accommodation and food service activities has been increasing from 2017 until pandemic minimized the tourism in Greenland (see Figure 27). Note that the second and third quarter are the summer season, hence more employments for the residents especially on the third quarter.

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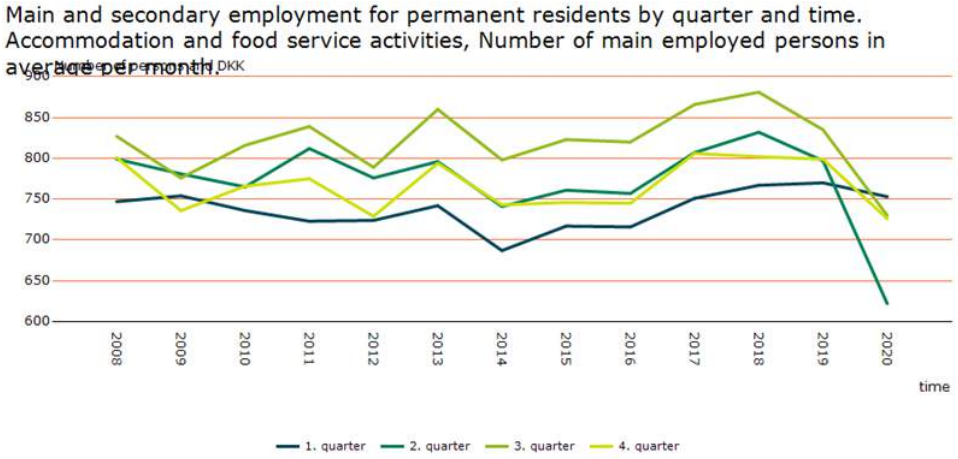

Figure 27. Main employment within accommodation and food service activities for permanent residents over time. Due to incomplete data public employment is slightly underestimated before 2015. It is considered that public employment has remained unchanged from 2014 to 2015. *Source* *www.bank.stat.gl*

The graph of quarterly numbers of main and secondary employments within accommodation and food services shows that the highest rate of employment is in the second half of the year, not completely mirrored with the high season of tourism in 2nd and 3rd quarter. However, the increase of employment in 2nd quarter until 2019 and then a steep decline could indicate a dependency on tourism activities.

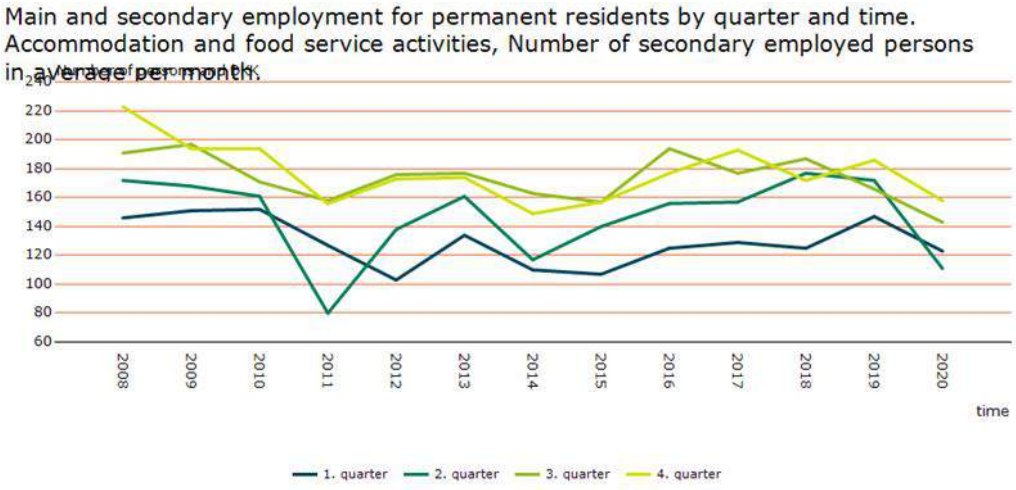

Figure 28. showing secondary employment within accommodation and food service industries for permanent residents over time. *Source Greenland statistics (www.bank.stat.gl)*

2.2.2.6 Tourism income and other country/Arctichub specific tourism characteristics

The revenue from tourism has increased following the tourism activities, until the covid-19 stopped most of the international visits to Greenland. Local customers used the opportunities of government-supported "staycation" during the pandemic, securing an income to many tourism companies. To support companies losing revenue during the pandemic, the parliament approved a fiscal stimulus package with direct subsidies and loans. According to the first quarterly statistics, the hotel overnight stays in Nuuk and Nuuk region increased 11.7% from 2019 to 2022 across the meagre years of 2020

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and 2021. (Anon.: Naalakkersuisut. Grønlands nationale turismestategi 2021-2023) Apparently, the prediction of increased tourism is thus true.

The fjord region is highly used by the inhabitants of Nuuk and Kapisillit for cabins, boat sailing, trekking, as well as recreational and commercial hunting and fishing. To accommodate both the local use and the tourists from abroad, the authorities need to consider the options for managing the different types and magnitude of tourism activities in the context of seasonality and local use for a sustainable co-existence.

Kommuneqarfik Sermersooq has ambitions to become a pioneer within development of sustainable management of resources in Greenland. As an example, the municipality has banned hunting of humpback whale in Nuuk Fjord in favor for tourism and recreational sightings, but against the request of local hunters, who must travel further for their catch wasting time and fuel.

2.2.3 Conflicts/ issues

Often the sectors can co-exist with non-conflictual activities. However, conflicts between tourism and other sectors also exist in Greenland, primarily within use of land and marine spaces and resources. This could be the mentioned ban on humpback hunting or hiking groups crossing local caribou hunting paths or areas.

Such conflicts should be managed so all stakeholders are heard and understood during the public hearing and consultation period in which the public has an official chance to react. In the case of the humpback hunting ban, the hunters felt excluded, and their voice not heard by the authorities, documented through local media (Sermitsiaq, 24/6-2021). Consequently, an opposition from the hunting sector against tourism could be the result including a possible future unwillingness to participate in new agreements. With the incrementing tourism more issues and conflicts will arise across other economic sectors using the same areas as tourists e.g., hunting, fishing, and mining. Such conflicts will need an open dialogue.

As the tourism business grow the coming years, and the new airports are finished, it is likely that multinational tourism businesses with larger investment capacities will push a new development. This could include additional foreign workers in the sector and transactions of taxes and economy across national borders causing possible disputes and media scandals of foreign economic exploitation of Greenland. Investments from within Greenland are essential in order to avoid the issue.

Foreign tourism business activities can also cause geo-political issues. To the World's superpowers, Greenland and the Arctic are viewed as the new frontier to exploit natural resources and secure a global strategic positioning. This is particularly true to the restarted strategic competition between the US, China, and Russia, where Greenland is located centrally between the Western Russia and Eastern USA when viewed from the North Pole. The new interest from the US, such as former President Donald Trump's offer to buy Greenland in August 2019, which became famous in the medias, sparked a significant increase in visits from the US, and eventually the interest from the US is still apparent for the 2022 tourist season.

Also, China is interested in the Arctic with emerging activities in Greenland within the mining sector, causing concerns and objections from the US and Danish governments. The previous active promotions around 2014-2018 of resources and services between Greenland, China, and Denmark have now somewhat diminished considering new tensions between superpowers. The numbers of Chinese

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tourists fluctuate (see data for flight and cruise passengers) over the years but saw a decrease in 2018. That could be a result of the changed relations – or just a cancelled cruise season.

Supplies to Greenland goes through imports of most of the commodities and the living costs are comparably high. Many adventure tourists bring everything that they need to Greenland and leave again without many purchases in Greenland stores. Souvenirs are expensive compared to other countries' merchandise and cruise ship tourists are not purchasing much locally. This makes it difficult for the businesses to gain a large turnover and thus for the government to receive extra taxes if not lay taxes on mooring spaces.

2.3 Iceland

2.3.1 Tourism industry

Over the course of the past decades, tourism has grown rapidly in Iceland from around 4,000 foreign visitors in 1950 up to nearly 2.4 million in 2018, which is sevenfold the country's population the same year. The number of international visitors dropped somewhat in 2019, and then collapsed in 2020 due to the COVID-19 pandemic. In 2021 the number rose to nearly 700 thousand (ITB, 2022). There are many indications that tourism will grow rapidly again in a post COVID era. Likewise, natural destinations like Iceland will be highly sought after following a long period of restraint. Tourism has also been a critical counteraction against the persistent migration of people in rural areas to the capital area and has thus been seen as an effective catalyst for rural development.

Throughout the centuries, the main occupation in the Westfjords region has been agriculture and fisheries, both which have been gradually declining during the past decades. Last decade aquaculture and tourism have been seen as positive aids in the region's rural development, aquaculture now being the major industry in many of the small settlements. Most of the aquaculture companies operate in open sea cages in the fjords, that provide good shelter for the cages. Before the COVID-19 pandemic 10.7% of all foreign visitors to Iceland visited Westfjords (ITB, 2020). Nature based tourism is by far the region's largest type of tourism, such as hiking, biking, horse-back riding, bird watching, and simply driving for the scenery. Past few years all kinds of adventure and sport tourism, as well as marathon tourism, has been rapidly growing, such as see angling, kayaking, climbing, mountaineering, mountain biking, cross country skiing, and all kinds of nature racing. Cruise tourism was on the other hand the type of tourism that grew the fasted the years before the COVID. In 2019 there were 126 cruises that came to Ísafjörður, compared to 61 in 2015, and 26 that came to Patreksfjörður, compared to 1 in 2015 (ITB 2022).

2.4 Norway

2.4.1 Tourism industry

The economic contribution from the tourism industry in Norway was 194 330 million NOK in 2019. The share from the tourism industry on GDP on mainland Norway corresponds to 4.2 %. Out of this non-residents' share of total tourism consumption make up 30.6 %. (Statistisk sentralbyrå 2022a)

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Table 7. Tourism satellite accounts in Norway. *(Statistisk sentralbyrå 2022a)*

Tourism satellite accounts

	2018	2019
Total tourism consumption in Norway. NOK million	186 288	194 330
Non-residents' share of total tourism consumption in Norway. Per cent	29.7	30.6
Annual volume change in total tourism consumption. Per cent	3.8	0.8
Resident households' tourism consumption in Norway as share of households' final consumption expenditure. Per cent	7.3	7.2
Value added in the tourism industries as share of GDP Mainland Norway. Per cent	4.1	4.2
Annual volume change in value added in the tourism industries.Per cent	1.5	-0.2
Employment in the tourism industries' share of total employment in Mainland Norway. Man year, full time equivalents, employees and self-employed. Per cent	7.4	7.4

2.5 Finland

2.5.1 Brief description

Finland, country located in northern Europe (Figure 29). Finland is one of the world's most northern and geographically remote countries and is subject to a severe climate. Nearly two-thirds of Finland is blanketed by thick woodlands, making it the most densely forested country in Europe. Finland also forms a symbolic northern border between western and eastern Europe: dense wilderness and Russia to the east, the Gulf of Bothnia, Norway to the north and Sweden to the west. (Weibull et all, 2022.) Finland has the world's biggest archipelago, as well as Europe's largest lake district and last untamed wilderness, Lapland. (Visit Finland, 2022)

Finland is a wealthy Nordic country with a gross domestic product per capita of EUR 42,300. Finland has an even distribution of income much like the other Nordic countries. Finland is a world leader in technology, and tops global rankings in environmental protection, social security, and education. The service industry is the largest employer by a clear margin. The Economist ranks Finland among the ten best business environments in the world. Finland is a leading country in shipbuilding and the manufacturing of large diesel engines, lifts and paper machines. New businesses are being created in the game industry, electronics and software production as well as in cleantech. (UM FINFO, 2019, p. 24)

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Figure 29. Location of Finland. *Source: Encyclopædia Britannica, Inc.*

2.5.1.1 Population dynamics

The first reliable population data is from 1749, when the compilation of population statistics began in what was then Sweden (Figure 27). At that time, the population of Finland was 410,400 people. Finland's population has grown steadily every year since the middle of the 18th century. Only a few exceptional years have caused the population to decrease. The biggest population loss was suffered in the year of hunger in 1868, when the population decreased by more than 96,000 people. The population increased the most in 1946, when the increase was more than 54,000 people. The last years of population loss were 1969 and 1970. At that time, the reason was the mass migration of Finns to Sweden. (Tilastokeskus, 2022.)

Currently, population growth is slowing down and without international migration, Finland would be approaching 0 population growth. When the birth rate does not seem to rise - and there would be no acute benefit from it now - then the future population development depends on the number of immigrants. In recent years, population growth has recovered to around half a percent. According to the latest population forecasts, the natural population increase, i.e. the difference between the number of births and deaths, would turn negative at the end of the 2020s or the beginning of the 2030s. Without immigration, the population of our country would probably decline at that time. (Tilastokeskus, 2022.)

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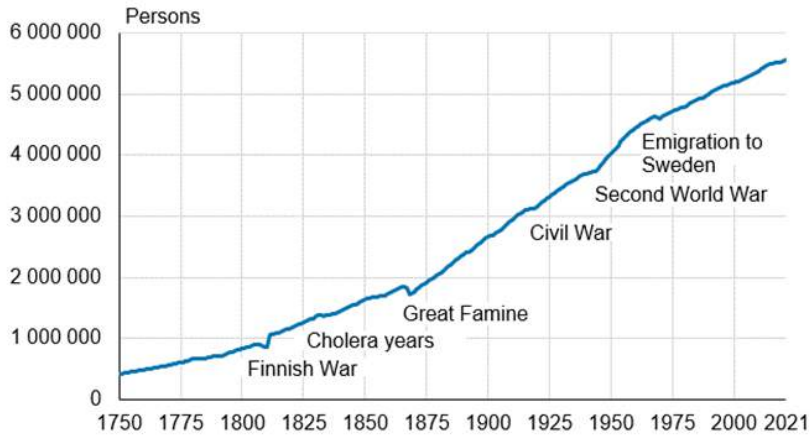

Figure 30. Development of population in Finland. *Source: Statistics Finland, population structure, 2022.*

The most significant change in the demographic structure in Finland and throughout Europe is the aging of the population structure (Figure 31). The share of pensioners in the population is growing strongly at the same time as the working-age population is decreasing. The shares of children and young people are also decreasing, and no significant change in the birth rate is expected in the future either. (Kuntaliitto, 2019.)

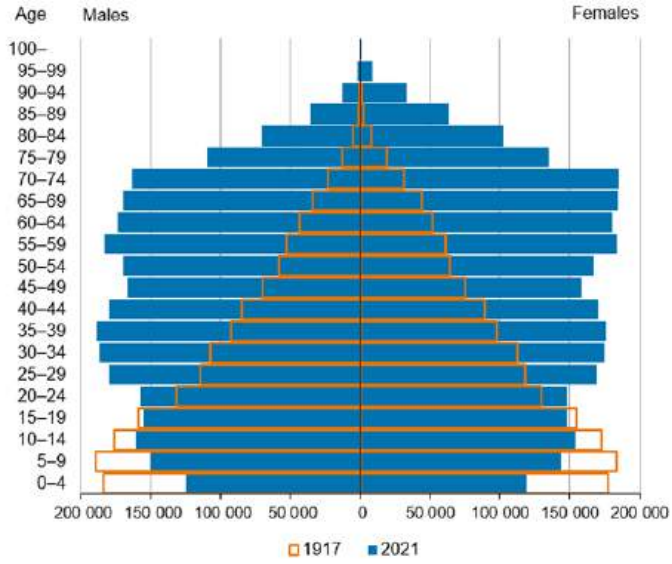

Figure 31. Age structure of population on 31 December 2021. *Source: Statistics Finland, population structure, 2022.*

Demographic dependency ratio presents the municipal demographic dependency ratio (Figure 32). Challenges, like shifts in citizen age distributions, emigration and economic fluctuations cause pressure on local level planning. Growing old-age dependency rates need to be addressed via sufficient health care solutions, while maintaining adequate infrastructure and investments for all other age groups. Good health and well-being needs to be ensured for everyone. The data presents the amount of inhabitants under 15 and over 64 in relation to a hundred 15-64 aged inhabitants per municipality. The

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lower the value, the lower the dependency ratio, that is pressure on the working age inhabitants. (Mayorsindicators, 2022.) In the north, there are differences between the provinces. The dependency ratio increases the fastest outside the population center in the small villages.

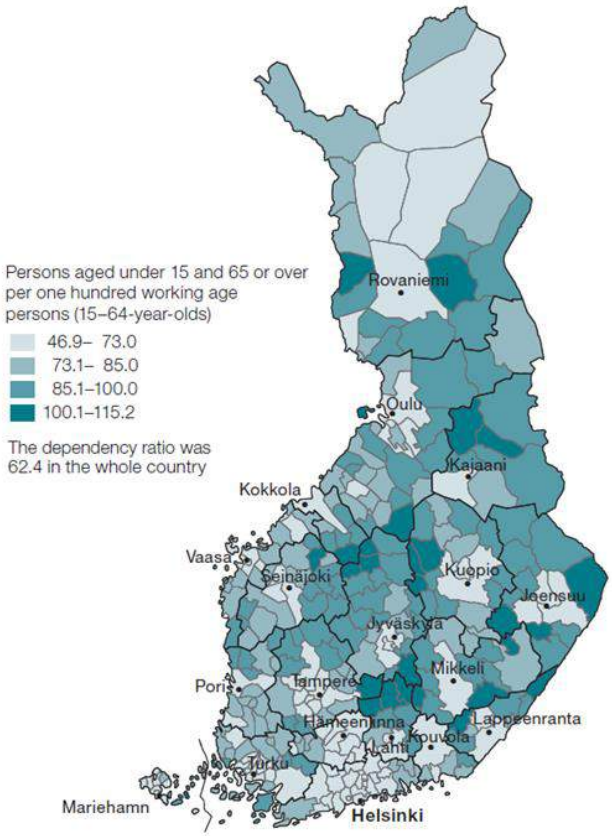

Figure 32. Demographic dependency ratio by municipality, 2021. *Source: Statistics Finland, population structure, 2022.*

2.5.2 Tourism industry

Importance of tourism for Finnish economy has become more important for the Finnish economy in recent years, before the pandemic. In 2017–2019, foreign tourism demand increased at an annual rate of about 8 per cent. The outbreak of the coronavirus pandemic in March 2020 and the resulting restrictions had a significant impact on tourism. Before the pandemic, the GDP share of tourism remained at 2.7% but, according to the preliminary data for 2020, it decreased by a whole percentage point to 1.7%. (TEM). Total revenue generated by tourism amounted to EUR 16,3 billion in 2019. Foreign tourists spent about EUR 5,3 billion in Finland, and domestic tourists 11 billion. In 2020, total tourism demand was EUR 9.7 billion, down by EUR 6.6 billion (41%) from 2019. Inbound tourism demand decreased by EUR 3.8 billion (71%) and domestic tourism demand by EUR 2.8 billion (26%). In 2019, more than half of tourists' consumption in Finland, about EUR 8 billion, went to Uusimaa and almost EUR 1.1 billion to Lapland. Regionally, in addition to Uusimaa, tourism demand was particularly concentrated in Lapland (7 %). Lapland and South Karelia were the only provinces where more than half (54 %) of the tourism demand was foreign. A total of 154 000 people worked in industries linked

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to tourism in 2019, which is 5.8 per cent of all employed people in Finland. The number of employed people increased by 2,500 (4.5%) in 2017 –2019. Tourism has also significant multiplier effects on other sectors, such as construction, transport, and commerce. In addition, the use of temporary agency labour is common. (TEM)

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4.Tourism Hubs

4.1 Suðuroy

4.1.1 Tourism industry

4.1.1.1 Accommodation for visitors (overnight stays, hotels and other accommodation)

As the number of tourists coming to the Faroe Islands has been growing, Suðuroy is also receiving more visitors. In 2022, 9 cruise ships are expected in Tvøroyri, the largest town in Suðuroy. However, a very large majority of the overnight stays are located in the main region in the area around the capital Tórshavn, 90% in 2021 (Table 8). Unfortunately, official statistics show only the two categories of "Capital area" and "Outside capital area" for overnight stays, and the figures for Suðuroy are thus included in the "Outside capital area" category, but it is difficult to say how large the Suðuroy proportion is. Also, the figures are slightly misleading as Airbnb is not included in the statistics

Table 8. Overnight stays in Faroe Islands.

		2013	2014	2015	2016	2017	2018	2019	2020	2021
		Total(year)	Total(year)	Total(year)	Total(year)	Total(year)	Total(year)	Total(year)	Total(year)	Total(year)
Overnight stay	Capital area	71,960	77,090	84,395	88,063	101,207	107,500	126,044	82,139	157,293
	Outside capital area	28,213	28,378	34,490	40,668	43,419	45,613	40,408	12,801	16,620
Number of sold rooms	Capital area	50,060	54,105	56,779	59,343	67,138	72,284	82,381	54,253	101,257
	Outside capital area	16,448	18,493	20,127	24,654	26,030	28,563	22,935	8,828	10,749
Check-ins	Capital area	30,743	28,588	31,337	34,700	40,172	43,300	50,764	35,041	63,765
	Outside capital area	17,106	14,011	19,574	20,480	22,659	20,894	21,189	5,995	8,450
Leisure	Capital area	16,681	13,437	16,370	21,790	26,835	21,725	25,844	19,258	44,515
	Outside capital area	11,141	9,789	15,169	16,265	18,586	16,038	15,981	3,820	5,522
Business	Capital area	14,062	15,151	14,967	12,910	13,337	21,575	24,920	15,783	19,250
	Outside capital area	5,965	4,222	4,405	4,215	4,073	4,856	5,208	2,175	2,928

Source: Statistics Faroe Islands

A significant part of the overnight stays at hotels and guesthouses are Faroese residents. During Covid19 this trend clearly increased as there was a boom in domestic tourism in this period. This is reported to be very clear in Suðuroy, where the number of overnight stays was higher than ever before in 2020. The tourists coming to the Faroe Islands are mainly residents of the other Nordic

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countries, especially from Denmark, but the number of visitors from other regions was increasing (Figure 33).

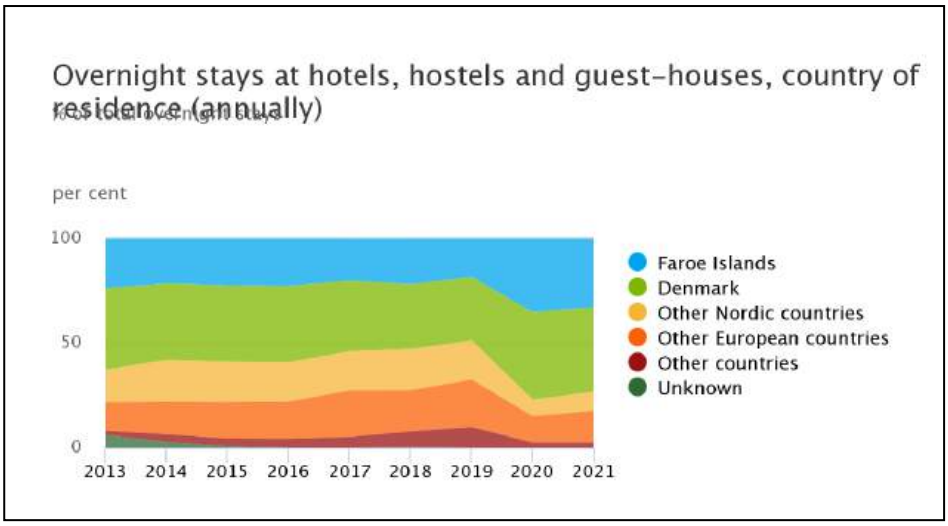

Figure 33. Overnight stays in the Faroes by country of residence. *Source: Statistics Faroe Islands*

4.1.1.2 Number of people employed under tourism activities

It is difficult to say how many people are directly employed in the tourism sector as the official national statistics do not have tourism as a separate category when it comes to employment, but the number of hotels, and lodging places as well as places serving food and beverages has increased in recent years. This trend is most clear in the capital area, but it is also discernible in Suðuroy (Figure 34). In a report made by Deloitte, it was estimated that on a national level there were 715 jobs in tourism in 2019.

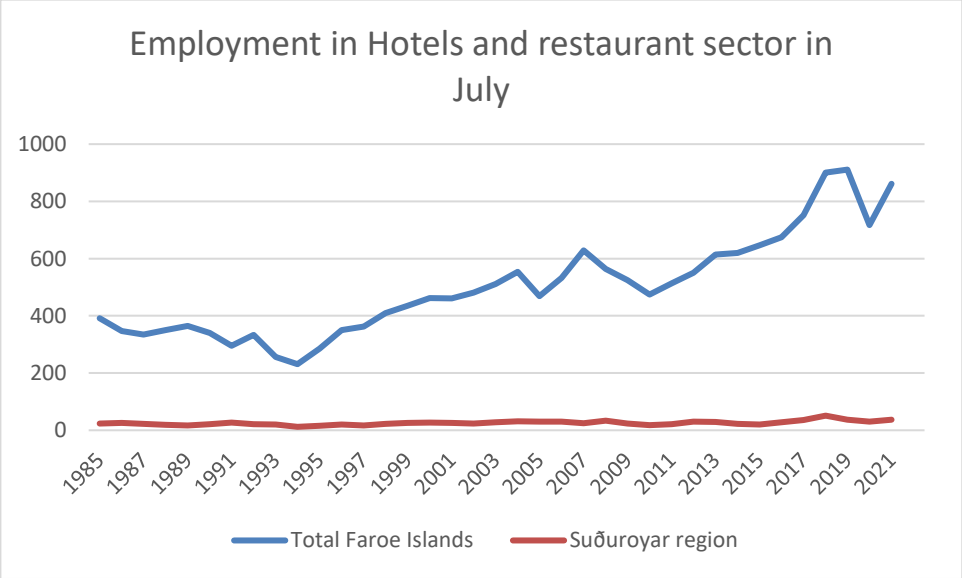

Figure 34. Employment in hotel and restaurant sector in the Faroes and Suðuroy. *Source: Statistics Faroe Islands.*

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4.1.2 Conflicts/issues

As the number of tourists arriving to the Faroes is increasing every year, and is prospected to continue to increase, all regions of the country are receiving more visitors. This growth trend is a result of a conscious political and marketing strategy, but it also means that conflicts are arising. Firstly, not all residents agree with the strategy to increase tourism. Secondly, especially in the peripheral areas, and the smaller settlements, there is discontent with the fact that although these areas are often major tourist attractions, they benefit little economically from tourism. Thirdly, tourism is conflicting with other landuse practices.

One area where tourism is creating problems is the local housing market. As the demand for tourist lodging is growing, many local people choose to rent their apartments, or holiday homes periodically to tourists rather than permanently for people to live in. This trend allows local people to supplement their household economy with the rents from Airbnb and similar, but it also adds to the pressure of the housing market, pushing living costs for local people.

While the official strategy to increase tourism has been successful, it is now clear that the strategy to ignore local people's perceptions and opinions is now having unforeseen consequences. After a few years with sometimes chaotic circumstances in places and settlements that are very popular tourist attractions, many of these sites have now enforced access restrictions, and set up various more and less regulated payment systems. The restrictions come as local reactions to increasing tourism, but the outcome and success of these measures is not yet clear.

One issue which remains unresolved, and which is also an issue in Suðuroy, is the access to the outfields. Most tourists coming to the Faroes are coming to experience the Faroese nature, but landowners are increasingly frustrated with the increasing activities of nature tourism in the outfields that are traditionally used for sheep pastures. This conflict between landowners, the tourism industry, and concerned citizens, who have organized around the issue of freedom-to-roam for Faroese people, remains unresolved.

4.2 Nuup Kangerlua

Nuup Kangerlua is situated in a low arctic climate where the summer months temperatures reach 7 degrees Celsius in average temperature in July and -8,3 in average temperature in the coldest month of February (Klimanormaler Grønland (dmi.dk)).

The arctic vegetation of low bushes and few grass species that can withstand harsh winter and high windspeed on ground that grow between bedrock and glacial deposits dominates the landscape. The landscape is formed by abrading glaciers that formed rolling hills along the coast but high rugged mountains in Nuuk fjord can reach 1220m above sea level.

The land fauna around Nuuk consists of arctic species: Caribou, Arctic hare, Arctic fox, ptarmigan, white-tailed eagle, migratory birds and sea birds. Some specific places can have muskox population that is not subjected of hunting. The sea mammals in the fjord are: Different species of migratory whales. Different species of seals. Fish species that can be related to tourists: Cod, redfish, seasonally migratory fish: arctic char and salmon.

There is a demand from adventure tourism that can be met by Nuuk and Nuuk fjord.

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Nuuk is the largest town and capital of Greenland, which has all the comforts of a town and better infrastructure in terms of housing, service etc. compared to other towns in Greenland. Nuuk has along with other towns and settlement in Greenland, easy access to pristine nature for convenience for citizens and the tourists.

Nuup Kangerlua (Nuuk Fjord) is situated in Sermersooq Municipality, which is the largest municipality by area in the World. The Nuup Kangerlua hub includes Nuuk and the settlement Kapisillit.

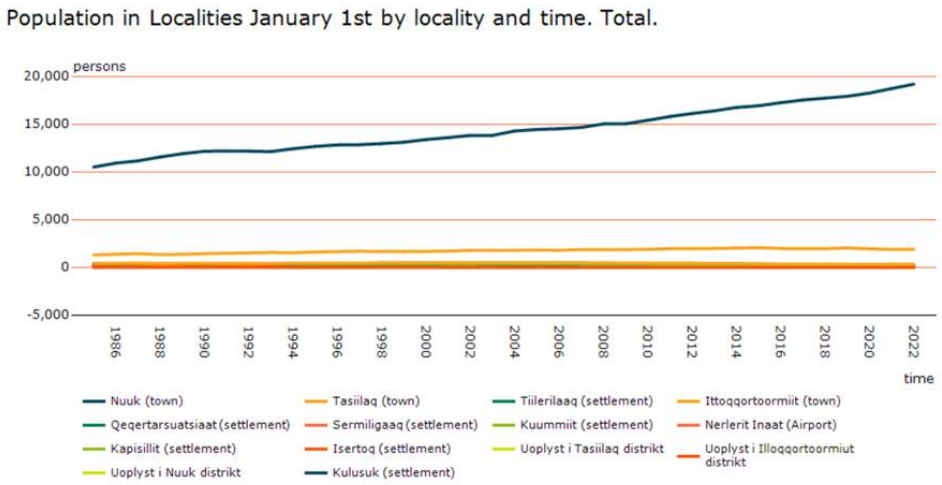

Figure 35. Trend of inhabitants in town of Sermersooq Municipality. *Source: Greenland statistics.*

The population of Nuuk town has increased steadily since the 1980's, while the number of inhabitants in other towns are stable or declining. Some local politicians in Nuuk have the ambition for the population to reach 30.000 by 2030 – being more than half of the Greenlandic population.

Data of the income from tourism in the municipality or any comparable numbers does not exist.

Tourists arrive to Nuuk on smaller airplanes of 30-40 passengers from Iceland or from Denmark via the larger airport Kangerlussuaq. The runway and airport facilities are under development until 2024 with the goal to attract larger airplane capacity for ease of access and being a junction for international and domestic flights.

Nuuk must brand itself differently than other towns in Greenland and find its own niche.

In addition, the Nuuk harbor has been expanded including better facilities to cruise ships since August 2017. Generally, the cruise tourism has increased within the Arctic due to climate changes i.e., thinner sea ice, making Arctic more accessible for a longer cruise season - that is until the covid-19 pandemic prohibited cruise traffic to the Arctic due to lack of heath care system that could handle covid-19 outbreak within cruise ships and the local population. Year 2022 will be the first cruise season after the covid-19 pandemic.

4.2.2 Tourism industry

4.2.2.1 Accommodation for visitors (overnight stays, hotels and other accommodation)

Accommodation capacity in Nuuk has increased (Table 9) since the beginning of registration of the overnight stay data and is likely to increase in future (Eskildsen, 2021). Between 2015 and 2019, the

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overnight stays from foreigners have increased by 34% (Anon., Grønlands Nationale Turismestrategi 2021-2023).

Overnight stays in Greenland between 1994 to 2020 have increased to 220,000 but ware reduced with 50.000 by 2020 due to the pandemic. However, local “stay-cation” tourism increased in 2021.

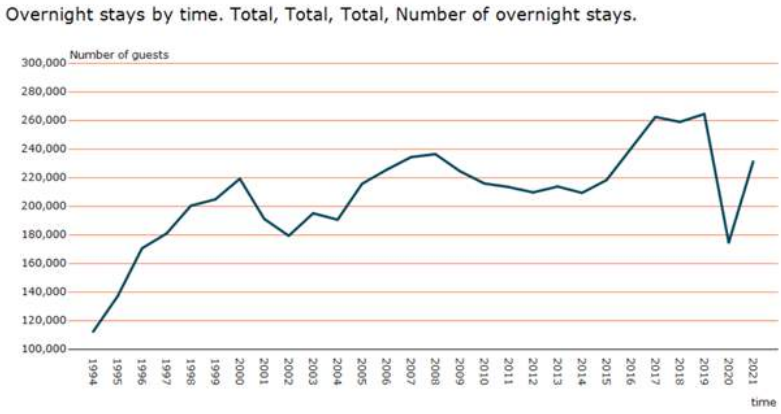

Figure 36. showing total overnight stays in Greenland over time.

Table 9. Accommodation capacity in Nuuk between October – November 2021.

Nuuk town			
Type	Units	Rooms	Beds
Hotels	5	391	717
Hotel apartments	70		141
Hostels	5	58	97
Total	42	449	955

Nuuk fjord			
Type	Units	Rooms	Beds
Cabins	12		63
Camps	2	8	16
Hostels	2	9	35
Total	16	17	114

AirBnB		
Type	Units	Beds
Houses	12	47
Rooms	7	31
Apartments	5	10
Total	24	88

Source: Eskildsen, H. A., "Turisme kapacitetsanalyse for Nuuk", Sermersooq Business (Dec. 2021).

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Accommodation capacity over time in Nuuk has steadily increased until 2020. The hospitality services investments began just before the covid-19 pandemic outbreak due to increasing demand. New hotels and hostels were ready to receive guests by 2020, but inactivity from covid-19 restrictions made difficult to maintain the revenue and hence to keep staff, but the government gave an opportunity for loans and subsidizing the local stay-cation guest in the hotels during the pandemic that helped the accommodation businesses survive the pandemic.

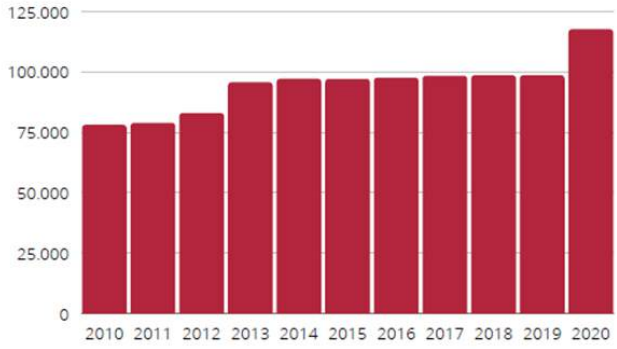

Figure 37. Accommodation capacity over time in Nuuk. *Source: Eskildsen, H. A., "Turisme kapacitetsanalyse for Nuuk", Sermesooq Business (Dec. 2021).*

The data on number of guests in Sermersooq municipality West (east Greenland not included in the Table 10) displays the different nationalities staying in Kommuneqarfik Sermersooq West and a stable increase of guests. Again, the pandemic restrictions prohibited some guest to arrive. The numbers of Danish guests have been stable in years 2000 to 2020, while the number of visitors from the US has increased over the time.

Table 10. International guests traveling to Kommuneqarfik Semersooq over time:

Kommuneqarfik Sermersooq West	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
Total	6895	12183	12208	11144	12200	12108	13424	14426	15664	14649	13795
Greenland	1062	6790	7227	6228	6619	6810	7827	8844	9036	10391	9685
Denmark	2058	3734	3638	3578	4160	3783	4060	3814	4081	3121	2612
Sweden	10	107	63	78	162	551	98	157	185	113	123
Norway	32	222	181	212	248	158	189	220	410	151	211
Iceland	6	109	117	49	96	73	150	89	146	145	129
Germany	6	101	72	57	54	45	63	157	112	84	68
France	11	76	30	22	53	29	29	69	95	35	27
Italy	0	20	8	20	13	8	20	19	5	6	11

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Kommuneqarfik Sermersooq West	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
The Netherlands	2	52	43	28	56	14	13	35	25	7	11
Great Britain	12	89	64	63	106	47	72	115	167	100	150
Rest of Europa	63	222	158	180	214	322	520	392	571	146	305
USA	16	166	77	79	85	57	150	272	312	119	169
Japan	22	114	125	127	84	114	69	22	202	13	14
Canada	59	279	274	324	180	67	102	140	160	135	170
Other countries	27	100	131	99	70	30	62	81	157	83	110
Unknown	3509	2	0	0	0	0	0	0	0	0	0

Kommuneqarfik Sermersooq West	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Total	15196	15809	18763	17455	18456	20613	22829	19971	19527	14957	...
Greenland	9868	9959	11537	10980	12114	13278	15562	13990	12711	11981	...
Denmark	3327	3681	4321	3900	3936	4455	4087	3666	4664	2308	...
Sweden	190	175	211	267	171	218	228	115	128	35	...
Norway	315	230	344	337	272	359	320	208	224	81	...
Iceland	204	335	442	347	254	308	334	235	211	105	...
Germany	68	100	141	129	212	151	152	176	118	24	...
France	30	42	43	77	54	63	115	35	81	15	-
Italy	13	13	23	24	14	25	23	31	19	10	-
The Netherlands	25	48	42	32	20	32	29	17	28	6	-
Great Britain	264	158	248	135	201	118	108	109	114	110	...
Rest of Europa	192	309	250	323	452	533	548	350	171	31	...
USA	162	234	315	236	260	352	456	401	494	87	...
Japan	8	41	24	42	15	13	29	8	14	-	...
Canada	369	277	362	352	218	394	439	266	223	103	...
Other countries	161	207	459	274	263	314	399	364	327	61	...
Unknown	0	0	1	0	0	0	0	0	-	-	-

Source: Statistics Greenland.

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4.2.2.2 Passenger transport (air, railway, water, road)

Flights

If we look at the number of monthly international flight passengers to Nuuk (Table 11) there is a seasonal variation. The summer months are busy, while the winter period has less flight traffic. One can assume that the tourists prefer the summer months to travel to Greenland.

Table 11. International passengers flying to Nuuk over time:

Nuuk	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Total	1387	1909	3791	4963	4100	4080	3859	3905	4720	4534	4700	4799	1296
January	-	-	14	267	178	119	192	167	138	163	249	223	187
February	-	-	9	209	129	153	189	167	168	136	231	257	245
March	-	-	10	364	279	242	213	259	379	286	363	322	112
April	3	-	36	566	284	375	316	325	430	389	326	303	-
May	35	92	274	452	389	399	358	375	533	433	420	420	-
June	377	525	449	646	504	452	432	398	517	457	552	574	53
July	396	641	693	510	500	571	581	476	504	452	611	580	257
August	460	474	550	462	579	509	381	456	545	515	547	579	188
September	107	93	610	524	478	653	515	533	727	838	505	505	115
October	9	49	473	461	385	294	393	439	475	477	357	516	51
November	-	-	271	267	212	166	153	209	172	266	299	296	31
December	-	35	402	235	183	147	136	101	132	169	240	224	57

Source: Statistics Greenland.

Nationalities of the international flight passengers leaving Nuuk were not registered before 2015, (see Table 12). There is an increase in European travelers and decrease of Icelandic passengers, while other nationalities are sporadic.

Table 12. International flight passengers traveling from Nuuk:

Nuuk	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Total	1632	2304	4289	5598	4454	4309	4181	4230	5395	4767	4894	5037	1601
Greenland	-	-	-	-	-	-	-	1488	1015	990	1087	1353	264
Denmark	-	-	-	-	-	-	-	310	158	93	145	386	61
Rest of Europe	-	-	-	-	-	-	-	93	70	108	119	258	26
Iceland	-	-	-	-	-	-	-	508	562	354	366	297	88
Norway	-	-	-	-	-	-	-	45	41	23	19	64	3
Sweden	-	-	-	-	-	-	-	22	17	16	9	20	6
Germany	-	-	-	-	-	-	-	41	26	31	34	74	9
France	-	-	-	-	-	-	-	33	20	38	29	64	4
Italy	-	-	-	-	-	-	-	5	15	19	17	32	-
Spain	-	-	-	-	-	-	-	10	8	5	13	17	2
United Kingdom	-	-	-	-	-	-	-	71	51	32	28	117	11
Russia	-	-	-	-	-	-	-	9	17	16	14	12	-
USA	-	-	-	-	-	-	-	173	256	226	214	340	27

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Nuuk	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Canada	-	-	-	-	-	-	-	163	546	155	212	308	16
China	-	-	-	-	-	-	-	27	55	43	45	61	8
Japan	-	-	-	-	-	-	-	23	7	2	1	18	1
Taiwan	-	-	-	-	-	-	-	5	3	-	-	5	-
Other Countries	-	-	-	-	-	-	-	62	93	85	64	159	24
N/A	1632	2304	4289	5598	4454	4309	4181	1142	2435	2531	2478	1452	1051

Source: Statistics Greenland.

Cruise tourism in Nuuk

Nuuk receives second or third most arrivals of cruise ships in Greenland, being located along the coast north of Qaqortoq that has the most arrivals. The number of passengers has almost doubled nationally since 2015, while passenger arrivals in Nuuk has more than doubled between 2015 and 2019 due to a larger number of ships calling Nuuk and also vessels of larger passenger capacity. Cruise ship passengers are often of German and US origin.

The pandemic stopped the cruise ship traffic in 2020 and the first cruise ships has reached the 2019 numbers and the arctic cruise tourism will most likely increase in 2023 according to local tourism industry.

Table 13. Number of cruise passengers arriving to Nuuk:

Nuuk	2015	2016	2017	2018	2019	2020
Total	7309	10849	14975	14683	18172	-
January	-	-	-	-	-	-
February	-	-	-	-	-	-
March	-	-	-	-	-	-
April	26	29	-	-	-	-
May	-	116	80	156	-	-
June	1315	355	457	1178	25	-
July	2105	3041	4204	3048	3480	-
August	1877	5780	7221	8027	11164	-
September	1986	1528	3013	2274	3503	-
October	33	-	-	-	-	-
November	-	-	-	-	-	-
December	-	-	-	-	-	-

Table 14. Number of cruise ships arriving to Nuuk:

Number of cruises	2015	2016	2017	2018	2019	2020
Total	90	104	101	119	125	-
January	-	-	-	-	-	-
February	-	-	-	-	-	-
March	-	-	-	-	-	-
April	2	2	-	-	-	-
May	4	8	2	2	5	-
June	10	9	4	8	4	-
July	16	20	16	21	17	-

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Number of cruises	2015	2016	2017	2018	2019	2020
August	35	37	42	49	57	-
September	20	27	35	36	40	-
October	3	1	2	3	2	-
November	-	-	-	-	-	-
December	-	-	-	-	-	-

Note: The base for the cruise statistics is the tax payment reports to the Tax Agency of Greenland. On the 1st of June 2015 charging passenger taxes was discontinued, however cruise ships continue to report number of passengers to the Tax Agency of Greenland. The cruises statistics for 2015 and 2016 are under revision due to late arrival of the harbor tax payment reports. Source: Greenland Statistics.

4.2.2.3 Number of tourism enterprises

Tourism operators lists from 2021 are listed below.

Table 15. Companies within tourism operating in Nuuk and fjord.

Tourism operators in Nuuk				
Company name	Field of operation	Activities	Sailing	Open all-year-around
Air Greenland Charter	Aviation	Flightseeing		Yes
AirZafari	Aviation	Flightseeing, fly charter		No
Arctic Boat Charter - ABC	Boat operator	Boat charter, fishing, hunting	x	Yes
Arctic Nomad	Accommodation, Boat operator, Tour operator	Glamping, expeditions, boat tours, climbing, mountaineering, cross-country skiing, cruises, flightseeing, city sightseeing, heliskiing, hiking, photo tours, river fishing, kayaking, snowmobiling, snowshoeing, skiing, food, Inuit culture, whale watching, ice fishing, sea fishing	x	No
Asimut Tours and Camp	Accommodation, Boat operator, Tour operator	Hiking, boat tours, fishing, hunting, running		No
Greenland Cruises	Boat operator	Boat charter, boat tours, city sightseeing, hiking, flightseeing, fishing	x	Yes
Greenland Escape	Accommodation, DMC			
Greenland Explorer	Boat operator, Tour operator	Boat charter	x	Ja
Greenland Extreme	Boat operator, tour operator	Heliskiing, ski touring, hiking, hunting, fishing, boat charter	x	Ja
Greenland Travel	Travel agency			
Greenland Waterways (Nuuk Adventure, Qussuk Adventure)	Boat operator	Boat tours, hiking, kayak, SUP	x	Ja
Greenlandic Boat tours ApS	Boat operator	Boat charter, fishing	x	Ja
Guide to Greenland	Portal			
Immanuel	Boat operator	Boat charter, boat tours	x	Nej
Inuk Travel	Travel agency			Ja

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Tourism operators in Nuuk				
Company name	Field of operation	Activities	Sailing	Open all-year-around
Kang Skicenter	Accommodation, tour operator	Snowmobile, ski touring, snowshoeing		Ja
Kang Tourism	Boat operator, Tour operator	Hiking, boat tours	x	Ja
Nuuk Adventours		Hiking		
Nuuk Bay Adventures v/ Kristian Heilmann	Boat operator	Boat charter, boat tours, fishing	x	Ja
Nuuk Outdoor	Boat Operator	Boat charter, boat tours, hunting, drone diving, fishing, photography	x	Ja
Nuuk Water Taxi - Greenland Boat Charter	Boat operator	Boat charter, boat tours, kayak, SUP, fishing, hunting	x	Ja
Qajaq Seaways v/Johan Rosbach	Boat operator	Boat charter	x	Ja
Tip Top Tours	Tour operator	Hiking, climbing		
Travel by Heart Greenland	Travel agency			
Tupilak Travel	Travel agency, DMC	Boat tours, hiking, city sightseeing, flightseeing, kaffemik		
Tuugaaq Travel	DMC			
Two Ravens	Tour operator	Hiking, snowshoeing, camping, heliskiing, ski touring, fishing, hunting		

Source: Sermersooq Business.

Table 16. Number of boat operators in Nuuk in 2021.

Boat trip companies					
Name	**Boats**	**Type**	**Pax**	**SUPs**	**Kayaks**
Arctic Boat Charter - ABC	1	Targa 37+	12		
Arctic Nomad	3	RIB	10		
		RIB	10		
		RIB	12		
Greenlandic Boat Tours ApS (Martek)	2	Marie Martek	10		
		Maja Martek	12		
Greenland Cruises	2	Targa 37	12		
		Targa 31	8		
Greenland Explorer		M/V Kisaq	12		
Immanuel	1	Lukket	27		
Kang Tourism / Kang Skicenter	5	Targa	6		
		Ivik	12		
		Poca 550	5		
		Poca 600	7		
		Targa 25	6		
Nuuk Bay Adventures v. Kristian Heilmann	2	Targa	10		
		Targa 25	6		
Nuuk Outdoor	3	Targa 31	8		

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Boat trip companies					
Name	**Boats**	**Type**	**Pax**	**SUPs**	**Kayaks**
		Somi 800	6		
		Nuumit 19	7		
Nuuk Water Taxi - Greenland Boat Charter	10	Targa 37	12	18	5
		Targa 37	12		
		Targa 37	12		
		Targa 35	12		
		Targa 35	12		
		Targa 25	6		
		Targa 25	6		
		Targa 25	6		
		Targa 37	12		
		Poca 550	5		
Qajaq Seaways	1	Targa 25,1	6		
Sum	30		299	18	5

Source: Sermersooq Business.

Table 17. List of cultural centers in Nuuk

Experiences / cultural centers in Nuuk		
Name	**Products**	**Opening hours**
Ajagaq - handicraft	Souvenirs	Open 10-16 except weekends
Godthåb Bryghus/ brewery	Tastings	
Golfklubben	Golf	
Katuaq	Culture events	
Kittat Economusée	National clothing	
Malik Svømmehal	Spa, swimming	
Nationalmuseet	culture	
Nationalteatret	culture	
Nuuk Kunstmuseum	culture	
Nuuk Lokalmuseum (Nuutoqaq)	culture	
Rådhuset/ town hall		By appointment
Sisorarfiit/ Skiing center	Skiing	Seasonal

Museums in Nuuk

There are no data on the most visited museums in Nuuk town, but available visitor numbers are gained from one museum in Nuuk: The number of visitors to Greenland National Museum has increased until 2019 but saw a strong decline of 10.000 visitors during the pandemic and then a slight increase in 2021. With the cruise ships and international tourist arrivals in 2022, the visitor number presumably will reach year 2019 numbers.

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Table 18. Number of entrances at National Museum and Archive.

Visits to Greenland National Museum

	2016	2017	2018	2019	2020	2021
	Number of visits					
Total*	11,545	12,646	12,342	19,391	9,274	11,108
Children	3,532	3,799	3,909	4,311	2,974	2,891
Adults	8,013	8,847	8,433	15,080	6,300	8,217

Source: Greenland National Museum **Numbers do not include visits in entrance*

Source: Greenland in figures 2022.

Gastro tourism

There is a potential to develop gastro tourism based on traditional food in restaurants in Nuuk. There are restaurants that serve local game with culinary inspiration from other countries. There is room for expanding the gastro tourism.

Table 19. Restaurants in Nuuk in 2021

Name	Type	Seats	Seatings	Breakfast	Lunch	Dinner	Days open in a week	Open all-year-around	Take-away
A Hereford Beefstouw	Restaurant	80	1.5	x	x	x	7	x	x
Bone's	Restaurant	82			x	x	7	x	x
Brugseni café	Fastfood	44					6	x	x
Café Esmeralda	Café	88		x	x	x	6	x	x
Café Inuk	Café	70			x	x	6	x	x
CaféTuaq	Café	40	2		x	x	6	x	x
Caffé Pascucci	Café	100		x	x	x	7	x	x
Hong Kong Pizzeria	Fastfood	40			x	x	7	x	x
IGGU	Fastfood	78			x	x	7	x	x
Restaurant Isikkivik	Restaurant	62		x	x	x	7	x	x
Killut	Restaurant	122		x	x	x	7	x	
Pisiffik café	Fastfood	32			x	x	7	x	x
Restaurant Charoen Porn	Restaurant	44				x	7	x	x
Restaurant Unicorn	Restaurant	66				x	6	No	x
Sarfalik Winebar & Brasserie	Restaurant	42	1			x	4	x	
Sunset Boulevard	Fastfood	44			x	x	7	x	x
Sømandshjemmet	Restaurant	80		x	x	x	7	x	
Tapasimut	Restaurant	34			x	x	7	x	x
Total		1148							

Source: Sermersooq Business

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4.2.2.4 Cultural industry including heritage sites

Compared to other towns in Greenland, Nuuk has the largest cultural sector available. Most cultural heritage items in Greenland are displayed at Greenland National Museum in Nuuk. In addition, there is an art museum in town, and temporary exhibitions at the cultural center Katuaq.

Now, the organized cultural tours for the tourists around Nuuk Fjord include some historic settlements in the area. Most tours are focusing on nature like sailing, fishing, and whale safaris.

Opportunities exist to develop new concepts of tourism activities within cultural heritage or art for Nuuk region because in other parts of Greenland, tourists visit former or active settlements to learn about past and modern lives. Geological tourism – "geo-tourism" is a possible asset since the geological regions around Nuuk include gold deposits and rock formations of extreme age from the earliest times of the Earth – and a nearby small island containing sedimentary rocks holding perhaps the oldest evidence of life on Earth. Development of these themes will involve new investments and targeted management. Municipality of Sermersooq in co-operation with Government of Greenland has commenced a project to open a visitor center in Nuuk called: "Nature and Geo Center" that focuses on geology of the area, but when the facility is available is unclear.

Numerous historical and nature protection exists around Nuuk, including caribou calving areas, seabird colonies and some historical and land protection areas, which are mapped (see Figure 38).

Another thing not included in the maps is the ban on Humpback whale hunting Nuuk fjord (mentioned in conflict section).

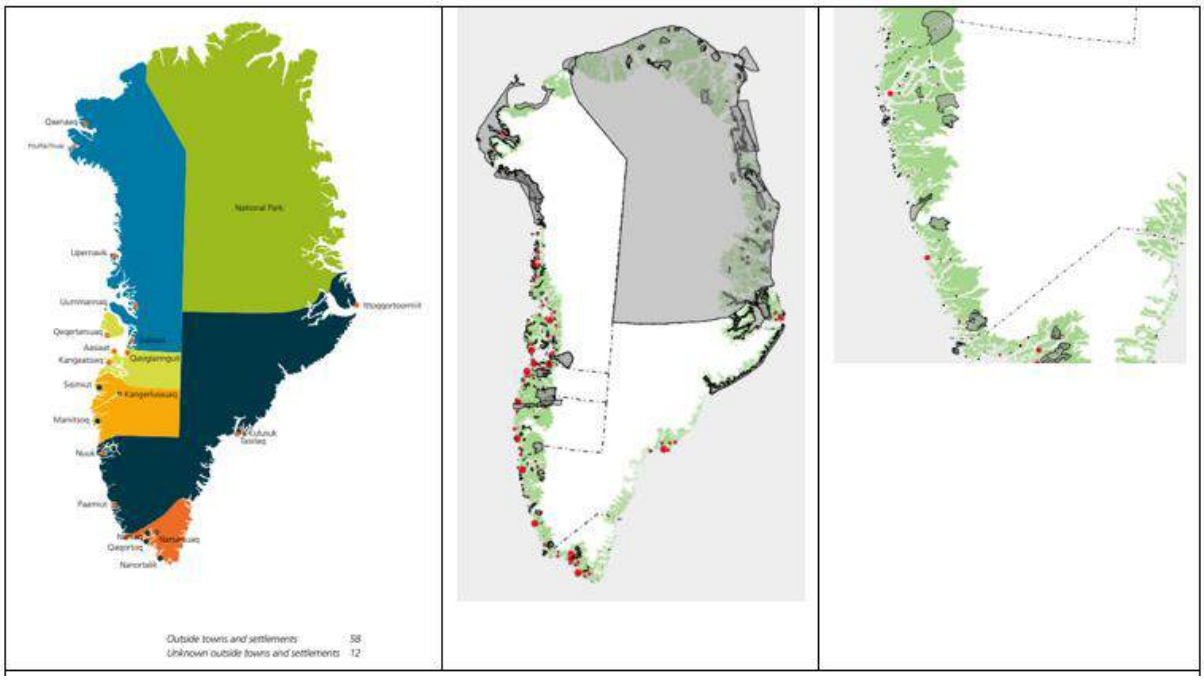

Figure 38. a: showing Greenland divided into 5 municipalities and one National Park (dark green). The capital of Greenland is Nuuk, situated in Kommuneqarfik Sermersooq (dark blue). The Nuuk hub includes the settlements Kapisillit and Qeqertarsuatsiaat. The population of Nuuk and its settlements is at 19.486, while the total population of Greenland is at 19.261 by January 1st 2022. *Source:* https://bank.stat.gl/BEESTD ;b: showing

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protected areas in Greenland. The Grey ones include Natural reserves, 3 UNESCO heritage sites, Ramsar, hunting game and historical protection areas. The red circles are towns and settlements. *Source: govmin.gl;* c: showing protected areas in western part of Sermersooq municipality which include caribou calving, bird, and historical protection areas. Red circles are towns and settlements. *Source: govmin.gl*

4.2.3 Conflicts/issues

Greenland has potential to provide an all-year-round tourism all of Greenland. Dog sledding is only available in North Greenland (due to regulations about Greenlandic husky) during the Spring season but can be combined with other activities in Nuuk and its fjord system 4-600 km away. To do so, interregional planning and co-operation is required concerning services and infrastructure, followed by destination development around Nuuk.

The Nuuk fjord can be developed further in tourism but with respect for local activities in the area.

4.3 Westfjords

4.3.1 Brief description of the hub

There are currently nine municipalities in the Westfjords region in Iceland. In the ArcticHub project we focus on two of these, i.e. Vesturbyggð and Tálknafjarðarhreppur located in the region's Southwestern part (Figure 39). The selection criterion is partly based on the fact that the Westfjords's region as a whole has been facing persistent migration of people since mid 1930ies, and was the region in Iceland where depopulation was greatest in the first decade of this century, with relative population change 1998-2008 of minus 14,2% (IRDI, 2022a). During the past few years new industries, like aquaculture and tourism, seem to have changed this development.

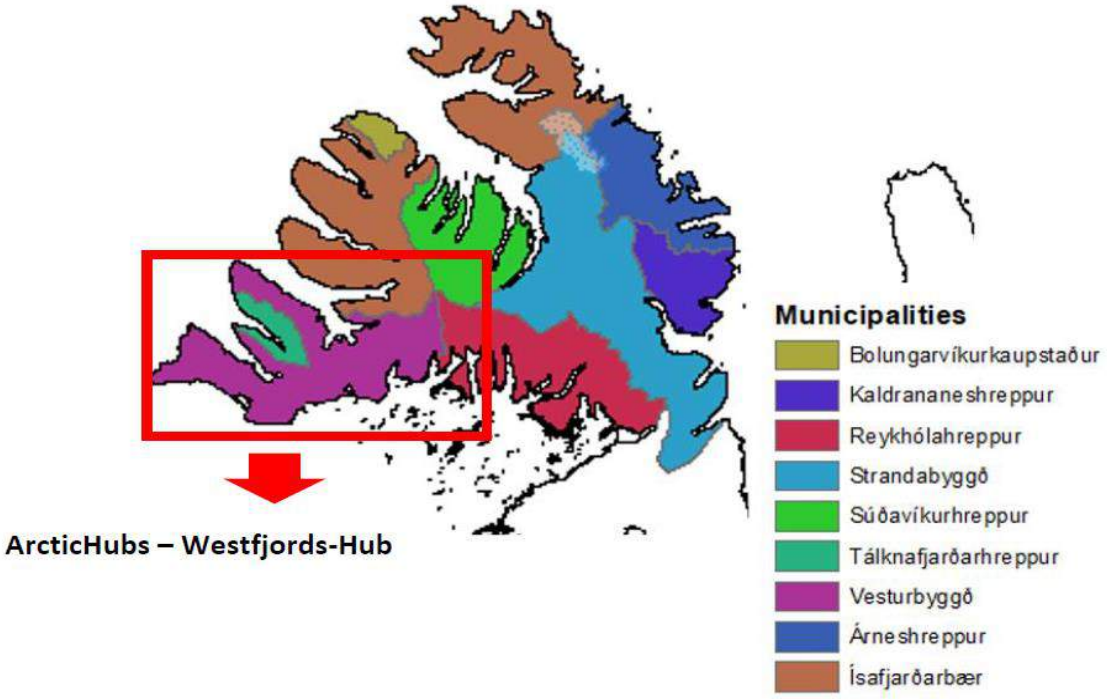

Figure 39. Location of the ArcticHub study area (the Westfjord Hub) in the Westfjords region in Iceland

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4.3.1.1 Population dynamics

Population records in Iceland are relatively precise over the past 140 years and show that the Westfjords region was most populated between 1910 and 1940 (Figure 40a). After that the population started to decline although the small villages scattered along the coastline kept on gaining numbers until the 1990s. This development reflects the general trend in Iceland during that time of people moving from their rural farms to more dense settlements. Depopulation of rural areas and urbanization of small towns were thus the driving forces in terms of land-use change, which from a spatial perspective associated with a transition from diffuse settlements to more densified clusters. Three of these clusters are found within our Westfjords Hub study area, i.e. *Patreksfjörður* emerging in the late 19th century, *Bíldudalur* around 1900, and *Tálknafjörður* during the 1960s. Since 2005, population numbers within these settlement clusters seem to have become more stable (Figure 40b).

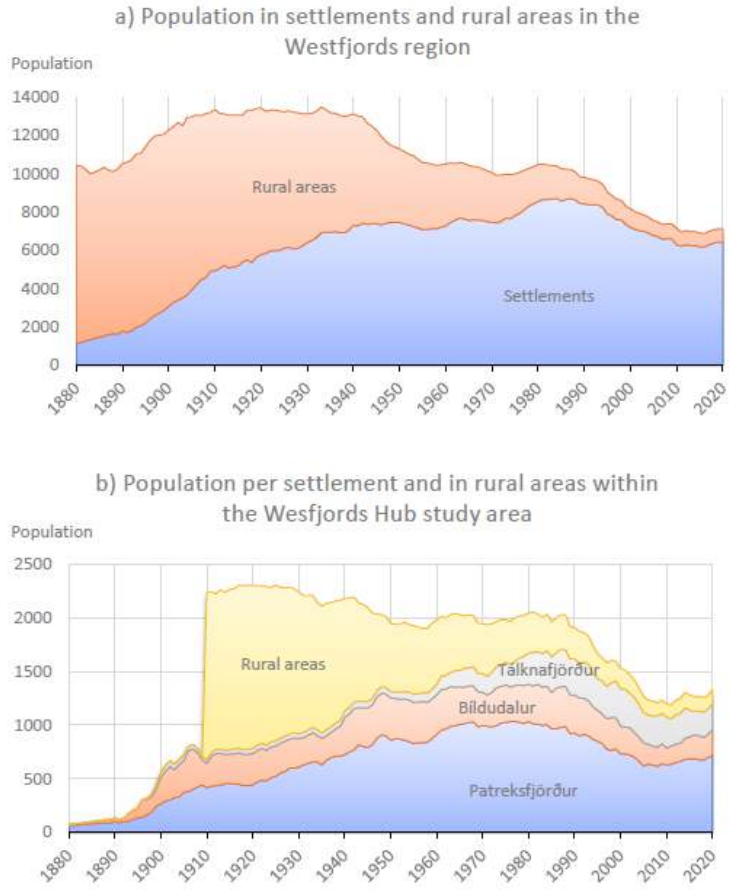

Figure 40. a: Population distribution between rural areas and settlements in the Westfjords; b: and in the ArcticHub – Westfjords hub study area; Note that population numbers for rural areas prior to 1911 are not available within the study area. *Sources: Statistics Iceland; Hagskinna*

When looking at the population development in the two ArcticHubs municipalities, i.e. Vesturbyggð and Tálknfjarðarhreppur, since the turn of this century, the population was gradually decreasing in both municipalities until 2011. In Vesturbyggð the total population dropped to 890 in 2011 but has

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since been gradually increasing and had reached 1064 on the 1st of January 2022. In Tálknafjarðarhreppur the number of people continued to decrease until 2012 when 276 were registered there, in the years after the number increased little, but in 2016 the population dropped to 267 and a year later to 236. Since then it has been slowly increasing and was 255 on the 1st of January 2022 (Figure 41).

The gender ratio in both ArcticHubs municipalities has traditionally remained fairly equal. In recent years, however, the proportion of men in the total population in both municipalities has been rising, the proportion of men is now 55% in Vesturbyggð and 57% in Tálknafjarðarhreppur against 45% / 43% women (Figure 42).

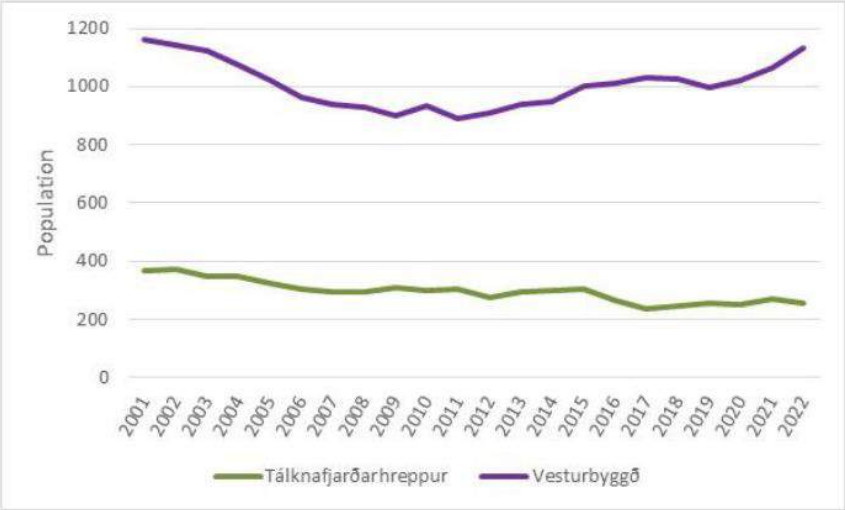

Figure 41. Population dynamics in Tálkanfjarðarhreppur and Vesturbyggð 2001-2022. *Source: Statistics Iceland, 2022*

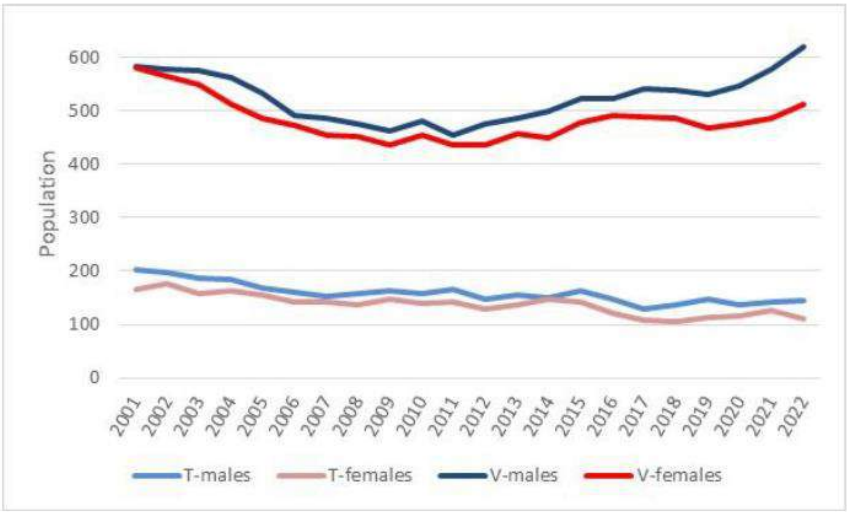

Figure 42. Gender division of the population of Tálkanfjarðarhreppur and Vesturbyggð 2001-2022. *Source: Statistics Iceland, 2022*

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Today's age pyramids emphasize this development in the gender division in both municipalities. They also highlight negative growth with relatively few in the youngest age groups (Figure 43).

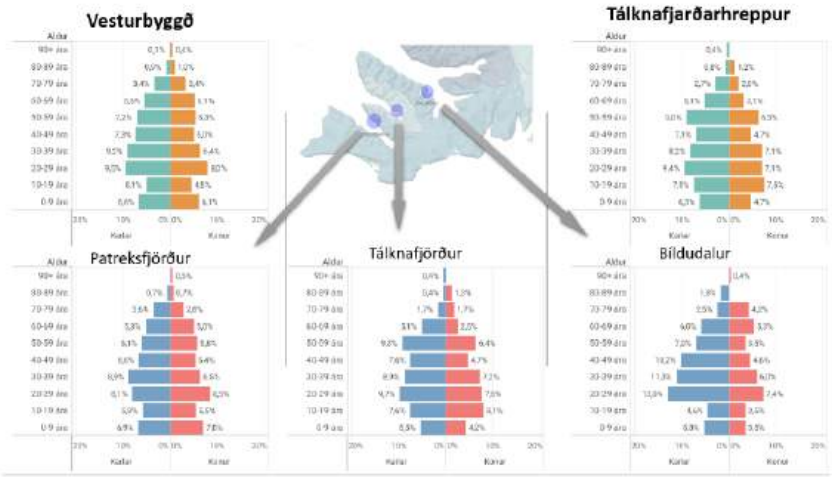

Figure 43. Age pyramids representing the division between the gender in Vesturbyggð and Tálknafjarðarhreppur on the 1st of January 2022 (above). The age pyramids below show the gender division in the three villages, i.e. Patreksfjörður, Tálknafjörður and Bíldudalur. *Source: IRDI, 2022 - Information only available in Icelandic.*

4.3.1.2 Road network and changes in road traffic

Over the past century, one of the key changes observed in terms of infrastructure in the Westfjords region is the expansion of the road network, which was substantial between 1951 and 1960. At first, roads were built near towns, only connected by more primitive horse-trails. In the 1960s most of them became interconnected and in the late 1980s, the road network started to resemble to its current configuration, especially within the Westfjords hub study area. Since 2000 road traffic has increased substantially in the Westfjords region (Figure 6), though most remains consentrated around the settlements. There are still relatively few connections between the North, Souteast, and Southwest part. The opening of the recent Dýrafjarðar-tunnel in 2020 (located in the Western part, around the middle of the road system - added to the 2015 map in Figure 44) are likely to increase road traffic and connections between the Northern and Southern parts of the Westfjords and thus be a positive counteraction for tourism development in the Westfjords Hub.

Currently it is only possible to get to the study area by private car. There are no direct flights to the area, nor direct ferry services. However, it is popular by both locals and tourists to take a car ferry from Stykkishólmur located in the Northern part of Snæfellsnes peninsula over to Brjánslækur located on the Westfjords South coast, and drive from there into the area.

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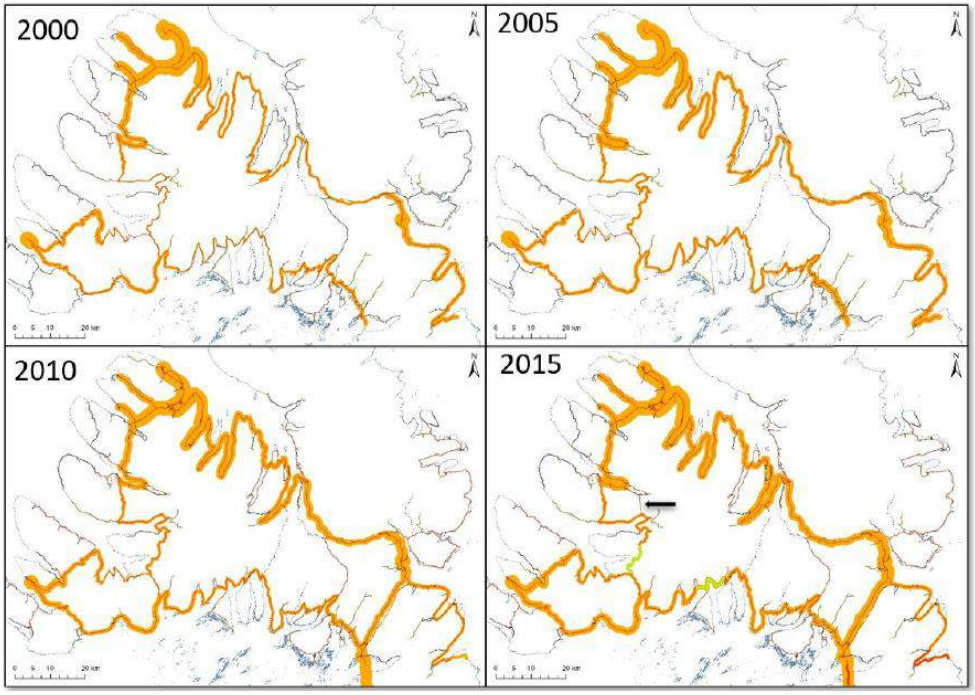

Figure 44. Yearly average number of cars per days on the main roads in the Westfjords regions in 2000, 2005, 2010, and 2015. Logarithmic display was used, with up to 5000 cars/day on the busiest segments. Location of road segments approximative and based on 2021 road network data. On the 2015 map, road segments used to estimate road traffic in and out of the Westfjords are shown in red (South East), and for the study area in green. The black arrow point to the new tunnel opened in 2020. *Sources: Iceland Road and Coastal Administration, 2000-2021*

This transfer of road traffic can be illustrated by data from vehicle counters located on the two main access roads to the Westfjords region. While overall road traffic in and out of the region increased substantially over past decades (from 271 vehicles/day in 2000 to a maximum of 598 vehicles/day in 2017), traffic on the Eastern access road was substantially reduced (Figure 45). The abrupt increase over the 2015-2017 might be related to the overall increased of tourism in Iceland. The increase in road traffic is particularly noteworthy within the Westfjords Hub study area as it nearly doubled in only four years between 2013 and 2016 (Figure 46).

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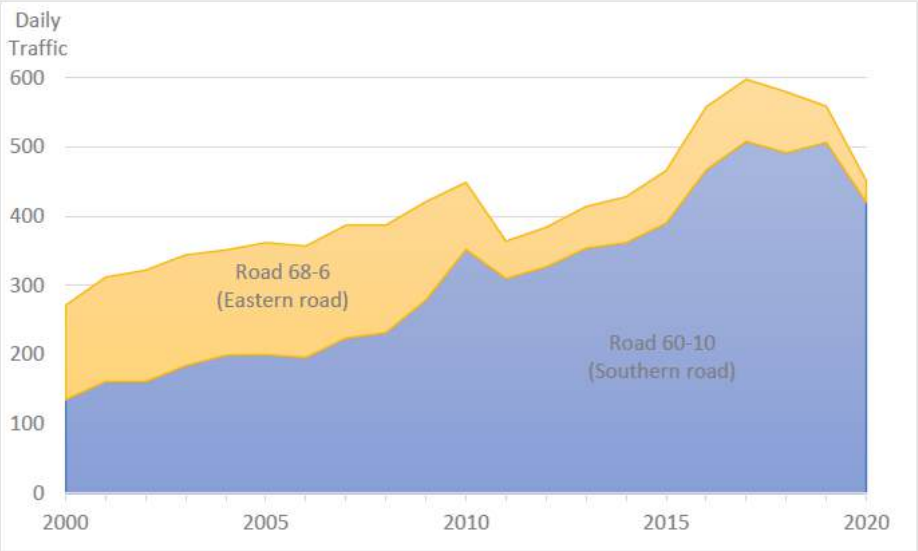

Figure 45. Average daily road traffic on the main access routes in/out of the Westfjords, using counters located in the Southeastern corner of the Westfjords (shown in red on the 2015 map in Figure 40)

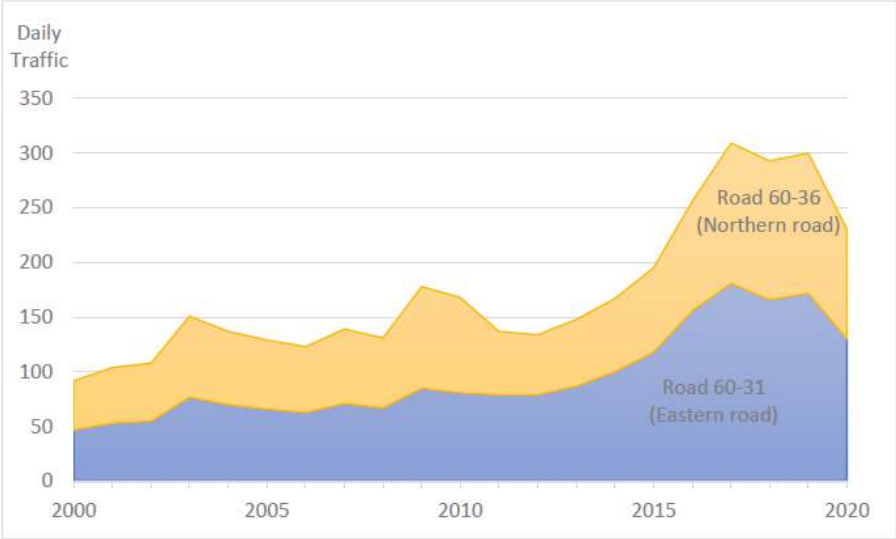

Figure 46. Average daily road traffic on the main access routes in out of the Westfjords Hub study area, using counters located North and East of the study area (shown in green on the 2015 map in Figure 40)

4.3.1.3 Protected areas

Protected areas in the Westfjords region fall into categories Ib (wilderness area), III (natural monument or feature), IV (habitat management area), and V (protected seascape) according to the IUCN classification system (Figure 47). Some of these areas make up some of the Westfjords most popular tourist attraction, such as Dynjandi waterfall, Surtarbrandsgil fossil ravine and Vatnsfjörður nature reserve, all close to our Westfjords hub study area. Látrabjarg, the largest seabird cliff in Iceland, is located within our Hub.

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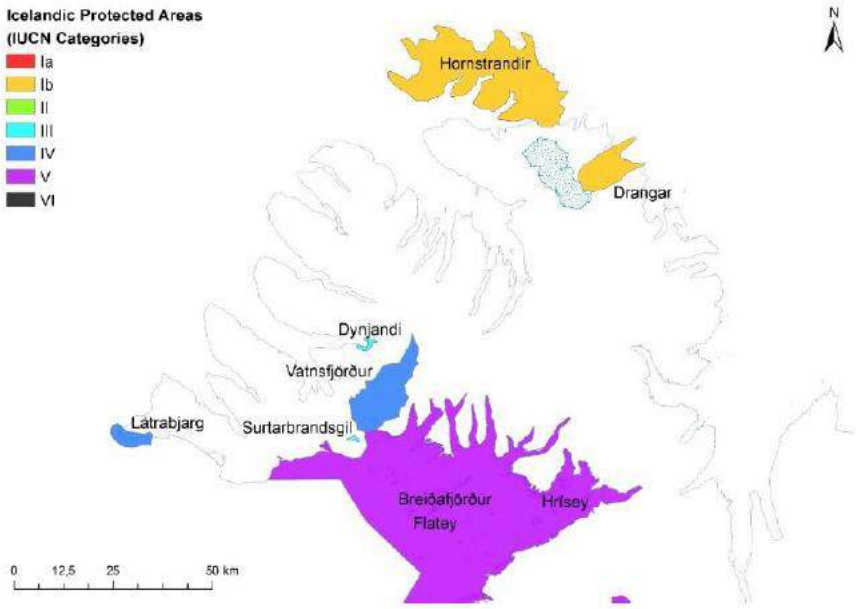

Figure 47. Protected areas in Westfjords region classified according to the IUCN categories

4.3.2 Tourism industry

4.3.2.1 Accommodation for visitors (overnight stays, hotels and other accommodation)

It is difficult, and often impossible, to obtain tourism-related data and information, such as information on the number of tourists at different sites, accommodation, employee within tourism, and so on for the Westfjords Hub, as they simply do not exist. Data on overnight stay in hotels and guesthouses, is also difficult to obtain for the Westfjords region as a whole, as such figures are published for the Westfjords and West Iceland together. This is done on the basis that it is not possible to trace certain information to certain parties. Therefore, we will here present available figures for the whole of the Westfjords and will wherever possible to scale down to our two Hub municipalities.

Over the past decade tourism sustained a rapid growth in the Westfjords, as seen by guests' arrivals in all types of registered accommodations that have tripled between 2008 and 2015, from about 50000 to 150000 (Figure 48). While the number of domestic guest's arrival remained relatively stable around 35000, international guests arrival were multiplied by five between 2008 and 2015, from roughly 20000 in 2008 to over 110000 in 2015. These numbers then gradually decreased to stabilize just under 100000 until the COVID-19 pandemic when these numbers dropped to about 30000. Domestic tourists on the other hand increased substantially from 2018 to 2020, from about 27000 to nearly 65000. This can be connected to the difficulties for international travel at that time.

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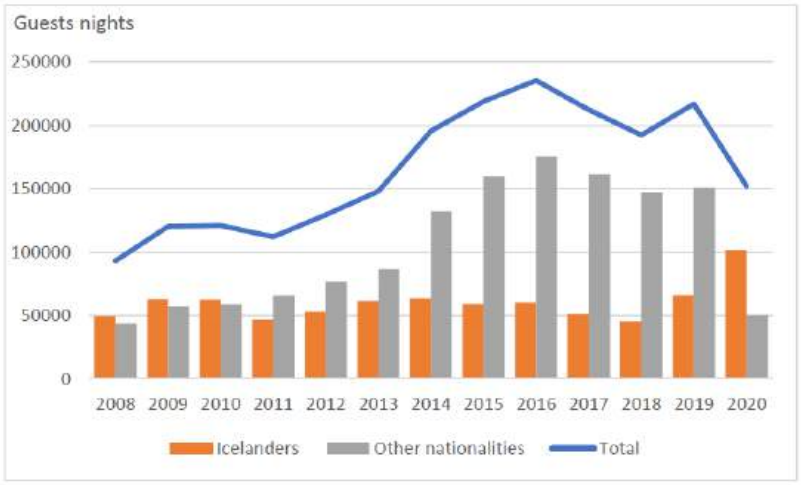

Figure 48. Overnight stays in all kind of registered accommodations in the Westfjords. *Source: Statistics Iceland*

4.3.2.2 Passenger transport (air, railway, water, road)

Similar trends on guest arrivals are observed in regard with overnight stays (Figure 49).

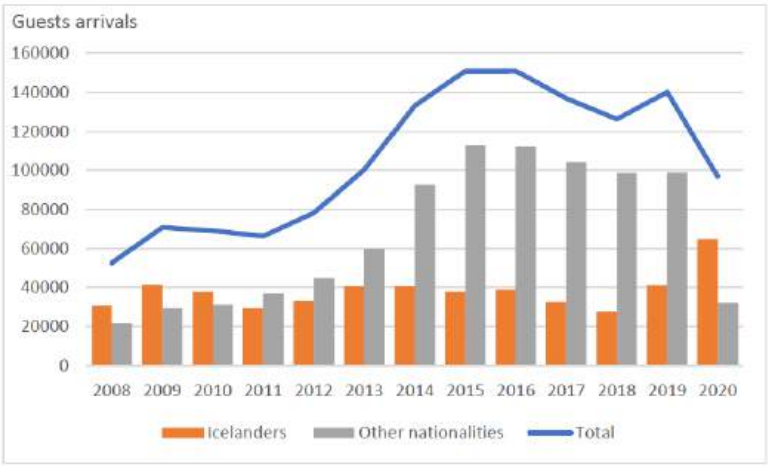

Figure 49. Guests arrivals in all kind of registered accommodations in the Westfjords. *Source: Statistics Iceland*

Cruise ship arrivals increased greatly over the past decade. Ísafjörður, the largest town in the Westfjords region, has been, and still is, the largest port for cruise ships. The number of cruises to Ísafjörður have increased from 27 in 2007, when their number were first recorded according to Ísafjörður website, to 125 in 2019 the year before COVID-19. The multiplier effect of this increase in cruise ship arrivals to the Westfjords led to cruises also stopping in smaller ports. As regard the Westfjords hub study area, one cruise ship came to Bíldudalur in 2016 and one in 2017, and two in 2018. A total of 18 cruise ships came to Patreksfjörður in 2018 and a total of 21 in 2019.

Adding together the capacity figures of cruise ships in the Westfjords provides an indication of the growth of visitor numbers from cruises in the area, with nearly a fourfold increase between 2012 to 2019 (Figure 50).

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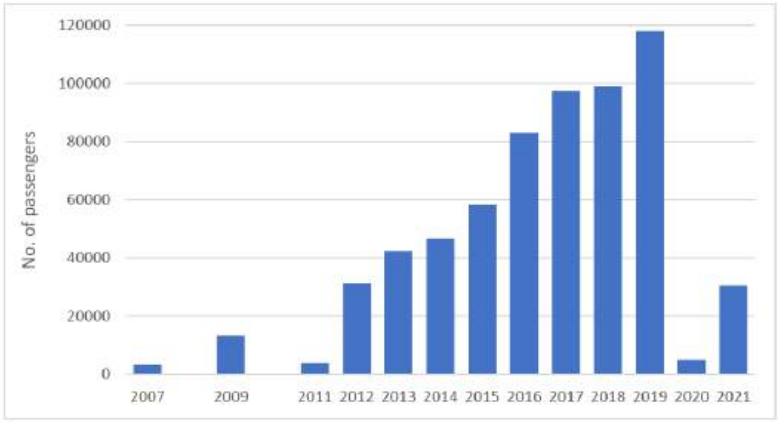

Figure 50. Changes in the number of passengers on cruise ship in the Westfjords 2007-2021. *Source: Ísafjarðarbær website*

4.3.2.3 Number of tourism enterprises

The total number of tourist operators in the Westfjords region, according to information obtained from Visit Westfjords (https://www.westfjords.is/en) , was 65 in the year 2021 and had then increased by more than two-thirds since 2014 (Figure 51). There are however considerably more enterprises that have an operating license. By looking at the accommodation and restaurant licenses divided by municipalities for the Westfjords region, there were a total of 129 in 2021, of which 28 were in Vesturbyggð and 6 in Tálknafjarðarhreppur (Figure 52). When looking at the development of operating licenses since 2017 there was a gradual increase until 2020 in all municipalities.

Figure 51. Number of tourist enterprises operating in the Westfjords region 2014-2021 registered by Visit Westfjords

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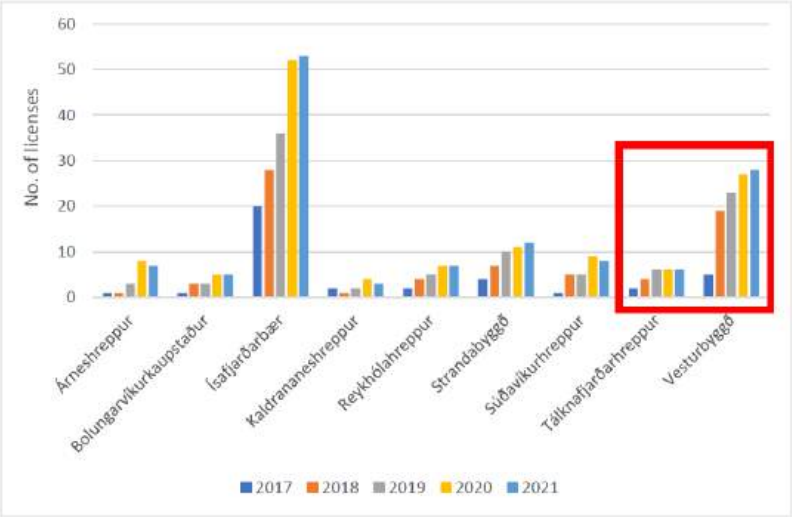

Figure 52. Accommodation and restaurant licenses by municipalities in the Westfjords. The red rectangle delimits the Westfjord Hub. *Source: the Westfjords Health Inspectorate and the Westfjords District Commissioner*

When looking at the official finance tourism infrastructure it seems clear that the Westfjords southern part, our study area, is not big in that picture (Figure 53).

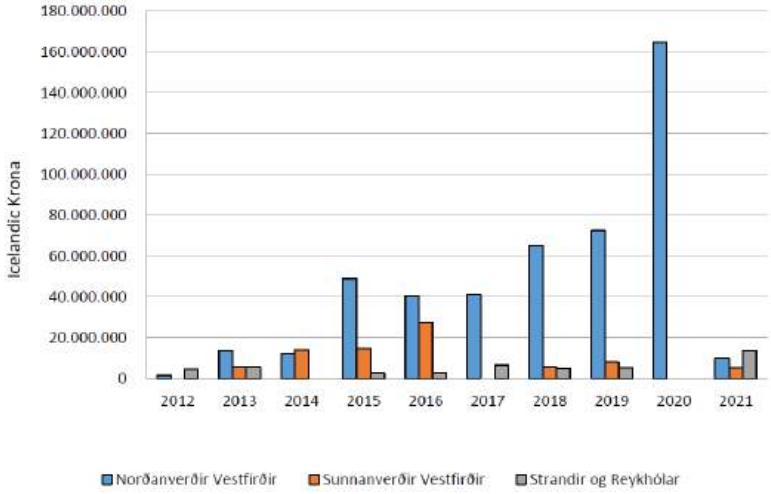

Figure 53. Financed tourism infrastructure in the Westfjords region 2012-2021

4.3.2.4 Tourism income and other country/Arctichub specific tourism characteristics

4.3.2.4.1 Most areas visited

There are many indications that the most popular destinations in the Westfjords is firstly the town Ísafjörður and secondly the waterfall Dynjandi. However, no accurate data exists presenting were tourists go, and what they are doing while they're staying in the Westfjords. Recently counters have been put up by Dynjandi waterfall and Látrabjarg bird cliff, that will give valuable future data. The Icelandic Tourist Board (ITB) has however identified 280 tourists' attractions in the Westfjords region,

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representing 12,8% of all those registered in Iceland. This is more than average, considering that the Westfjords only represent about 9% of Iceland's land surface area. Most of these sites (70%) are within 500m of a road. The ITB database distinguishes "particularly interesting sites" from "moderate attractions", and 10,4% of them are found in the Westfjords (Figure 54).

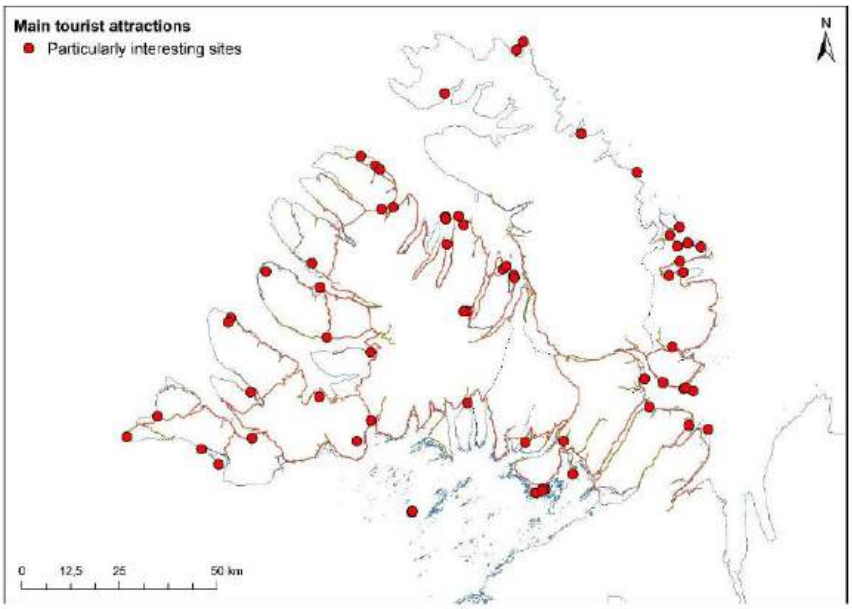

Figure 54. Distribution of main sites of interest in the Westfjords region according to the ITB. *Source: ITB*

Due to the lack of data, we decided to use distribution of Flickr data as a proxy to map the most popular destinations in the Wesfjords. A final sample used is based on 212854 photos for the years 2004-2021 (methodology is explained in Ólafsdóttir & Bishop, 2022). The results show that high-density areas in the Westfjords region are distributed along the jagged Western coastlines of the area (Figure 55). This distribution overlaps well know tourist attractions, such as the main sites of interest identified by the ITB. The main urban center of the region, Ísafjörður, stands out and concentrates high-density values. Aside from Bolungarvík situated Northwest of Ísafjörður, four other high-density areas identified which are in a clockwise order from the Southwest: Látrabjarg, Dynjandi, Þingeyri and Djúpavík. Higher resolution data (i.e. map produced with a radius of 5km) enable the identifications of more localized high-density areas (Figure 56). Among these, Hornstrandir peninsula in the Northern part is the only area which is not connected to the road network and therefore only accessible by boat or by foot.

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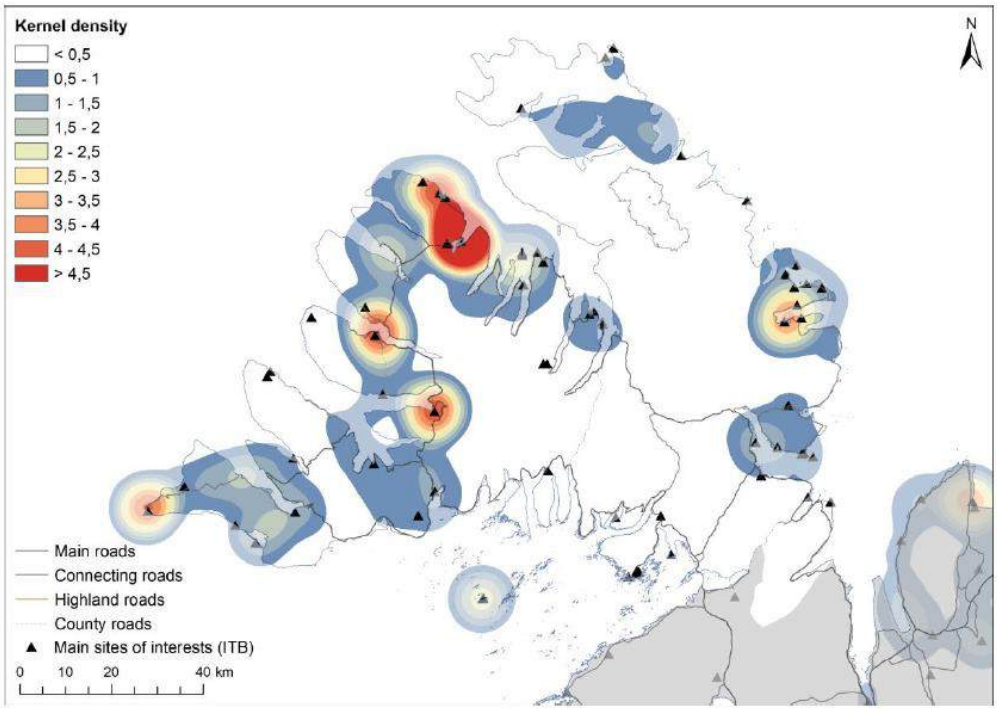

Figure 55. Density map of Flickr geodata in the Westfjords between 2004 and 2021, without duplicates, along with main sites of interest as identified by the Icelandic Tourist Board. Radius of 10 km.

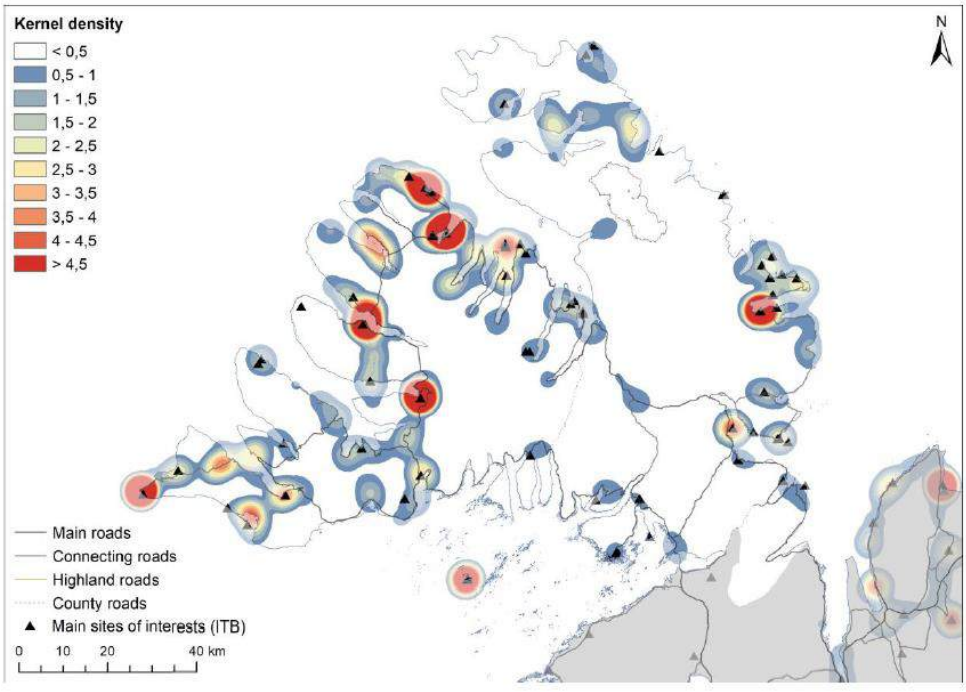

Figure 56. Density map of Flickr geodata in the Westfjords between 2004 and 2021, without duplicates, along with main sites of interest as identified by the Icelandic Tourist Board. Radius of 5 km.

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Over three quarters of these geotagged photographs are distributed within two kilometers of one of the main roads (Table 20, Figure 57). The majority are furthermore distributed within two kilometres of one of the main sites of interests (Table 20, Figure 58). The map with the distance from roads helps identifying wilderness remote destinations. The map with distances from main sites shows many clusters of points away from such sites, mostly along remote roads or mountain pass.

Table 20: Proximity analysis of Flickr data based on the distance to nearest features (roads and main sites) for the Westfjords (WF)

	<2 km	2-5 km	5-7,5 km	7,5-12,5 km	>12,5 km	TOTAL
To nearest road (WF)	5993	524	259	234	820	7830
% of total (WF)	*77%*	*7%*	*3%*	*3%*	*10%*	*100%*
To nearest main site (WF)	4365	1251	721	1096	397	7830
% of total (WF)	*56%*	*16%*	*9%*	*14%*	*5%*	*100%*

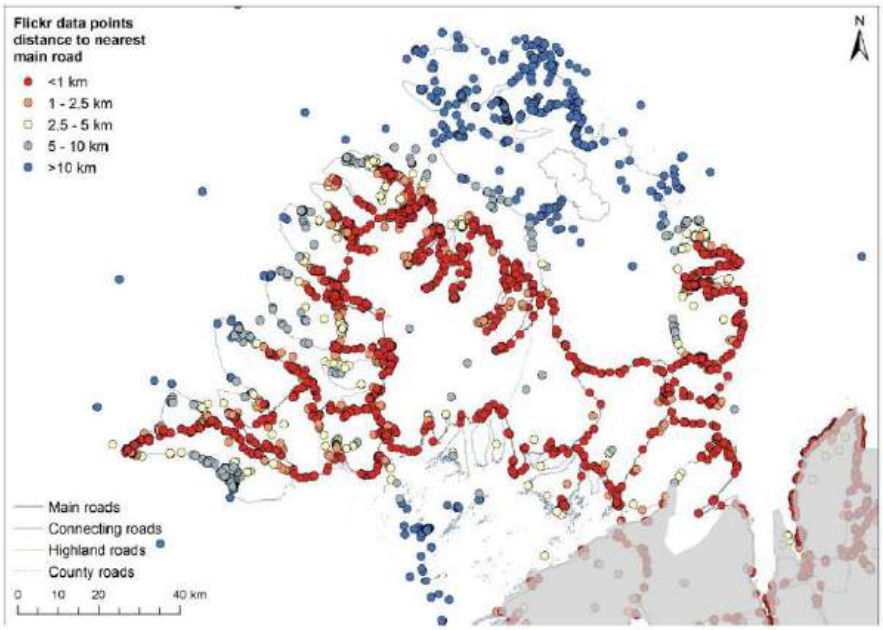

Figure 57. Distribution of Flickr data points classified by their distance to the nearest main/connecting road in the Westfjords.

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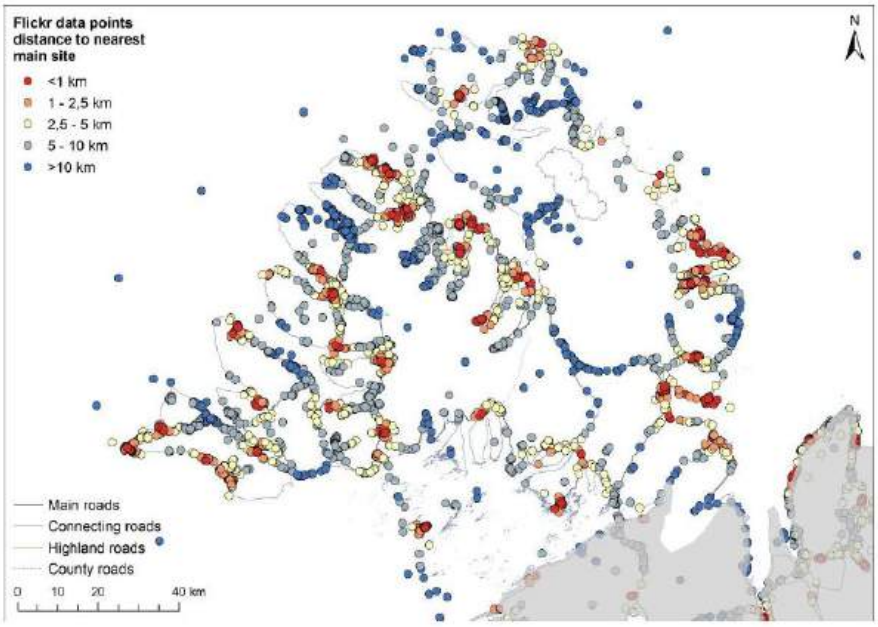

Figure 58. Distribution of Flickr data points classified by their distance to main sites in the Westfjords.

4.3.2.4.2 Seasonal variations

When looking at the seasonality and comparing the Westfjords to the whole of Iceland it is clear that seasonality remains a big challenge for tourism in the Westfjords with most tourists visiting the area over the three summer months, i.e. June, July and August (Figure 59).

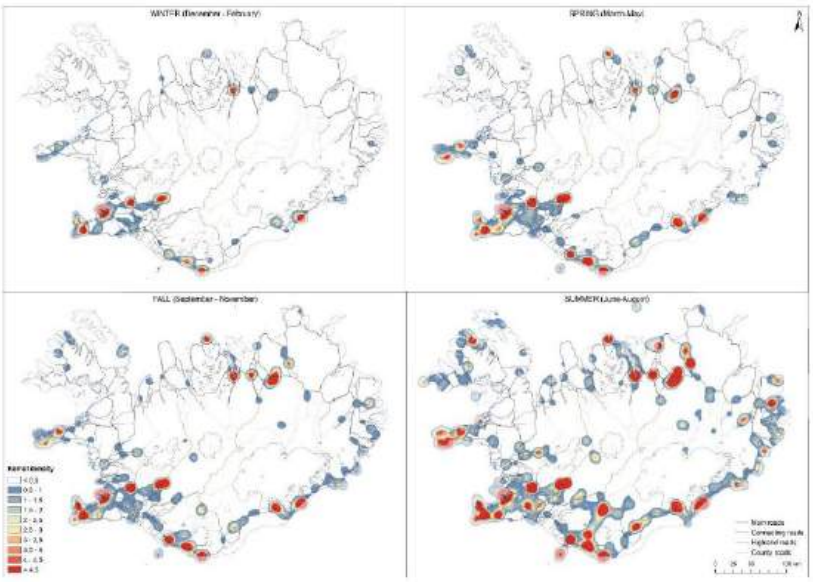

Figure 59. Density maps of seasonal Flickr data in Iceland.

When looking at the density change between residents and visitors the biggest visitors' sites in the Westfjords remain the township Ísafjörður, Dynjandi waterfall and Látrabjarg bird cliff (Figure 60).

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Apart from Látrabjarg, other popular visitor sites within the Westfjords hub study area are Rauðisandur, Kollsvík and Patreksfjörður. Results from content analysis of the Flickr photos tags support this and emphasize that tourists visiting the Westfjords come for the nature, wilderness and wildlife (Figure 61).

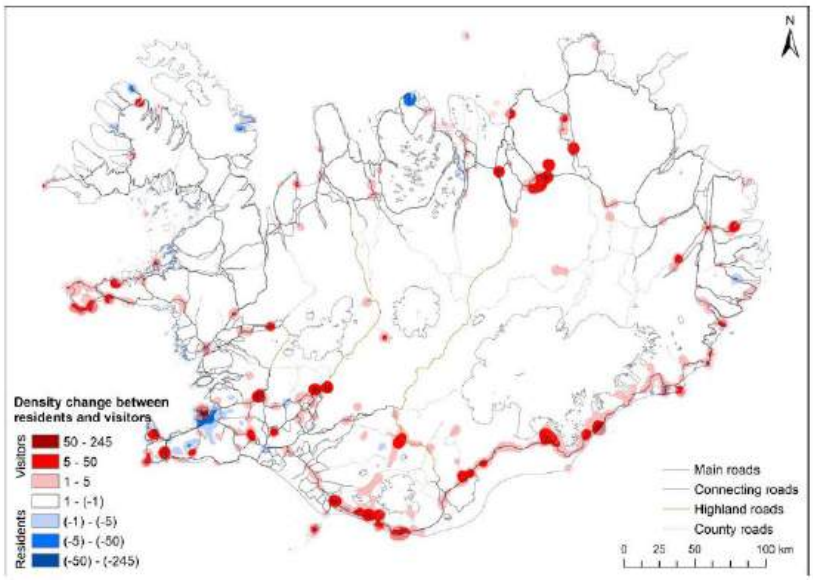

Figure 60. Flickr density of residents and visitors in Iceland. Radius of 5 km.

Figure 61. Wordcloud based on frequent words in Flickr data titles in the Westfjords.

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4.4 Varangerfjord

The coastal zone in the north is distinctive with large fish and shellfish resources and a great potential for value creation for other marine industries like aquaculture, tourism, offshore windmill plants and mining. The precondition for sustainable business development in the north is that different industries can live well side by side in the coastal zone. What is seen is that there is often a conflict about the use between existing and new industries. The level of conflict between the various players in the coastal zone can be high at times. There is therefore a need for knowledge that sheds light on the various conflicts, obtain new knowledge about the pros and cons related to environmental impact, as well as find synergies that help to create better dialogue between the different actors in the coastal zone.

The Varangerfjord (Northern Sami: Várjavuonna, Kven: Varenkinvuono, Finnish: Varanginvuono) is the easternmost fjord in Norway. The fjord is located in Troms og Finnmark county between the Varanger Peninsula and the mainland of Norway. The fjord flows through the municipalities of Vardø, Vadsø, Nesseby, and Sør-Varanger. The fjord is approximately 95 kilometer's long, emptying into the Barents Sea. Its mouth is about 70 kilometers wide, located between the town of Vardø in the northwest and the village of Grense Jakobselv in the southeast (Fig 62). The fjord is 3200 square kilometers, while the main land and islands are 7267 km2.

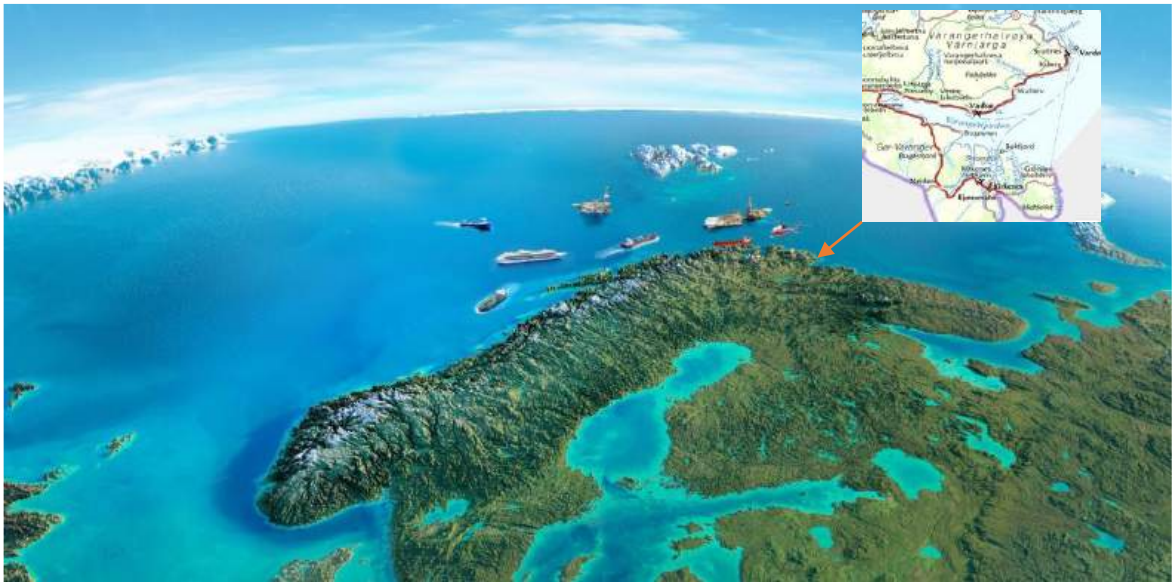

Figure 62. The location of the Varangerfjord Hub

4.4.1 Brief description of the hub

The aquaculture and tourist hub in northern Norway is Varangerfjord. Varangerfjord is part of the Troms & Finnmark County. There are 4 municipalities in Varangerfjord HUB populated with 21 413 inhabitants (year 2021). The municipalities are Sør-Varanger, Vadsø, Vardø og Nesseby.

In Troms and Finnmark there are 241,680 people per. 30.06.2021 with an average age of 41 years. In 2010, the population in Troms and Finnmark accounted for 4.7% of the country's population, in 2021 the population in Troms and Finnmark accounted for 4.5% of the country's population, and since the beginning of 2021 we have had a decrease in the population in the region of 0.2 %.

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The Varanger HUB population development in the four municipalities have been up and down except for Vardø. The development in habitants in Vardø have declined from over 4000 around year 1970 to under 2000 in year 2021. The total population in 2022 are 18244 inhabitants. The region eastern Finnmark have 26414 (Figure 63).

Despite this, forecasts for the future show that the population in the region will grow further towards 2040. In 2040, the average age in Troms and Finnmark will be 44 years, while the rest of the country will have an average age of 43 years.

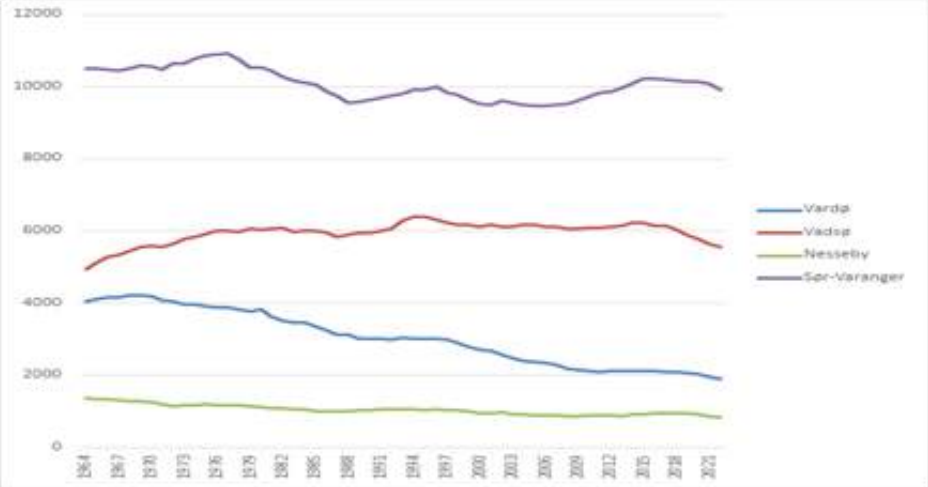

Figure 63. Varangerfjord hub population development. Source: Troms and Finnmark County Municipality

4.4.2 Tourism Industry

At the Varanger website this headliner is prominent, and describes different reasons to come and visit the area:

"In the far north and as far east as you can go in Norway, where the sky meets the sea, lies Varanger, bathed in the midnight sun and the northern lights of winter. Here the wild landscape meanders through bird-nesting cliffs, fishing villages, and rugged headlands – out to the end of the world.

Nature offers rivers teeming with fish, snow-clad plains, exotic king crabs, birds breeding in spring, leaping salmon, the shining sea, and dancing northern lights. People and traditions make Varanger an Arctic melting pot of communities and cultures. Varanger is a different experience. Scenery and settlements, the light, the colours, the lofty sky and wide horizon, exciting activities – and the open people." (www.visitgreaterarctic.com, date 09.09.2022)

The tourism industry is characterized as one of the land-based industries in North-Norway with the greatest value creation potential, with an estimated value creation of NOK 7.5 billion in 2020. This was a decrease of 23% from 2019. Troms and Finnmark had a decrease of 47% and 33%, while Nordland had an increase of 13%. Svalbard had a decrease of 50%

Like 2020, the tourism industry in the north was strongly affected by the corona pandemic. Statistics show large regional differences in relation to how the corona pandemic has affected the tourism industry's value creation in the north. It appears that the tourism industry in Troms and Finnmark and on Svalbard has been hardest hit.

Tromsø and Svalbard were the two regions that were hardest hit, with a decrease in value creation from 2019 to 2020 of respectively 53.8% and 50.1%. Other parts of Troms and Finnmark, as well as

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Lofoten, were also negatively affected by the pandemic. (NHO Reiseliv Regionforening Nord-Norge 2021)

The report states that it will take time before the biggest actors (Avinor, Hurtigruten, and atractions) will be back to the results are at before Covid 19 level. The last two years have been difficult, but the figures shows a nice overall increase in 2022.

The most important players in tourism are:

- accommodation and food service establishments
- transport companies
- mediation – travel agencies and tour operators
- attractions, activities, culture and experiences
- trade and service companies
- counties and municipalities, as actors and managers
- the tourism joint organisations

4.4.2.1. Employment

The figures for employment in the tourism industry had a clear decline in 2020, but have rised again to approximately the same level for all categories. Although some of the categories have a decline e.g. Transport with -7.6% compared to 2017.

Table 21 Employment in the tourism sector in north Norway 2017-2021 (source: NHO Reiseliv, 2021)

Tourism type	Employment North Norway					
	2017	2018	2019	2020	2021	2017-2021
Accommodation business	4 077	4 081	4 165	3 006	3 917	-3,9 %
Serving businesses	6 189	6 350	6 487	5 602	6 429	3,9 %
Culture and entertainment	1 684	1 743	1 777	1 535	1 835	9,0 %
Dissemination	619	701	761	445	635	2,6 %
Transport	6 071	6 108	6 070	5 753	5 607	-7,6 %
Sum	18 640	18 983	19 260	16 341	18 423	-1,2 %

The figures for Troms and Finnmark County shows a stronger decline in employment with more than 1000 fewer employees in the tourism business compared to 2019.

Table 22 Employment in the tourism sector in Troms and Finnmark - 2017-2021 (source: NHO Reiseliv, 2021)

	Employment in Troms and Finnmark County					
	2017	2018	2019	2020	2021	2017-2021
Accommodation business	2 159	2 165	2 221	1 515	1 925	-11 %
Severings business	3 462	3 553	3 619	3 112	3 505	1 %
Culture and entertainment	952	1 045	1 083	864	1 013	6 %
Dissemination	406	476	530	287	437	8 %
Transport	2 764	2 755	2 874	2 435	2 397	-13 %
Sum	9 743	9 994	10 327	8 213	9 277	-5 %

Tromsø has the biggest decline (-53,8%) from 2019 to 2020 with 1.2 billion NOK. Other regions have a nice increase in value creation like the northern part of Nordland County, Vesterålen/Narvik and the

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southern part of Nordland the region Helgeland. The increase in Vesterålen/Narvik was 87.6% while Helgeland achieved 14%.

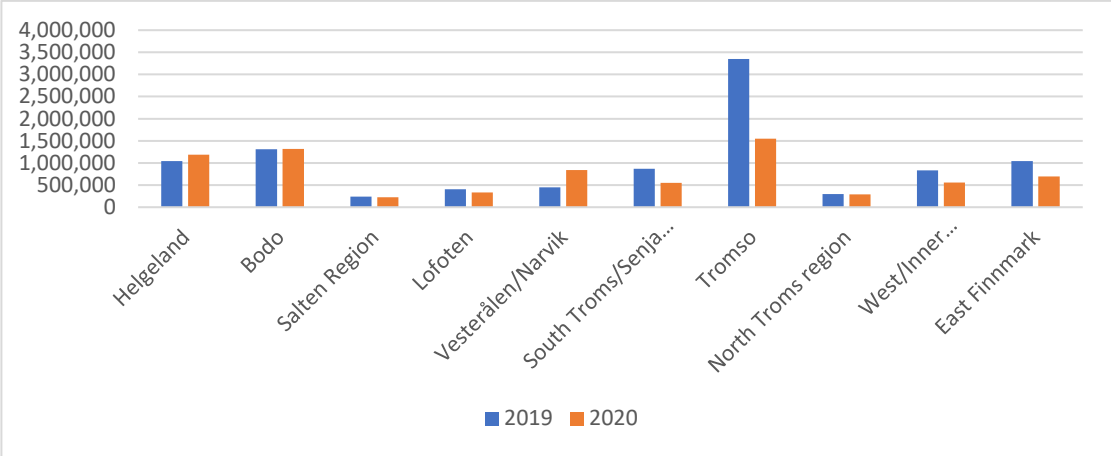

Figure 64. Value creations in the tourist regions north of Norway (in NOK 1000 current prizes) (source: NHO Reiseliv, 2021)

4.4.2.2 Accommodation for visitors (overnight stays, hotels and other accommodation)

The development in number of commercial overnight stays at hotels, campsites/cabin hamlets and hostels, county-wise distribution in Nordland, Troms and Finnmark shows a clear decline both for Finnmark (-25,4 % from 2017 to 2021) and Troms (-29,4%). Nordland has a minor decrease, -4.1%. If we compare 2020 with 2021 we see a positive development for all three counties.

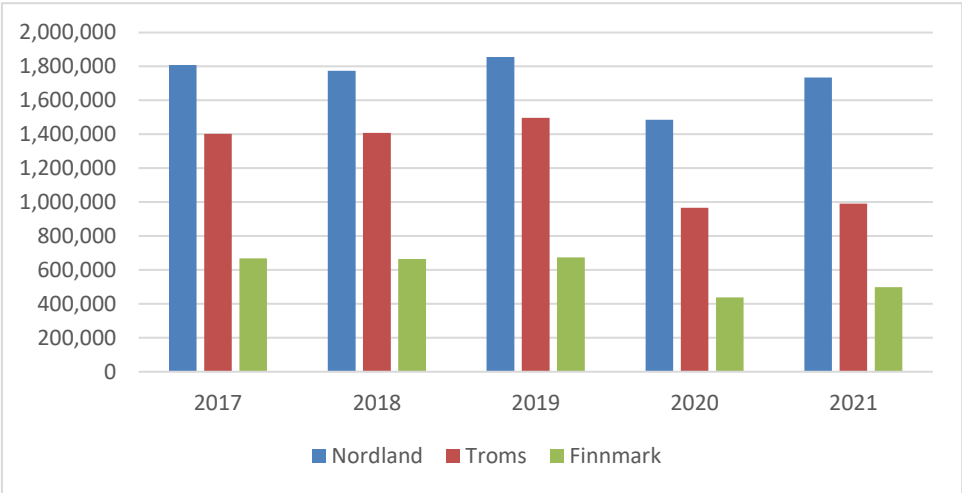

Figure 65. development in number of commercial overnight stays at hotels, campsites/cabin hamlets and hostels, county-wise distribution (source: NHO Reiseliv, 2021)

The overall figures for commercial overnight stays in Norway and Northern Norway show a clear decline before covid (2019). The relative part for northern Norway is stable around eleven/twelve percent of total Norway.

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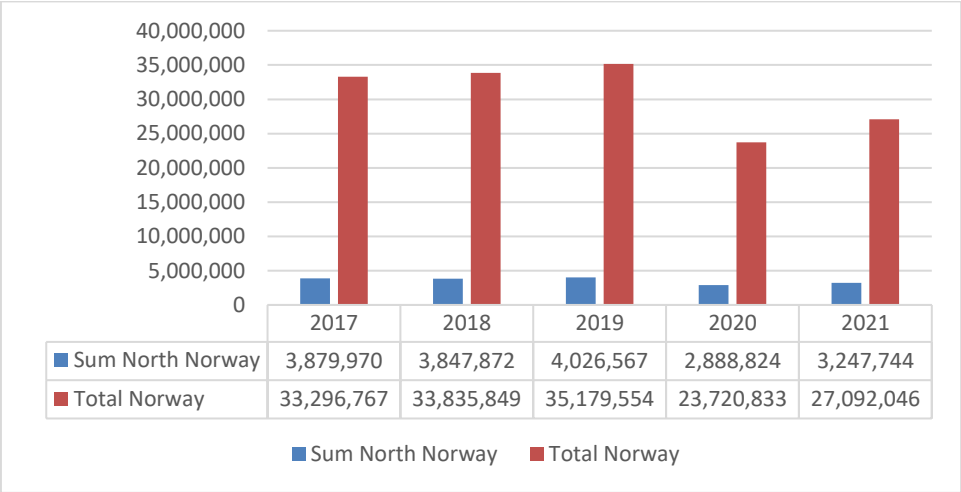

Figure 66. Overnights in northern norway compared with Norway (source: NHO Reiseliv, 2021)

Number of commercial foreign overnight stays at hotels, campsites/cabin hamlets and hostels have a clear decline, especially from 2019 to 2021. Finnmark had the largest decline with 64.7% in 2021 compared to year 2017. Both Troms and Nordland has a substantial decline due to the pandemic.

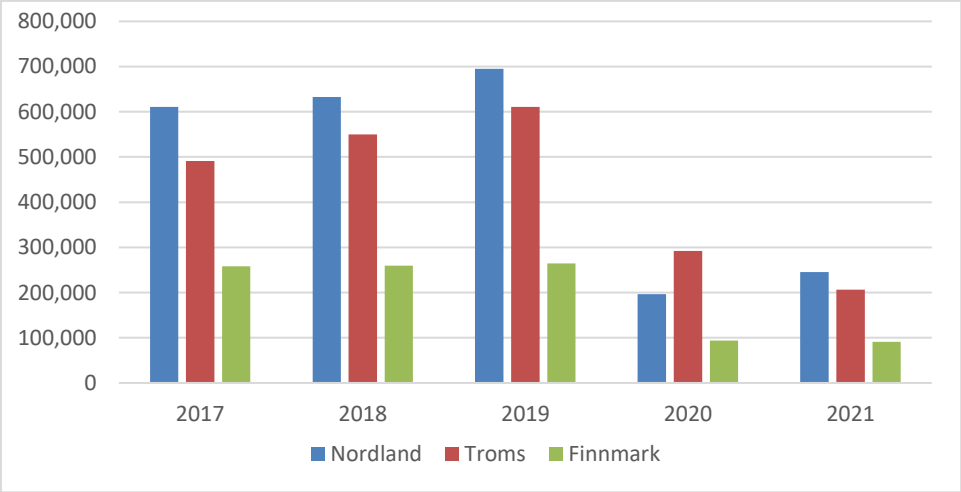

Figure 27. Number of commercial foreign overnight stays at hotels, campsites/cabin hamlets and hostels – northern Norway

Commercial foreign overnight stays at hotels, campsites/cabin hamlets and hostels in North Norway. Largest markets – summer (period May to September 2021) and winter period (period October 2021 to april 2022). Visitors from Germany are dominant in northern Norway followed by Finnish and Swedish tourists.

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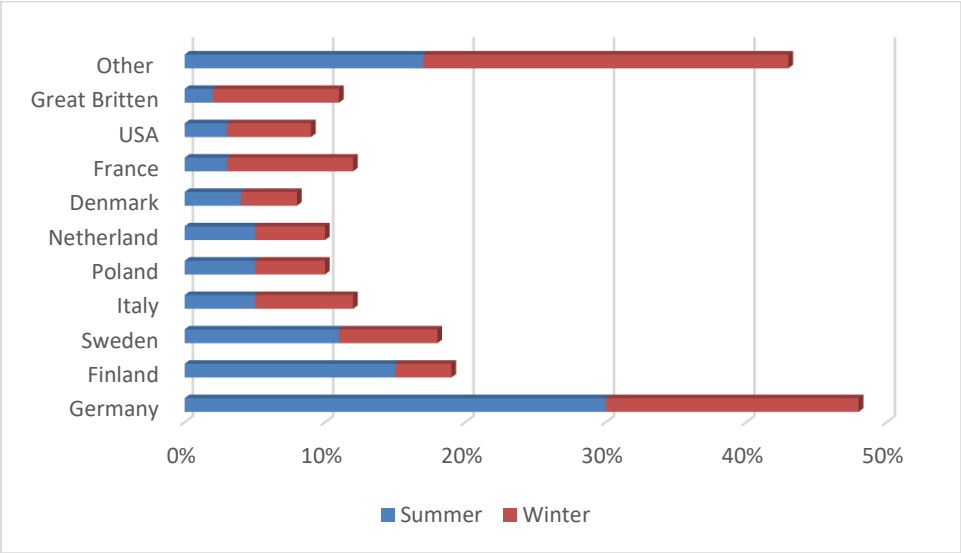

Figure 68. Tourist by country visiting northern Norway summer 2021 and winter 2022

Benchmark on the north calotte shows that northern Norway have most total overnight stays. The development is shown Table 23. There is a positive trend from a decline in to the change from 2020 to 2021.

Table 23 Development in overnight stays in north calotte region (source: NHO Reiseliv, 2021)

	2017	2018	2019	2020	2021	Change 2017-21	Change 2020-21
Northern Norway	3 879 970	3 847 872	4 026 567	2 888 824	3 247 744	-16,30 %	12,40 %
Norrbotten	2 410 053	2 516 200	2 666 676	1 740 818	2 030 262	-15,80 %	16,60 %
Lapland	2 909 073	2 995 837	3 121 782	2 052 441	2 345 237	-19,40 %	14,30 %
Sum	9 199 096	9 359 909	9 815 025	6 682 083	7 623 243	-17,10 %	14,10 %
Northern Norway's share	42,20 %	41,10 %	41,00 %	43,20 %	42,60 %	0,40 % Points	-0,60 % Points

4.4.2.3 Passenger transport (air, railway, water, road)

Aviation is an important transport activity. In Figure we see an overview of passengers in Finnmark. It is a decrease from 1.2 million passengers to different airports in Finnmark. 2020 was clearly very low with totally 686 thousand passengers. After the pandemic the figure raised to 854 thousand, an increase of 24,5 %.

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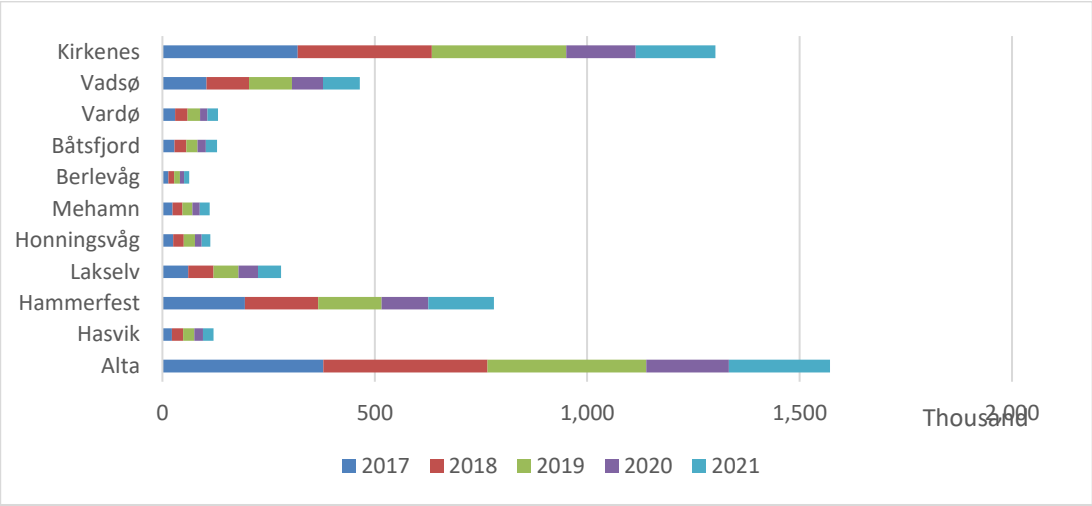

Figure 69. Aviation - scheduled, offshore and charter traffic including transfer and transit (source: NHO Reiseliv, 2021)

Cruise

In total, there were 112 cruise ship calls in North Norway in 2021, which is an increase of 111.3% compared to 2020. 47,228 passengers to port represent an increase of 10.8%. The number of passengers per port call in northern Norwegian ports has decreased by 47.5% from 2020 to 2021. In the period from 2017 to 2021, the number of calls in the northern Norwegian ports has decreased by 68.0%, while the number of passengers to port has decreased by 87.5%. Longyearbyen had no cruise calls/cruise passengers to port in 2021, i.e. a decrease of 100% from 2017. (NHO Reiseliv 2021)

Table 21 Number of calls in northern Norway ports (source: NHO Reiseliv, 2021)

	2017	2018	2019	2020	2021	Change 2017-21	Change 2020-21
Alta	18	18	27	15	12	-33,3 %	-20,0 %
Bodø	13	17	26	5	4	-69,2 %	-20,0 %
Brønnøysund	18	20	17	3	16	-11,1 %	433,3 %
Hammerfest	17	16	18	0	0	-100,0 %	
Harstad	4	8	3	0	1	-75,0 %	
Lofoten	74	115	84	0	28	-62,2 %	
Narvik	3	14	20	6	2	-33,3 %	-66,7 %
North Cape	96	100	99	4	22	-77,1 %	450,0 %
Tromsø	103	116	121	18	27	-73,8 %	50,0 %
Vesterålen	4	6	7	2	0	-100,0 %	-100,0 %
Sum North Norway	350	430	422	53	112	-68,0 %	111,3 %

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Table 25 Numbers of passengers (source: NHO Reiseliv, 2021)

	2017	2018	2019	2020	2021	Change	Change
Alta	20 428	26 641	33 436	14 608	3 112	-84,8	-78,7
Bodø	11 808	16 875	30 549	5 798	1 522	-87,1	-73,7
Brønnøysund	3 556	5 228	2 879	300	3 650	2,6 %	1116,7
Hammerfest	18 000	13 788	21 102	0	0	-100,0	
Harstad	2 632	6 210	4 500	0	0	-100,0	
Lofoten	64 405	78 141	88 736	0	27 567	-57,2	
Narvik	1 943	9 264	23 142	3 720	900	-53,7	-75,8
North Cape	123 476	138 544	143 717	3 658	4 842	-96,1	32,4 %
Tromsø	125 680	142 348	155 160	12 370	5 635	-95,5	-54,4
Vesterålen	4 561	7 717	7 446	2 152	0	-100,0	-100,0
Sum North	**376 489**	**444 756**	**510 667**	**42 606**	**47 228**	**-87,5**	**10,8 %**

Hurtigruten Norway sails from Bergen to Kirkenes on a daily basis. The route takes 11 days, operated with 7 ships. 7 days of the coastal route are in Nordland and Troms and Finnmark county.

Table 22 Passengers numbers from and until to ports in Troms and Finnmark county (the column from/to summarizes) (source: NHO Reiseliv, 2021)

	Total 2018			Total 2019			Total 2020			Total 2021		
	From	Until	From/To	From	Until	From/To	From	Until	From/To	From	Until	From/To
Harstad	12 646	5 995	18 641	10 340	6 144	16 484	2 957	2 294	5 251	2 399	2 077	4 476
Finnsnes	6 841	2 987	9 828	6 831	2 992	9 823	2 015	1 208	3 223	1 771	1 285	3 056
Tromsø	34 231	42 804	77 035	30 104	33 212	63 316	12 157	12 908	25 065	10 724	10 328	21 052
Skjervøy	6 370	7 012	13 382	3 626	3 195	6 821	912	789	1 701	794	739	1 533
Øksfjord	5 272	5 389	10 661	1 388	1 467	2 855	541	525	1 066	521	522	1 043
Hammerfest	12 070	6 988	19 058	6 658	5 252	11 910	2 683	2 346	5 029	2 314	2 087	4 401
Havøysund	1 803	1 835	3 638	1 576	1 795	3 371	783	913	1 696	551	827	1 378
Honningsvåg	6 959	7 459	14 418	4 824	5 578	10 402	2 081	2 474	4 555	1 865	2 433	4 298
Kjøllefjord	2 722	2 500	5 222	2 060	2 033	4 093	772	876	1 648	696	889	1 585
Mehamn	1 329	1 066	2 395	1 162	961	2 123	390	332	722	380	356	736
Berlevåg	611	624	1 235	663	641	1 304	290	272	562	283	303	586
Båtsfjord	1 079	1 036	2 115	975	890	1 865	407	577	984	334	331	665
Vardø	1 362	2 190	3 552	1 306	1 672	2 978	553	532	1 085	551	818	1 369
Vadsø	4 104	525	4 629	3 283	495	3 778	711	250	961	598	222	820
Kirkenes	28 611	43 798	72 409	27 239	39 952	67 191	6 416	9 595	16 011	5 362	7 581	12 943
Troms & Finnmark	126 010	132 208	258 218	102 035	106 279	208 314	33 668	35 891	69 559	29 143	30 798	59 941

The tourist activity in the Varanger HUB is important to the area. It consists of many traditional activities and attractions that are present in both in Lappland and Northern Sweden. One of the special activities in Varangerfjord is Sea Fishing Tourism. It is an important activity in many small communities and create both ripple effects and employment. Many young people work within this industry.

4.4.2.4 Fishing tourism in Troms and Finnmark

Since 2018, the Directorate of Fisheries has kept statistics on catches and landings of fish at Norwegian fishing tourism companies. In 2019, a catch of 2.49 million fish was registered at these companies, of which 40 % were released again while the rest, 1.49 million fish, were brought ashore (Directorate of

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Fisheries, 2021). Just over 95% were cod and saithe, and the number of fish registered increased by about 5% from 2018 to 2019. In 2020, activity in the industry fell sharply back as a result of the COVID-19 situation with infection measures and travel restrictions, and a total of 654,000 fish were caught, a decrease of 74% from the previous year.

In 2019, 318 000 fish were caught at 46 different tourist fishing companies in Finnmark. This was a decrease in the number of fish of 3% from 2018. In 2020, the catch fell to 65,500 fish, down 79% from the previous year, with registered activity at 38 companies. The five municipalities in Finnmark with the most activity and the largest number of companies are Hasvik, Loppa, Måsøy, Alta and Nordkapp. These house 80% of the tourist fishing companies in the region, and 80-90% of the registered catch is taken there (Robertsen et. al., 2022). A large proportion of the companies engaged in fishing tourism in Troms and Finnmark are sole proprietorships. The county has 164 companies registered in fishing tourism, of which 60 are sole proprietorships and 104 are limited companies. At country level, there are 1110 companies registered in fishing tourism, of which about 65 per cent are sole proprietorships.

Characteristics of fishing tourists in Troms and Finnmark

The nationality of the fishing tourists as well as the number of guests and guest nights at the fishing tourism companies are presented in the figure below shows the distribution of fishing tourists' nationality within the old counties of Troms and Finnmark.

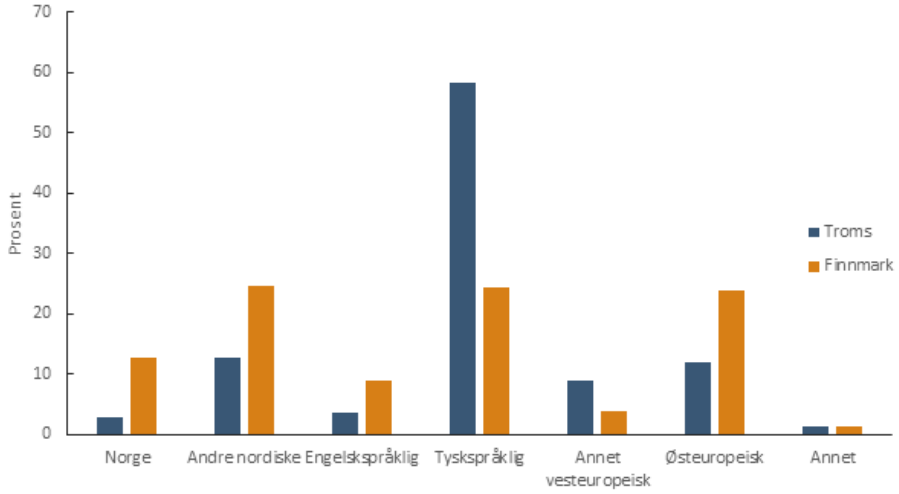

Figure 70. Distribution of fishing tourists' nationality (Source: Menon Economics), from left (Norway, Other Nordic tourist, English, German, Other western Europe, Eastern Europe, other)

The figure shows that there is a significantly higher proportion of German-speaking fishing tourists in Troms than in Finnmark. Almost 60 per cent of fishing tourists in Troms are German-speaking, while the corresponding figure for Finnmark is about 24. In Finnmark, the proportion of Norwegian and other Nordic tourists is higher, in total about 40 per cent. The corresponding figure for Troms is about 16 per cent. The proportion of Eastern European tourists is also higher in Finnmark, 24 per cent compared with 12 per cent in Troms.

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The number of guests at the fishing tourism companies can be divided into guests who stay overnight as well as guests who stop by without accommodation. The figure below shows the estimated number of guest nights and the number of guests (regardless of length of visit) for Troms and Finnmark.

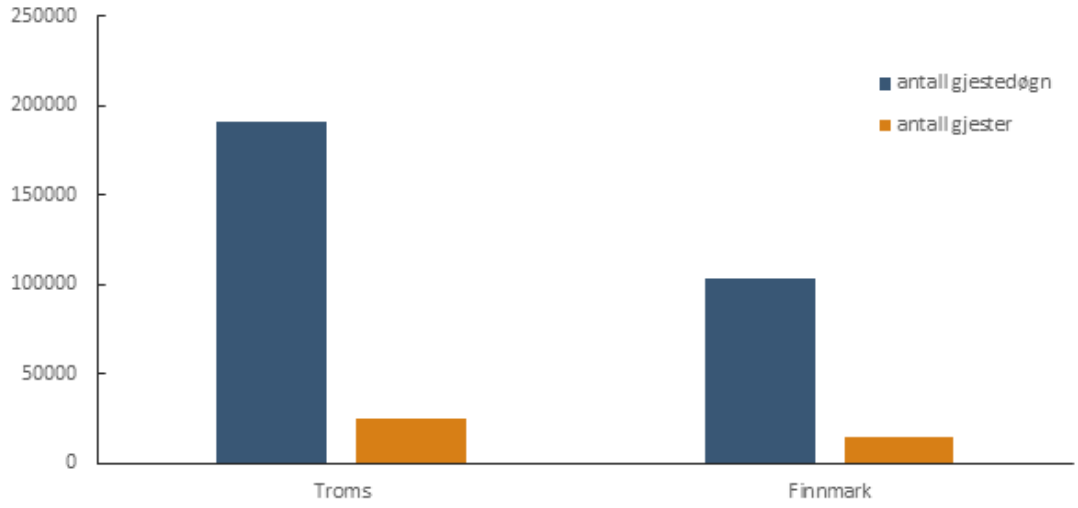

Figure 71. Number of guests and guest nights related to fishing tourism in Troms and Finnmark in 2019 (Source: Menon Economics)

The estimated number of guest nights in fishing tourism in Troms and Finnmark is in the order of 190 000 and 100 000 respectively. The overnight guests stay on average for 7 nights, but there are also some visitors at some fishing tourism companies that do not take advantage of the accommodation offered. The estimated number of guests who have visited the companies associated with fishing tourism is approximately 25,000 and 14,000, respectively.

Employment

We find that the total employment effects of fishing tourism in Troms and Finnmark in 2019 were about 330 man-years. This is shown in the figure below.

In total, there are 190 man-years directly and indirectly linked to the fishing tourism companies in the old Troms county. In Finnmark, the corresponding figure is 140 full-time equivalents. A total of 280 man-years come from direct effects and 50 from indirect effects. In addition, the fishing tourism industry in Troms and Finnmark lays the foundation for 75 man-years in the rest of the country.

The largest fishing tourism municipalities are Senja, Tromsø, Harstad, Karlsøy, Lyngen, Nordreisa, Hasvik and Båtsfjord, all of which have employment effects of between 20 and 60. If we instead look at the relative effects, the effects are greatest in Hasvik, Loppa, Ibestad and Karlsøy, where the employment effects as a share of private employment are more than 2.5 per cent.

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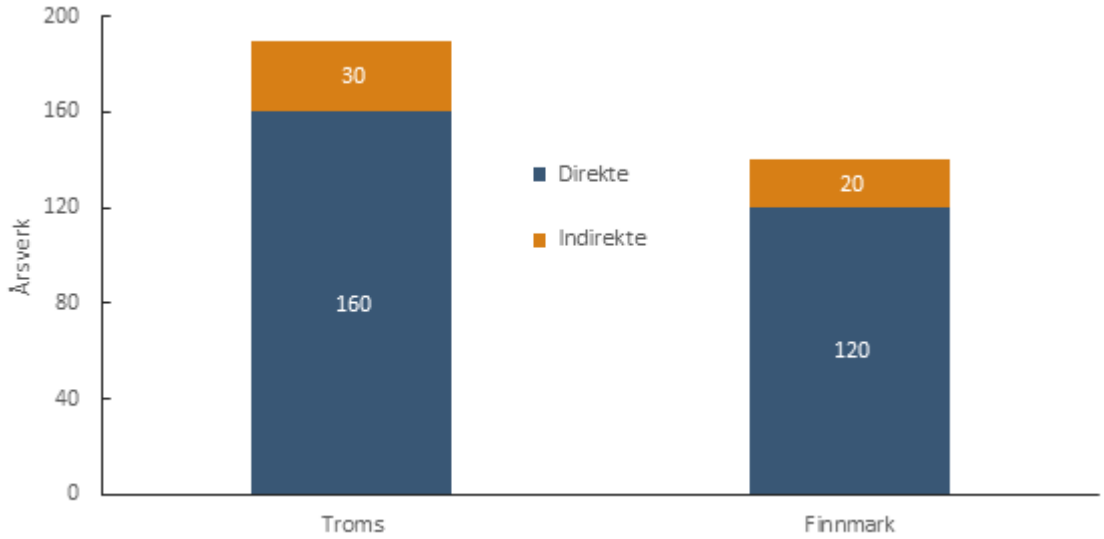

Figure 3 Employment effects in Troms and Finnmark respectively from fishing tourism in 2019 (Source: Menon Economics) (blue – direct in the industry, indirect orange – employers created in other industries)

Ripple effects of fishing tourism in Troms and Finnmark

Overall, fishing tourism laid the foundation for 410 man-years in Troms and Finnmark counties in 2019. These are divided into 230 man-years in Troms and 180 in Finnmark.

280 man-years come from employees in the fishing tourism companies, while 80 man-years are employees in the tourism companies that are supported by the fishing tourist's consumption. The remaining 50 man-years are indirect effects from suppliers and subcontractors. In addition, we find that fishing tourism in Troms and Finnmark in 2019 laid the foundation for value creation of a quarter of a billion kroner in the county (Robertsen et. al., 2022)

Value creation

The fishing tourism results in value creation in the municipalities of Troms and Finnmark. Based on the Menon ripple effect model, we find total value creation effects of NOK 194 million in 2019. These are divided into direct and indirect effects as shown in the figure below.

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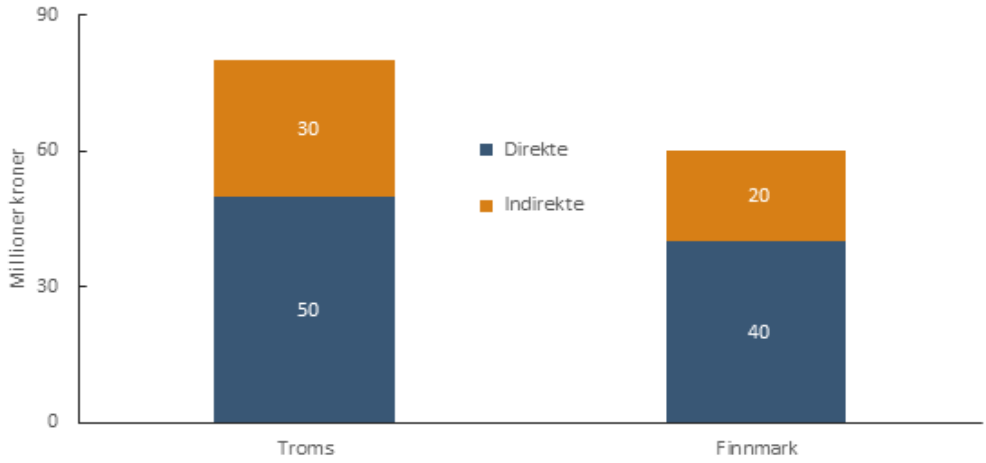

Figure 73. Value creation effects in Troms and Finnmark respectively from fishing tourism in 2019, Million NOK (Source: Menon Economics) (blue – direct in the industry, indirect orange – Value created in other industries)

These effects are distributed between NOK 80 million in Troms and NOK 60 million in Finnmark. In total, the fishing tourism companies had a value creation of NOK 130 million in 2019. In addition, they laid the foundation for value creation of NOK 50 million at their suppliers and subcontractors in the rest of Troms and Finnmark. The relationship between value creation and employment is a measure of how productive an industry is. For the activity in companies engaged in fishing tourism, we find productivity of NOK 460 000 per full-time equivalent, while among suppliers and subcontractors it is more than NOK 1 million.

Tourism in General – inside the Varangerfjord HUB

Available statistics for tourism in the HUB is not easy to obtain, we have data on the Eastern Finnmark region that includes the municipalities of Lebesby, Gamvik, Berlevåg, Deatnu - Tana, Båtsfjord, Vardø, Vadsø, Unjárga - Nesseby and South-Varanger. The last four municipalities is the Varangerfjord HUB sea and land area.

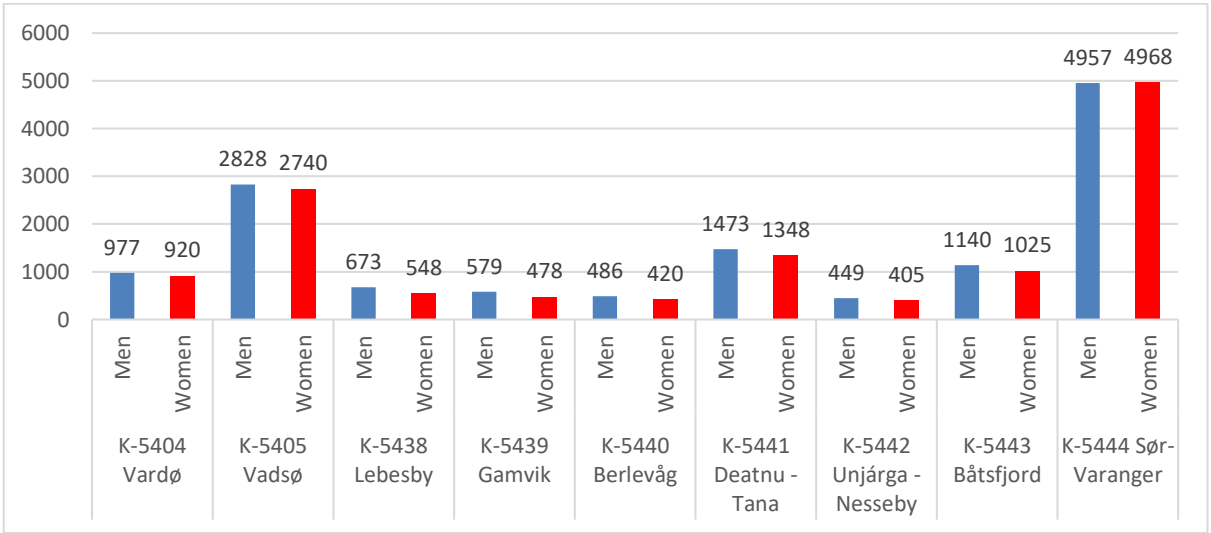

Figure 74. Population (year 2022) in Eastern Finnmark by municipalities. Source: Statistics Norway

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The total population in year 2022 in Eastern Finnmark is 26414 persons where 12852 are women. The Varangerfjord Hub have 69% of the region inhabitants. The biggest municipality is south-Varanger followed by Vadsø. We can assume that the statistics we show in on tourism are dominated by the municipalities in the Varangerfjord.

Table 27. Tourism Statistics in Eastern Finnmark region (2017-2021) (source: NHO Reiseliv, 2021)

Type of tourism statistics		2017	2018	2019	2020	2021	Change 2019-20	Change 2020-21
Number of commercial overnight stays at hotels, campsites/cabin hamlets and hostels	East Finnmark	168 235	171 945	171 331	112 166	116 705	-34,5 %	4,00 %
Number of commercial foreign overnight stays at hotels and campsites/cabin hamlets	East Finnmark	70 337	69 313	69 853	32 945	24 449	-52,8 %	-25,80 %
Number of total hotel guest nights	East Finnmark	139 013	140 906	136 340	84 183	92 802	-38,3 %	10,20 %
Number of foreign hotel guest nights	East Finnmark	53 901	52 183	49 431	21 525	16 299	-56,5 %	-24,30 %
Number of hotel guest days holiday and leisure	East Finnmark	73 330	76 137	75 109	42 834	43 292	-43,0 %	1,10 %
Number of hotel guest nights courses and conferences	East Finnmark	7 659	7 419	7 829	4 416	4 170	-43,6 %	-5,60 %
Number of hotel guest nights by profession	East Finnmark	58 024	57 350	53 402	36 933	45 340	-30,8 %	22,80 %
Capacity utilization room in hotels and similar accommodation establishments (per cent)	East Finnmark	52,5	55,1	51,3	35,8	39,5	-11,8	3,7
Achieved price per room sold at hotel and similar accommodation establishments (NOK)	East Finnmark	949	953	1 003	1 064	1 113	6,1 %	4,60 %
Lodging turnover per available room in hotels and similar accommodation establishments (NOK)	East Finnmark	499	525	515	381	439	-26,0 %	15,20 %
Sold room days Airbnb	East Finnmark	8 189	14 406	21 147	15 382	13 160	-27,3 %	-14 %
Sold room days hotel	East Finnmark	99 296	100 802	97 050	61 957	74 489	-36,2 %	20 %
Number of total overnight stays at campsites / cabin hamlets	East Finnmark	29 222	31 039	34 991	27 983	23 903	-20,0 %	-14,60 %
Number Foreign overnight stays at campsites / cabin hamlets	East Finnmark	16 436	17 130	20 422	11 420	8 150	-44,1 %	-28,60 %

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The overall impression is that after a clearly drop in tourism due to the pandemic. The figures shows a large decline on almost all measures from 2019 to 2021. The biggest decline was the hotel foreign guests stays with a 56,5%. The change from 2020 to 2021 shows a positive trend with better measures.

Table 28 Value Creation in the Varangerfjord HUB (Source: Asplan Viak)

	Value Creation 2019 (1000 NOK)			**Value Creation 2020 (1000 NOK)**		
	Tourism	Transport and communication	SUM	Tourism	Transport and communication	SUM
VARDØ	13 209	939	14 148	11 397	1 461	12 858
VADSØ	34 452	19 637	54 089	20 796	17 821	38 617
NESSEBY	4 658	0	4 658	6 350	0	6 350
SØR-VARANGER	139 014	777 379	916 393	76 101	528 727	604 828

Table 28 shows that Value Creation in the Tourist part of the HUB have a clear decline from 2019 to 2020 (the first year of the pandemic). This suits well compared to the other statistics for the region and the HUB. Signals and measures for 2022 shows an increase in Tourism visitors and activity and are slowly getting back to normal. This is positive, but the new black swan – the Russian invasion of Ukraine have large impact on the Varangerfjord HUB. Especially South-Varanger municipality have strong economic and cultural relations with the Kola Peninsula and Arkhangelsk.

4.5 Svalbard

4.5.1 Brief description of the hub

Svalbard is a high-Arctic Archipelago that is experiencing a rapid and multifaceted change: climate, industry, tourism, sea ice and glacier extent, terrestrial and marine biology, economic development, and population composition. Svalbard is strongly affected by changes in international markets, such as low coal prices and increasing interest from the tourist and fishing industries, which has resulted in a major change in economic activities in recent times. These changes have large impact on the population at large (nationalities, gender, age, professions), the economic system, infrastructure and environmental management.

The main settlements on the Spitsbergen islands are the Norwegian Longyearbyen and the Russian Barentsburg. Both are based on long traditions of State-owned coal mining. Other mining communities are now closed. Coal mining is no longer the main activity in the Norwegian settlements and will be faced out as soon as alternative energy sources for electricity supply are in place. Tourism and research/education are nowadays more important for employment. Increased interests from tourists, especially from the cruise industry, to experience the fragile Arctic nature, is already on the limit of sustainability.

Just under 30,000 tourists visit Longyearbyen in the course of a year. In addition to this, overseas cruise tourism accounts for about the same number, including crew. Svalbard has become a destination with varied and well-organized tourism. Despite visible growth, Svalbard tourism is still a small number. The traffic to Longyearbyen, for example, represents less than one percent of the total tourism on the North Calotte. (Eliassen n.d.)

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4.5.1.1 Longyearbyen

Longyearbyen is the world's northernmost town at 78°N (SSB 2016) and is the hub of administration, transportation, and business on the Svalbard Archipelago. It comprises the Governor's office, the University Centre on Svalbard (UNIS), diverse services and industries.

The settlement was established in 1906 as a "company town" where the Norwegian coal mining company, "Store Norske Spitsbergen Kulkompani," historically controlled most aspects of community life. With the onset of uncertainty about the future of coal production in the late 1980s, Longyearbyen began a period of transition toward tourism, education and research. A major reduction in coal mining activities occurred in 2017 due to the closure of the Svea Mine. This politically-guided transition is evident in the port of Longyearbyen, as mining-related shipping is steadily decreasing while research and tourism-related shipping activities consistently increase. (Olsen et al. 2020).

Table 29. Population and shipping trends in Longyearbyen (From Olsen et al. 2020).

Year	2000	2002	2004	2006	2008	2010	2012	2014	2016
Population in Longyearbyen and Ny-Ålesund[a]	N/A	1570	1581	1721	1821	2052	2115	2100	2152
Number of passengers	15,899	18,757	21,837	37,085	38,569	40,123	55,091	54,808	75,201
Number of ship calls, including	**166**	**505**	**490**	**799**	**771**	**814**	**812**	**1178**	**1542**
Tourism (passenger) vessels[b]	78	345	374	550	550	566	558	806	1099
Fishing vessels	50	43	20	27	21	8	15	30	32
Cargo vessels (incl. community supply)	5	29	20	78	54	60	52	67	51
Research	28	47	23	64	41	92	108	70	84
Coast Guard and the Governor's vessel	5	41	45	68	89	74	72	74	110
Pilot[c]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	96	142

Longyearbyen is today the northernmost place in the world with regular scheduled air traffic.
Source: Statistisk sentralbyrå 2019

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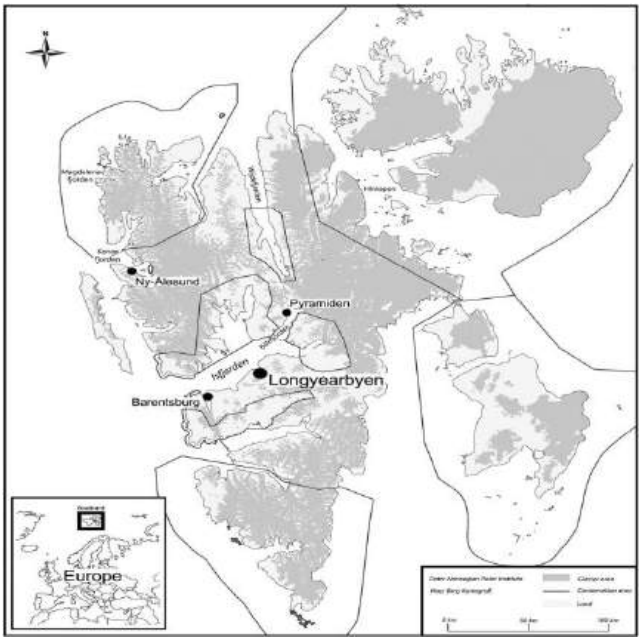

Figure 75. A map of Svalbard. (*Source: Olsen et al. 2020).*

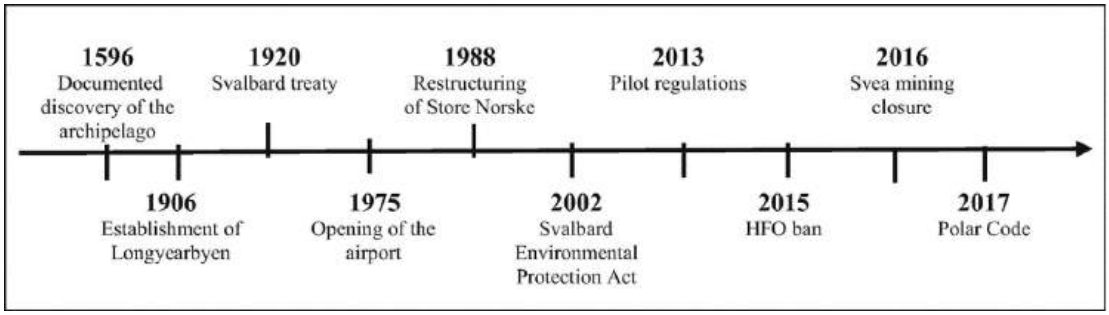

Figure 76. Timeline of historical events related to community and shipping development *Source: Olsen et al. 2020.*

4.5.1.2 Barentsburg

The settlement is almost entirely made up of ethnic Russians and Ukrainians. It is the second-largest settlement on the archipelago. This description of the Russian settlement is an English translation of the site description at the Visit Svalbard website.

Barentsburg is located 60 km west of Longyearbyen, and has its own coal power plant, hospital, hotel, school, kindergarten and culture and sports building. The city is also home to a research station adjacent to the Kola Science Center and the Russian Academy of Sciences, as well as one of Russia's two consulates general in Norway. Although the mining operations in Barentsburg are still operational, Trust Arktikugol has in recent years focused on tourism, and established the company Arctic Travel Company Grumant.

Accommodation in Barentsburg is possible at Pomor Hostel and Barentsburg Hotell, and dining is possible at Red Bear Bar & Brewery and Restaurant Rijpsburg with the Icebreaker Bar Krasin. In

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summer you can visit Barentsburg with day trip boats departing from Longyearbyen, and in winter you can participate in organized guided snowmobile trips there from Longyearbyen.

4.5.1.3 Norwegian sovereignty

Svalbard was long considered a so-called terra nullius - a land area where no state had sovereignty. The Svalbard Treaty was created as a result of the negotiations during the peace conference after the First World War and was signed in Paris in 1920. It confirms that Norway has sovereignty over Svalbard, and in 1925 Svalbard became part of the Kingdom of Norway. It is therefore Norway that gives and enforces laws and regulations on Svalbard. International agreements to which Norway is a party include Svalbard, unless a special exception has been made. According to the Svalbard Treaty, persons or companies from the currently 42 states that are parties to it have an equal right to conduct hunting, fishing and certain forms of business activities on the archipelago and in the territorial waters. [5]

4.5.1.4 Population dynamics

Since 1995 the population in Longyearbyen and New Ålesund has increased from 1,218 people to 2,552 in 2021. The opposite trend is taking place in Barentsburg, Pyramiden and Hornsund, where the population in 1995 was greater than in Longyearbyen, with 1,688 people. In 2021, only 388 people were still living in these areas. During the last nine years, the total number of people from Norway has remained the same, while the proportion from abroad has almost doubled. About one in three in Svalbard has foreign citizenship. The population increased during the period by 411 people, of which 409 were people from abroad. The settlements of Barentsburg and Pyramiden, as well as Hornsund, have increased by a total of 82 people in the same period. [6]

[5] https://www.ssb.no/svalbard/artikler-og-publikasjoner/fangst-forskning-og-gruvedrift
[6] https://www.ssb.no/befolkning/artikler-og-publikasjoner/flere-flytter-til-svalbard

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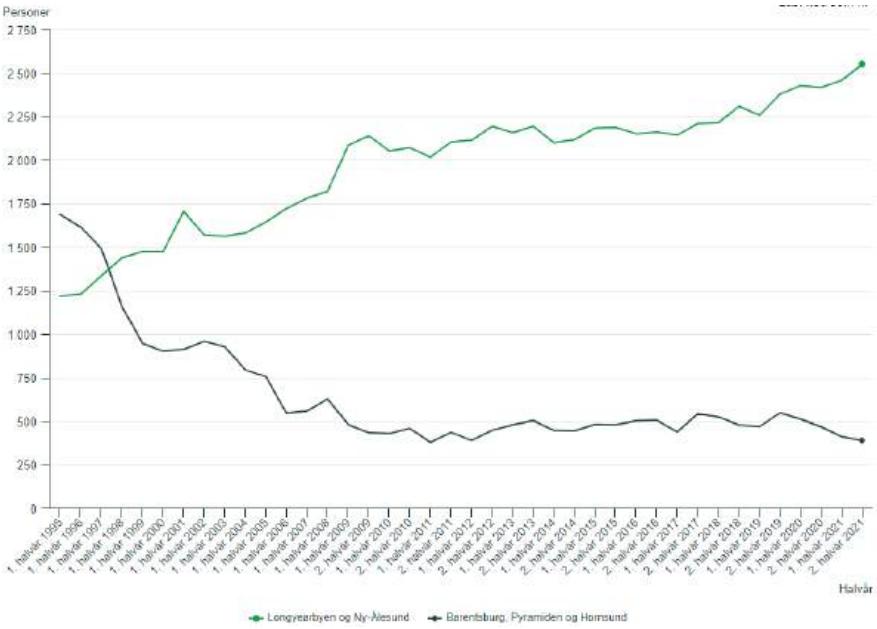

Figure 77. Inhabitants on Svalbard between 1995 and 2021. *Source: Statistisk sentralbyrå 2022.*

4.5.2 Tourism industry

Top ten activities in tourism industry on Svalbard in 2021 includes cruise tourism, dog sledding, scooter tours, food, and beverages, hiking trips, sightseeing and guiding, visiting mines, ATV trips, visiting ice caves, and watching northern lights (visitsvalbard.com). The following numbers on tourism also include the food and beverage-serving industry as Statistics Norway include this in their presentations of tourism and culture sectors.

4.5.2.1 Accommodation for visitors (overnight stays, hotels and other accommodation)

The number of overnight stays reached a record 166,801 guest days in 2019. The largest increase is linked to the holiday and leisure market. The number of overnight stays in this segment more than trebled from 2005 to 2019. The number of people attending courses/conferences rose steadily from 2005 through to 2018 but fell by two thirds in 2019 compared with the previous year. Since 2005, the number of overnight stays linked to business trips has fallen steadily, with the exception of 2018, which saw extensive construction work in Longyearbyen. The figures for overnight stays during 2020 are inevitably affected by the measures relating to the coronavirus pandemic which were introduced in March 2020. These measures resulted in a substantial fall in the number of overnight stays in Longyearbyen and we have to go back 20 years to find corresponding figures at the same level as in 2020.[7]

[7] https://www.mosj.no/en/influence/traffic/overnight-stays-longyearbyen.html

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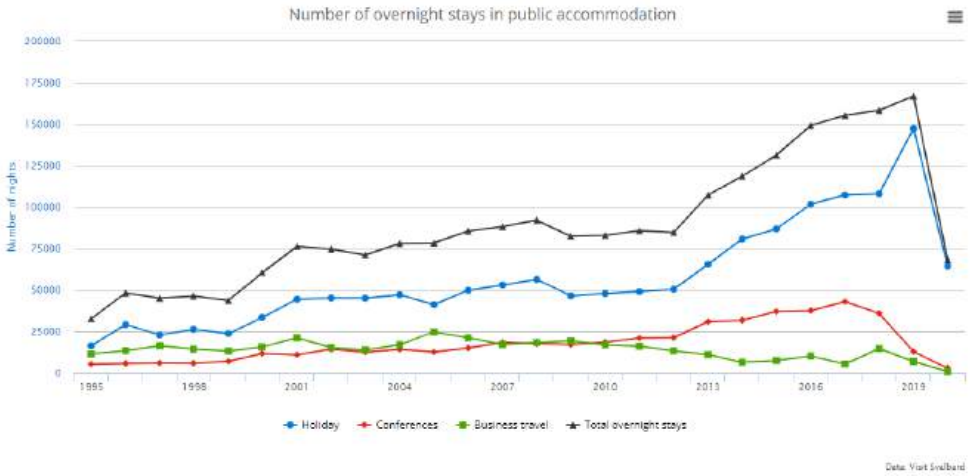

Figure 78. Number of overnight stays from 1995 to 2020.

4.5.2.2 Passenger transport (air, railway, water, road)

From 2009 to 2019 number of passengers in commercial flights has increased, from 52,788 to 92,187 passengers per year. There was a dramatic decrease in 2020 due to covid-19 but in 2022 the numbers are increasing, reaching 16,035 passengers in first quarter of 2022.

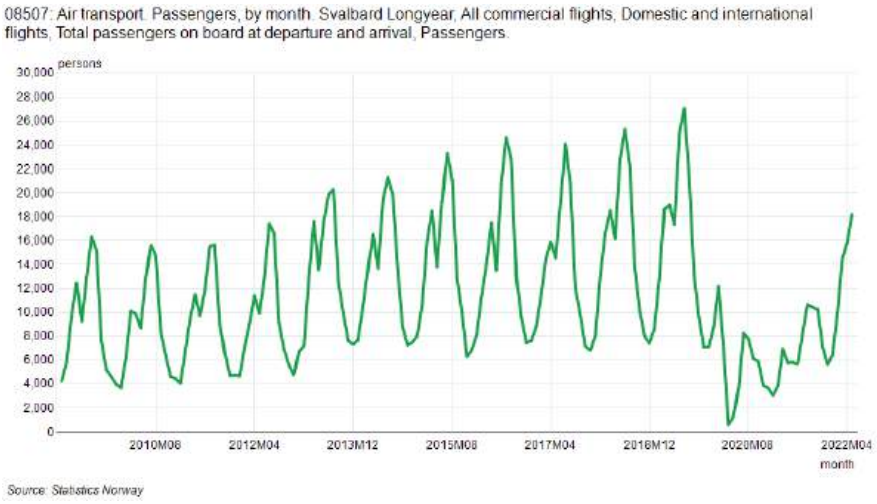

Figure 79. Air transport to and from Longyearbyen airport. Number of passengers per month from 2009 to 2022.

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Cruise tourism makes up a major part of tourism on Svalbard with a large number of operators and vessels. There are two main types – ocean-going cruise ships (luxury ships) and expedition cruise ships. In addition, several small vessels (research vessels) offer day trips in Isfjorden.[8]

Despite the industry's long history in Svalbard, statistics only go back to 1996. Prior to that, there was little cruise traffic and few operators. Most vessels sailed along the west coast or around Spitsbergen. The number of places where passengers were put ashore rose steadily from 1996 to 2000. More small expedition cruise vessels appeared on the scene and they began visiting new areas and landing at new places, including eastern Svalbard. However, the number of people put ashore remained reasonably stable. Since then, it has largely increased (figure 80). In 2019, 108,830 people went ashore in areas outside the settlements and Isfjorden, i.e., the fjord entering Longyearbyen. Isfjorden is much used for day cruises, often in open boats, and is therefore excluded from this data series. By 2020, the number had been reduced to 1,769 people. The low number in 2020 is due to the corona situation. (MOSJ 2021; Miljøstatus 2021).

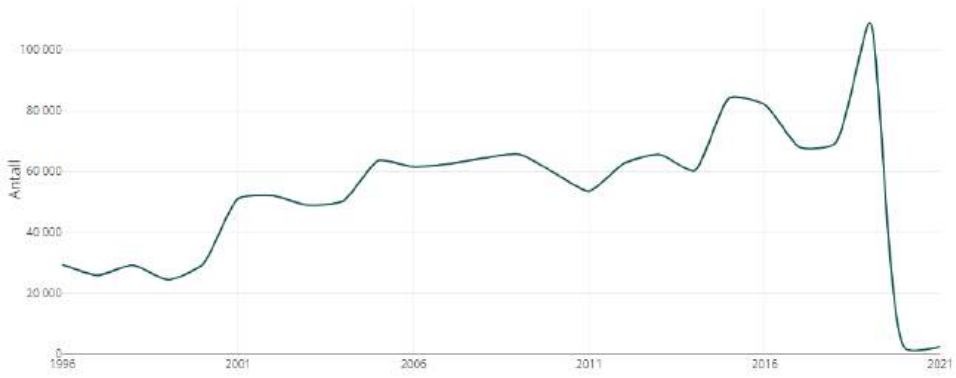

Figure 80. Number of people that have gone ashore in areas outside settlements and Isfjorden. *Source: Miljøstatus 2021.*

The graph below (Figure 81) provides evidence that cruise tourism is spreading to new areas. The number of landing sites for cruise ships and ships increased from 53 in 1996 to a preliminary peak of 224 in 2019. New cruises of the "Sail & Ski" type, offering summit trips with skis, have increased in recent years. These cruises put people ashore in completely different types of places than those traditionally visited by boat tourists. In 2020, cruise tourists only landed in 33 places. This low number is also due to the corona situation.

[8] https://www.expeditioncruise.net/arctic/svalbard-cruise/#tab-con-1

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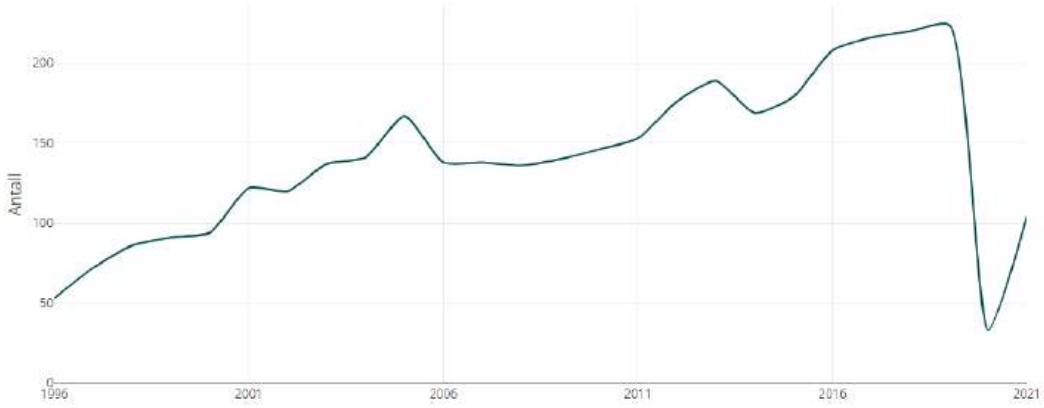

Figure 81. Number of places people have gone ashore in areas outside settlements and Isfjorden. *Source: Miljøstatus 2021.*

Port of Longyearbyen has reported number of calls and number of passengers from the port in years 2007 and 2012-2019.[9] The data includes cruise ships, passengers on cruise boats, expedition cruises and day trip boats and can also be separated into these different categories. In 2007, the number of calls from the port was 499. From 2012 to 2019 the numbers increased from 558 to 1474, which means an average annual increase of 38 %. Regarding number of passengers, this is in connection to number of calls from the port. The data includes passenger on cruise boats, expedition cruises and local day-trip boats and data can be separated into these different categories. In 2007, number of passengers was 31,756. From 2012 to 2019, the numbers increased from 55,091 to 87,977 passengers.

4.5.2.3 Number of tourism enterprises

Number of businesses is connected to the income from the industry. There was in total 46 businesses in 2008, peaking with 115 businesses in 2016 and a small reduction to 111 businesses in 2019. In 2020 there was again a small increase with 142 businesses registered. (Statistics Norway 2022d). The Covid-19 pandemic forced many of the smaller businesses to close, but there is yet no available statistics on the exact number of closed businesses

[9] https://portlongyear.no/wp-content/uploads/2020/02/Ba%CC%8Attrafikk_2007_2012-2019.pdf

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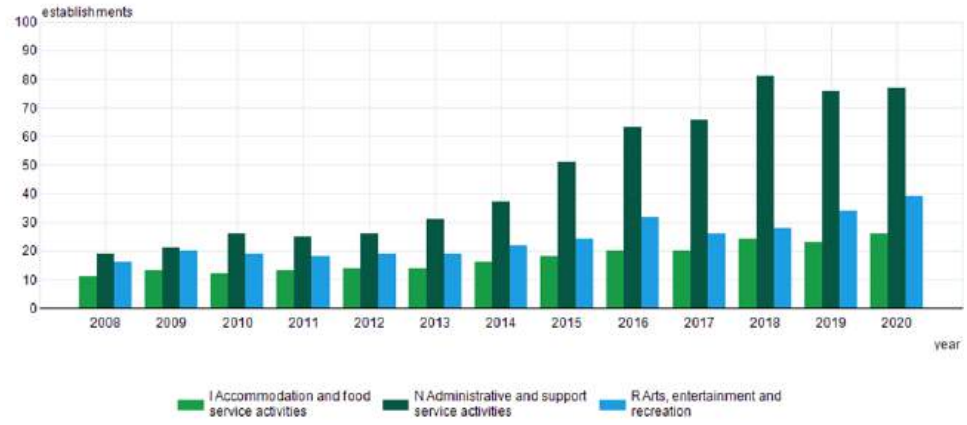

Source: Statistics Norway

Figure 82. Svalbard industry statistics. Number of businesses in tourism and culture sector. *Source: Statistisk sentralbyrå 2022d.*

4.5.2.4 Cultural industry including heritage sites

Exploration and exploitation of natural resources have left a tangible human imprint on the Svalbard landscape since the Dutch explorer Willem Barents (re-)discovered the archipelago on 17 June 1596. (Thuestad et al. 2015a). It is worth noting some scholars argue that Norsemen discovered the archipelago around 1194, as there are descriptions in the sagas that may be preferable to the archipelago. In fact, the name "Svalbard" is adopted from the Viking annals.

The cultural monuments are often located at places that from earlier times have been suitable for disembarkation, which contributes to the cultural monuments being particularly exposed to the influence of visits by tourists and other traffic. Today, more than 2,100 cultural monuments and over 3,500 objects have been registered. This includes human graves, or traces of such, human skeletons, crosses, and inscriptions are protected regardless of age. The same applies to bone remains and fishing gear at slaughterhouses for walruses and white whales and by self-shooting for polar bears. At many localities, there are cultural monuments from different eras and the various forms of resource utilization that are associated with them. It can be about e.g. whaling from the sixteenth and seventeenth centuries, hunting and trapping in the seventeenth and eighteenth centuries, arctic expeditions and mining to the present day (Øian & Kaltenborn 2020).

Several of Svalbard's tour operators have guided tours that include cultural heritage sites. Especially on the west side of Spitsbergen and up to Northwest Spitsbergen, there are many guided landings from cruise ships and local boats. The cruise guide for Svalbard, which is operated by the Norwegian Polar Institute, is also responsible for updating, and the cruise industry itself informs about specific guidelines for visits to some of the most popular cultural heritage sites, including how traffic should take place to protect the natural environment and cultural monuments - so-called «site specific guidelines». (Øian & Kaltenborn)

Svalbard's heritage management authorities face increasing challenges when it comes to degradation and destruction of the Archipelago's cultural heritage, especially pertaining to impacts from tourism and climate change. Tourism is now an important industry for Svalbard, and cultural heritage is a main attraction for many visitors. Both local and national heritage management authorities emphasise the

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need for a methodological approach to monitoring and reporting status and trends (Barlindhaug, Tømmervik et al., in prep)

Several projects have contributed to better understanding of the impacts of tourism and suggested measures for managing human traffic (Kaltenborn et al. 2020). The authorities have chosen 50 localities that that should represent the history of Svalbard. The follow-up of the 50 prioritized objects varies from supervision, proposals for conservation, safeguarding in the area plan and to extensive restoration and maintenance. Other measures include site-specific actions (cf. the "site-specific guidelines" mentioned above). At some locations in Northwest Spitsbergen, information booklets have been prepared, signage has been created and other arrangements have been made for visitors. Fences have been put into use at Smeerenburg, Gravneset and Virgohamna. The conditions for visits are subject to relatively strict restrictions. (Øian and Kaltenborn 2020).

4.5.2.5 No. of people employed under tourism activities

The number of employees in the tourism and culture sector increased from 638 in 2008 to 1,001 in 2019 but went down in 2020 due to layoffs of employees caused by covid-19. The largest proportion of employees is in accommodation and food service activities. [10]

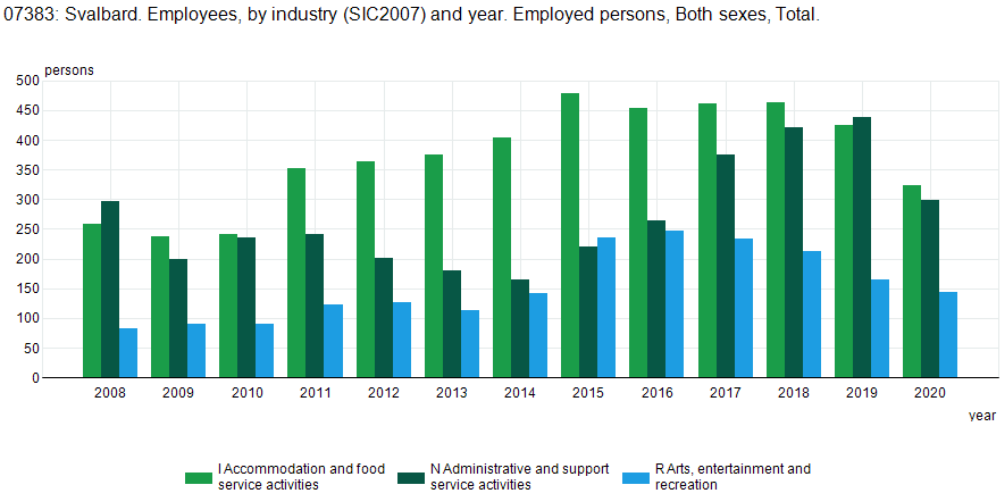

Figure 83. Number of employees in tourism and culture sector from 2008 to 2020.

4.5.2.6 Person-years in the tourism and culture sector

Number of person-years in the tourism and culture sector has been increasing from 291 in 2010 to 370 in 2020, and there was a peak in 2017 with 597 person-years.

[10] https://www.ssb.no/en/statbank/table/07383/chartViewColumn/

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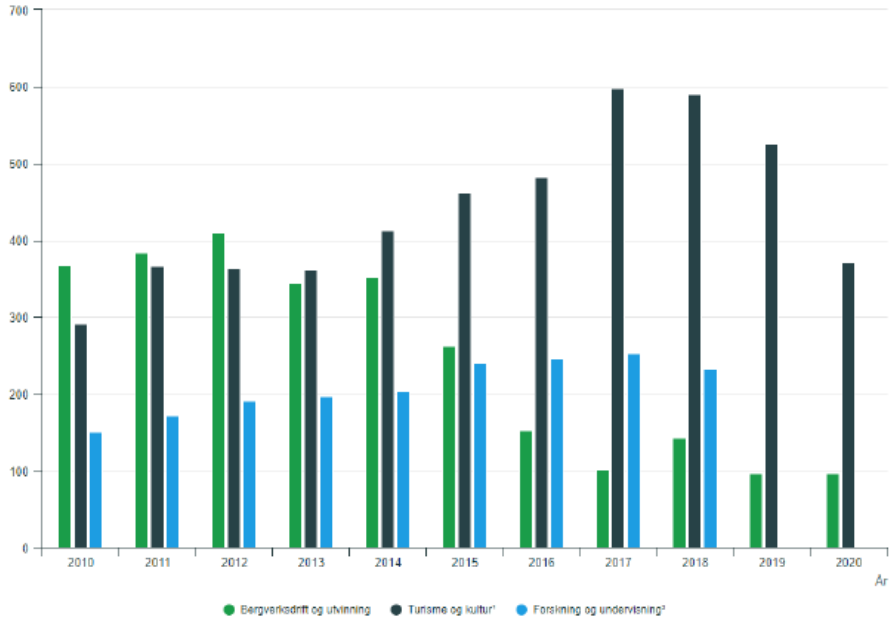

Figure 84. Number of person-hours in tourism and culture industry (black), mining (green) and science and education (blue) from 2010 to 2020. (*Source: Statistics Norway 2022*). Data for S&E lacking for the two last years in this period.

4.5.2.7 Educational level

There has been raised concern about unorganized tour operators and the fact that all operators are not required to be members of Visit Svalbard or AECO, and that the guides might not have necessary knowledge in order to minimize the impact on the environment. There is also a lack of consolidation for courses and education (Ikonen & Sokolíčková 2020). UiT Arctic University of Norway writes on their web pages: “Norway is far behind other countries when it comes to requirements for nature guides' competence. Except for NORTIND's internationally approved mountain guide education, only UiT runs a Nature Guide course with a specific and clear focus on the nature guide profession.” “…UiT has built up strong subject expertise, and the environment is now working in collaboration with other educational institutions, authorities and tourism to raise the focus to a national level. We want to formalize a standard for the nature guide's competence and the quality of the national nature guide education.” (UiT 2018)

4.5.2.8 Tourism income and other country/Arctichub specific tourism characteristics

The value creation from the tourism industry was 520 million NOK in 2008 and has increased until a peak in 2017 reaching 893 million NOK. In 2019 the income had decreased to 851 million NOK and further to 539 million NOK in 2020. (Statistisk sentralbyrå 2022c).

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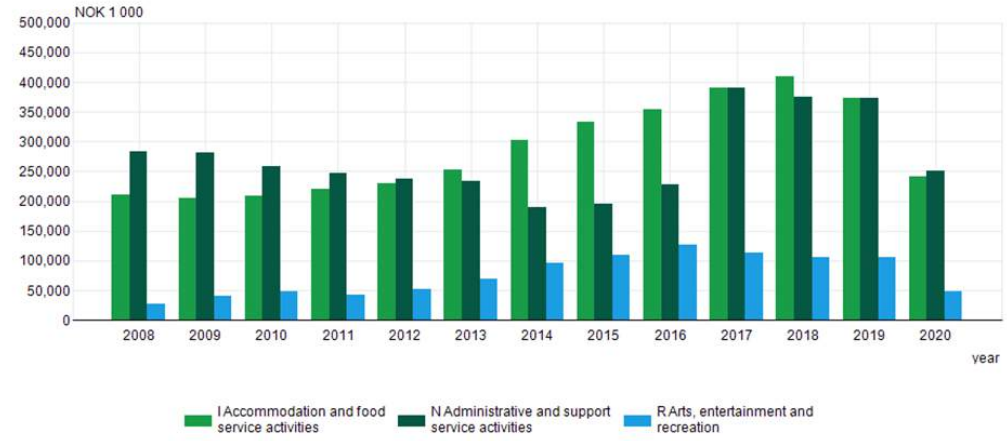

Figure 85. Svalbard industry statistics. Value creation from tourism and culture sector. *Statistisk sentralbyrå 2022c*.

4.5.2.8.1 Number of people visiting remote areas

The number of individual travelers varied between 400 and 700 from 1998 to 2013. Since then, there has been an increasing trend in traffic to remote areas; see figure below. Scientists make up a varying proportion of this number depending on the types of projects that are ongoing at any given time and where they are geographically located. In particular, during the International Polar Year 2007–2008, a high proportion of remote travelers were on scientific fieldwork.

The tourism statistics show that recreation is the purpose of the trip for approx. ⅔ of the persons, while the researchers normally make up ¼ of the number of persons. However, the residence time for researchers in the field is usually longer.

According to the Governor on Svalbard, until 2008 there was an increase in the number of private sailboats that arrived in Svalbard and sailed along the west coast. Some also sail much further. An increase in the number of small boats located in Longyearbyen and Ny-Ålesund may have contributed to this increase. The International Polar Year explains part of the increase from 2006 to 2007–2008. Since 2013, there has been a steady strong increase, probably by both researchers and other individual travelers. The bulk of the traffic takes place from June to August. [11]

[11] https://www.mosj.no/no/pavirkning/ferdsel/individuelle-reisende.html

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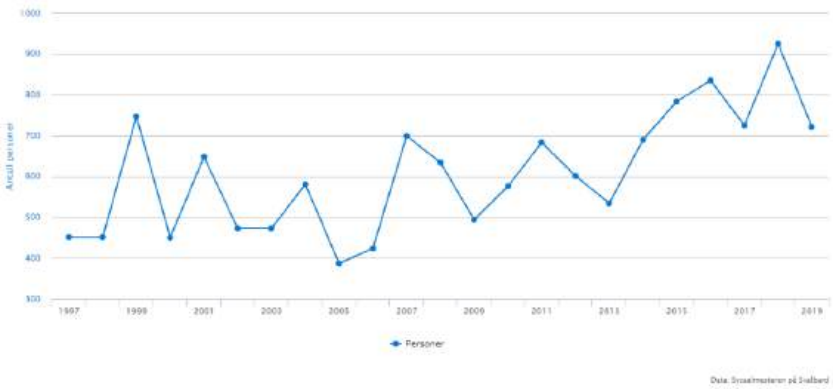

Figure 86. Number of people visiting remote areas from 1997 to 2019 on Svalbard.

4.5.2.8.2 Snowmobiles on Svalbard

Since 1973, there has been a steady increase in the number of registered snowmobiles. In the period 2003–2009, the number of snowmobiles more than doubled. The increase continued in the period 2005 to 2009, peaking at nearly 3,000 snowmobiles.

Due to the transition to a new registration method, the number of registered snowmobiles decreased in 2010. The reduction of approx. 500 scooters is due to the fact that ZN-registered scooters that had been taken down to the mainland were excluded. Thus, the peak period from 2007 to 2009 is partly artificial.

Between 2011 and 2019, the number of snowmobiles on Svalbard has been stable at approx. 2,100 scooters. In 2020, the number increased to just under 2,300 scooters and the number increased further in 2021 to 2,500 scooters. It is uncertain what the reason for this increase is.[12]

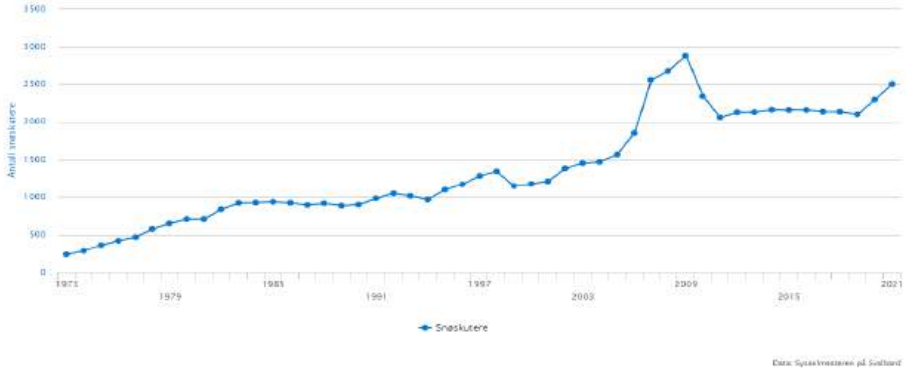

Figure 87. Number of snowmobiles on Svalbard from 1973 to 2021. [13]

[12] https://www.mosj.no/no/pavirkning/ferdsel/snoskuter.html
[13]https://www.mosj.no/no/pavirkning/ferdsel/snoskuter.html

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 869580.

4.5.3 Conflicts/issues

4.5.3.1 Environmental Impacts

4.5.3.1.1 Increased traffic

Determined, long-term marketing of the cruises, growing interest for the Arctic with its virgin wilderness, magnificent scenery, exotic animal life and exciting cultural heritage relics, improved flight schedules, more tour operators and vessels, and more overnight accommodation in Longyearbyen have all contributed to the increase in traffic to Svalbard. [14] Increased traffic can have negative consequences for plant and animal life. The large number of tourists who go ashore from cruise ships and other ships can cause wear and tear and damage to vegetation and terrain. There is also a danger that birds nesting in and around the landing sites will be disturbed. In addition, there are from time-to-time encounters between polar bears and hikers that can be potentially dangerous.

The peak season for snowmobiling is from March to May and coincides with the most vulnerable time for many animal species. Reckless driving can disturb animals such as polar bears, Svalbard reindeer, arctic foxes, ringed seals and geese. Snowmobile traffic contributes to emissions of greenhouse gases and soot. The emissions are difficult to quantify and are small in a global context. Locally, snowmobile traffic contributes to noise pollution, which is noticeable at certain times of the day and during the peak season.[15]

Helicopter traffic in protected areas can also be a potential disruption factor. Such traffic may be due to monitoring, supervision and research assignments.

The consequences can be:

- unnecessary energy consumption and stress in the animals
- animals avoiding heavily trafficked areas
- occurrence of dangerous situations (polar bear)

When the main traffic routes for snowmobiles are used, the disturbances are limited. But there are always some who want to drive off the main trails, into side valleys and up into the mountain sides.

Since 2013, a clearly increasing proportion of visitors have rented snowmobiles to travel on their own, without an approved guide. This may raise concern regarding environment (Miljøstatus 2021) and security. In recent years, several people have died in snowmobile accidents on the archipelago.

The traffic has the potential for possible negative effects on birds, mammals and cultural monuments. Individual travelers make their disembarkations at self-selected locations without being led by an expedition leader or guide. They must of course comply with the provisions of the Svalbard Environment Act and the Tourist Regulations, but they are not obliged to comply with the Site Guidelines as AECO's members and tourists must. Research groups are often located in the same place

[14] https://www.mosj.no/en/influence/traffic/cruise-tourism.html
[15] https://www.mosj.no/no/pavirkning/ferdsel/snoskuter.html

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over a longer field period. The majority of the individual travelers travel in a considerate manner, but there are exceptions. Lack of knowledge about the regulations is most often the reason when people do not act considerately. In recent years, there have been known cases of violations of cultural heritage legislation caused by individual travelers. This often applies to tenting / camping or burning bonfires within the protection zone around protected cultural monuments. Everyone has a responsibility to familiarize themselves with laws and regulations and teaching and research institutions have an overall responsibility for the training of their personnel. A few polar bears have been shot in emergency mode in recent decades outside Administrative Area 10. Several of these have been shot by researchers, and some have been shot by tourists and guides. The movement of people into central polar bear areas can create conflict situations that are fatal to polar bears or humans, so thorough training and use of the right equipment to scare polar bears is important. [16]

4.5.3.1.2 Cruise ships

In recent years, there has been increased attention to the noise caused by all ship traffic and how this negatively affects marine wildlife. In 2018, the United Nations stated that there is "An urgent need for research and cooperation to address the effects of anthropogenic underwater noise".

Many cruise ships run on fuel oil, also known as heavy oil or bunker oil. From 2022 the Parliament of Norway will ban all use of fuel oil at and around Svalbard. The reasons for this are

- risk of acute pollution
- fuel oil have larger environmental impacts than lighter fuels
- marine pollution outside protected areas will quickly be transported by sea currents into protected areas

Some modern ships that have modern diesel-electric transmission and which does not require fuel oil will still be allowed to cruise around Svalbard. Instead, lots of older, smaller ships will not be allowed. Thus, modern giants (large cruise ships) may in fact become more frequent as compared to old, smaller ships (Prop. 421 L 2021).

4.5.3.1.3 Regulations and guidance

The Svalbard Environmental Protection Act regulates how permanent residents and visitors are to travel. Everyone who stays on Svalbard must show consideration and act with caution, so that nature and cultural monuments are not inflicted with unnecessary damage or disturbance. This means, for example, that those who travel on foot, by boat, scooter or otherwise, are responsible for complying with the regulations. (Miljøstatus 2021)

Pursuant to section 38 of the Svalbard Environmental Protection Act, all cultural monuments dating back to the time before 1946 are protected as part of a comprehensive environmental management

[16] https://www.mosj.no/no/pavirkning/ferdsel/individuelle-reisende.html

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and shall have a protection zone of 100 meters. At several cultural monuments, there is a traffic ban throughout the year. Where no traffic ban has been introduced, there is a safety zone of 100 meters. In other words, it is not permitted within this zone to set up tents, burn bonfires or in any other way do anything that may impair or damage the cultural heritage. It is forbidden to burn anything other than clean paper and wood. (Øien & Kaltenborn 2020)

Among other things, it is forbidden to travel in bird sanctuaries at vulnerable times of the year. The governor can also close vulnerable areas where marine mammals live on the ice in the fjords for a period in the spring. This has been done several times in recent years, most recently in Tempelfjorden in the spring of 2021. (Miljøstatus 2021)

Norwegian Polar Institute has made a guide for excursions in Svalbard's natural environment, and AECO (Association of Arctic Expedition Cruise Operators) has also made visitor guidelines for visitors in the arctic.

4.5.3.2 Tourism Impacts on Community

In a workshop initialized by Visit Svalbard and AECO (Ikonen & Sokolíčková 2020) the conflicts in relation to tourism on Svalbard is emphasized. Tourism triggers a major structural change in a community. Svalbard attracts more non-Norwegians, the turnover is extremely high plus the numbers in the population register might be inaccurate, the housing situation is described as critical, and there is a clear risk of social dumping. In addition, the attitude towards tourism varies among people living in Longyearbyen. By some, the economic benefit is questioned given the social loss. Unorganized tour operators and stakeholders exploiting the destination are seen as a risk. The community sees unskilled and/or uncertified guides as a threat also because they fear that the destination's brand might be at stake. More local value creation is desired, and the existing rules and regulations are perceived as insufficiently adapted. Another area of concern are the practical issues related to the booming tourism industry, such as scarcity of housing, seasonality and instability of tourism-related jobs, unequal employment contracts, illegal and/or morally questionable working practices, and growing pressure on infrastructure.

Here, they elaborate on four research focus areas: (1) developing a strategy for tourism based on local values, (2) provide knowledge about tour operators, visitors, and residents including the guides, (3) research on innovations and technologies tested and/or used in the high Arctic and (4) more research on the existing legal framework and future possibilities to adapt to the new challenges ahead. They also stress the need of local businesses and focus on quality and that the industry must be able to offer all-year-round jobs that are based on fair and legal working conditions (Ikonen & Sokolíčková 2020).

In Svalbard, there are two key levels of potentially transformative change: (1) Svalbard's economic and policy portfolio transforming from coal to tourism, research, and education, driven by the Norwegian state; and (2) the tourism industry's responses to multiple pressures and demands, and to the opportunities and challenges that may arise in developing new tourism products both in response to a changing market and to change the traditional tourist demands. Tourism operators have ambitions to expand the tourism industry, shifting its focus from the traditional products of ice and polar bears towards more localized products with a lower carbon footprint, while ensuring that the transition is sustainable. The COVID-19 pandemic has created a crisis for the tourism industry, but this crisis may also be an opportunity for the transformative change that is needed to solve the sustainability issues in the years to come (Hovelsrud et al 2021).

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As the ban on heavy oil means that large cruise ships are largely confined to Isfjorden, this can lead to an increased load in this area, including so-called slow-cruising, which means that a certain number of cruise ships are located there almost at all times. This could increase the burden in terms of pollution that ships without heavy oil are still responsible for, as well as increasing wear and tear on disembarkation points both in terms of the environment and social conditions (especially in Longyearbyen). At the same time, it stands in contrast to a 'culture' in the expedition cruise environment on Svalbard, namely that only one ship at a time should enter the fjords (apart from Isfjorden and Kongsfjorden). (Øien & Kaltenborn 2020).

In general, there is very limited SAR (search and rescue) capacity in Svalbard, including SAR resources, personnel, infrastructure, medical facilities, and overall community capacity. There is also a lack of knowledge on what the local impact on Longyearbyen would be in case of a large-scale incident. There has been an increasing number of unorganized tour operators and self-arranged tours, and the workshop raised concerns that the authorities and local community do not know what the tourists are doing, are they safe, what kind of competence they possess, and whether they have the right equipment if something were to happen. In addition, there are no official Svalbard specific certification requirements for guides and crew. This raise concerns as new operators or operators who are not part of Visit Svalbard or AECO might not have enough competence and experience when it comes to Arctic conditions and safety.

A huge challenge is also unmonitored private sail boats and vessels that come to Svalbard, as there is no knowledge on where the boats go, where they land and what they do at the landing sites. (Ikonen & Sokolíčková 2020).

4.6 Egersund

4.6.1 Brief description of the hub

Egersund town, where the head quarter of Magma Geopark is located, is the most populated city in Eigersund municipality: one of the five Geopark´s municipalities together with Lund, Bjerkreim, Flekkefjord and Sokndal. The five municipalities and the two Counties Rogaland and Agder are owners of the Geopark together with 13 private investors, operating in the tourism sector.

The Geopark is situated along the southwest coast of Norway, one hour drive south from Stavanger. The name ‘Magma Geopark’ refers to the fact that most of the solid rocks in the area has formed from molten rock – magma – about 930 million years ago! Large volumes of magma crystallized to form the rock type anorthosite.

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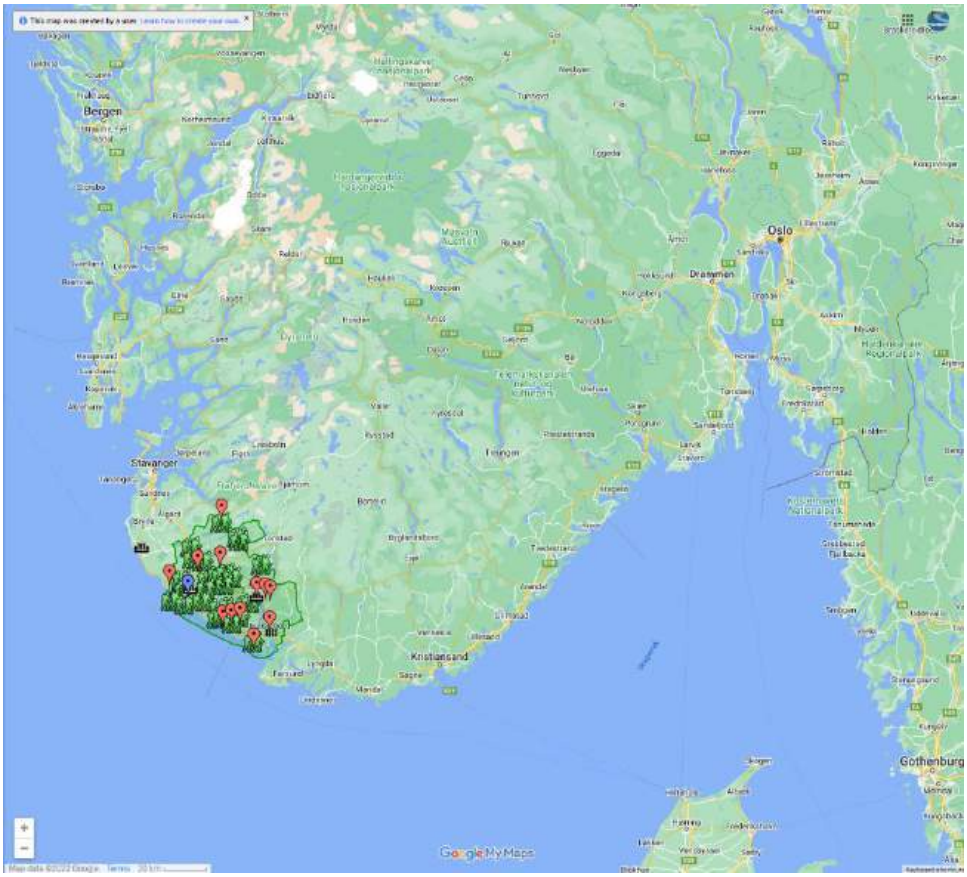

Figure 88. Magma Geopark situated along the southwest coast of Norway and is 2326 km^2.

On a global scale, it is a quite rare type of rock, yet everyone has seen it – that's because the light parts of the moon consist of anorthosite! In Magma Geopark you are in an area that was once 20 km below the earth's surface, and which was covered by mountain ranges the size of the Himalayas and for several thousand million years, the large mountain ranges that covered the Magma Geopark were worn down by hot and cold periods called ice ages. As the last ice age approached its end, about 10,000 years ago, the ice and the enormous amounts of meltwater left their last traces in the landscape. The ice left, among other things, exciting sculptures made of stones of all sizes and shapes the landscape like we can see it today: 6000 lakes and unique vast and wild natural spaces to explore.

The main tourist activities are outdoor sport linked with the unique characteristic of the landscape: trekking, cycling, climbing and water activities. The highest number of tourists are coming from the Nordic Countries, Germany, however more than 30 nationalities for about 120.000 overnight stays are registered. The trend from 2013 to 2021 in overnight stays are increasing. Overnight stays in hotels are significantly increasing (overnight stays are tripled compared from 2013 to 2021) in comparison with the stays in camping or other accommodation (See statistic part). The 2020 and 2021 were the most successful years for the number of Norwegian tourists in the Geopark, due to Covid-19 pandemic restrictions to travel abroad.

Magma is positioned as a unique company, it is the management body of the the only site in the southwest of Norway recognized by UNESCO, so it is in fact, irreplicable. Magma is, in fact, encompass

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education, tourist, development of innovation, internationalization, local and international networking.

From the environmental point of view, Magma is active on several fronts: we have been certified as EMAS for evaluation of internal environmental standards.

Promoting the use of km-zero food though the support to local producers within the GEOfood brand and MANIFESTO addressed to the major challenges detected by the UNSDGs.

Magma is developing tourist offer which are supporting the use of “green” transport” for reaching our localities, we are active in promoting the “leave nothing but footprint” motto for avoiding garbage abandonment in the nature.

We are presenting in September the PhD research from one Geopark employee, concerning the evaluation of abiotic ecosystem services in 4 Geopark locations, for measuring the importance of abiotic nature on human society and for supporting the local municipality in specific planning which taking care of the geological heritage.

Through the GEOfoodEDU project we are establishing educational video on sustainable practices linked with local food production and new food, like sea weeds. Energy in the Geopark is 100% sustainable from hydroelectric sources.

The Magma new products for summer 2022 are the Tourist Route and the food trails available online for exploring some Geoparks highlights and taste local food. Thanks to the increase cooperation with the municipalities, we have developed tailored tourist strategy for the overall area which is detecting 20 lighthouses to be promoted further.

4.6.1.2 Population dynamics

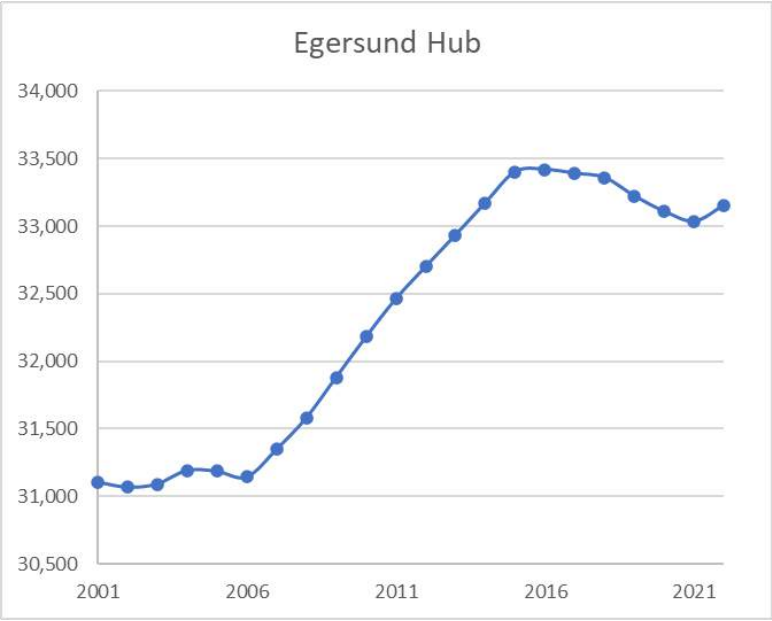

Figure 89. Development of the population in Magma UNESCO Global Geopark from 2001 to 2022. The geopark consists of the five municipalities Bjerkreim, Eigersund, Flekkefjord, Lund and Sokndal.

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4.6.2 Tourism industry

The main tourist activities are outdoor sport linked with the unique characteristic of the landscape: trekking, cycling, climbing and water activities. The highest number of tourists are coming from the Nordic Countries, Germany, however more than 30 nationalities for about 120.000 overnight stays are registered. The trend from 2013 to 2021 in overnight stays are increasing. Overnight stays in hotels are significantly increasing (overnight stays are tripled compared from 2013 to 2021) in comparison with the stays in camping or other accommodation. The 2020 and 2021 were the most successful years for the number of Norwegian tourists in the Geopark, due to Covid-19 pandemic restrictions to travel abroad.

The overnight stays in the geopark has changes dramatically as overnight stays in hotels has increased significantly (see figure) as the total overnight stay just have had a smaller increase (see figure). This means that tourist that arrive to Magma Geopark choose to stay more at hotel than camping and cottages. Since 2017 there har bee a decline in conferences and professionals since 2018. At the same time there har been significant more Norwegian tourists compare to foreigners. Before 2019 there har normally been around 2/3 Norwegians but since 2019 the relative amount of Norwegians compares to foreigners grown to more than 90%. It seems that Norwegians to a lager degree than foreigners prefer hotel to camping. Total overnight stays have had a smaller growth in the same period with about 10% growth.

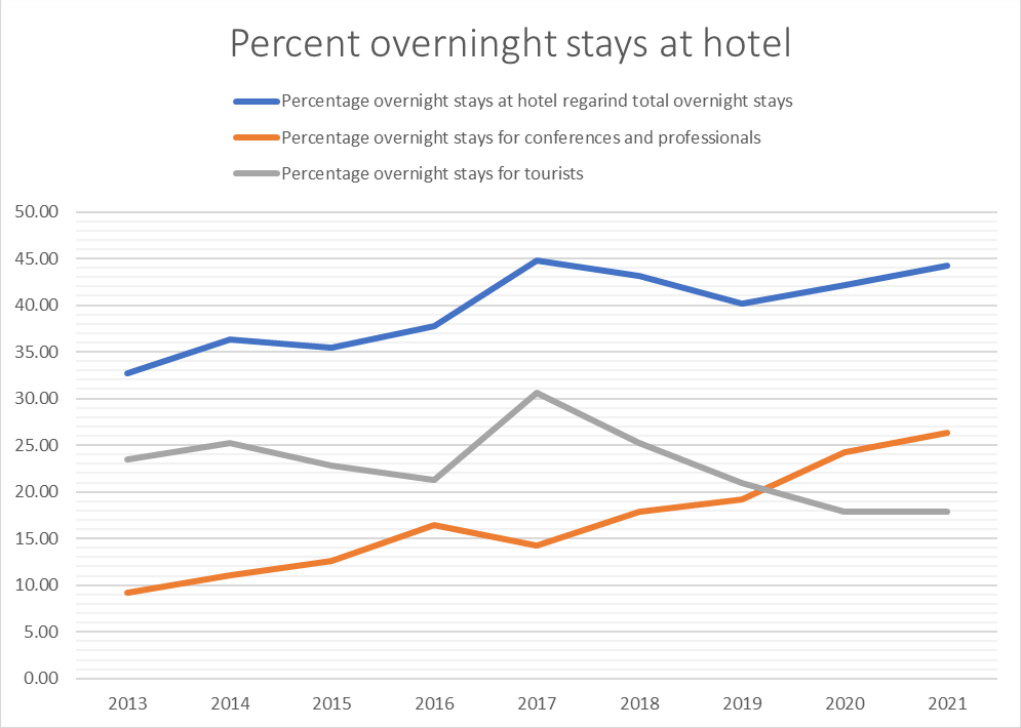

Figure 90. Development of tourist that stay at hotels in Magma Geopark for the period 2013 to 2021. The blue line is total overnight stays (conferences, professionals and holiday) at hotel relative to all kind of overnight stays in the geopark (cottage, camping and hotel). The red line is the growth in tourists (holiday) that stays at hotel relative to all kind of overnight stays. The grey line is conferences and professionals relative to all kind of overnight stays.

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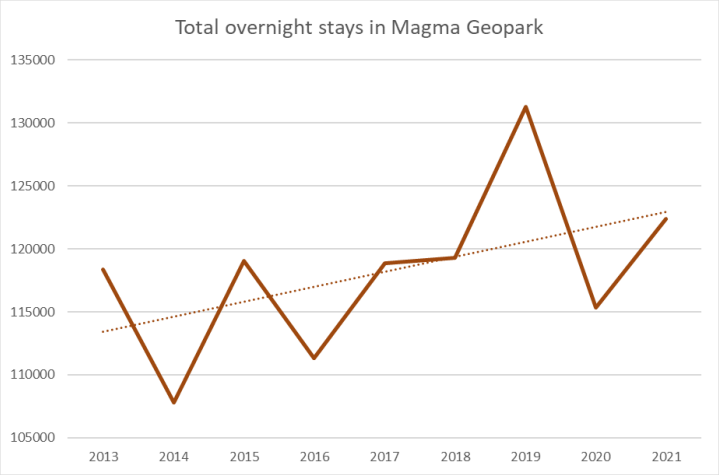

Figure 91. Total overnight stays in the Magma Geopark area. The trend line shows a growth on about 8% in the period 2013 to 2021. Trend line increase from 113000 to 123000.

4.6.2.1 Passenger transport (air, railway, water, road)

Egersund and Flekkefjord towns has become cruise destinations the last years, starting in 2018. In 2022 are there planned that 8 cruise ships shall visit Magma Geopark.

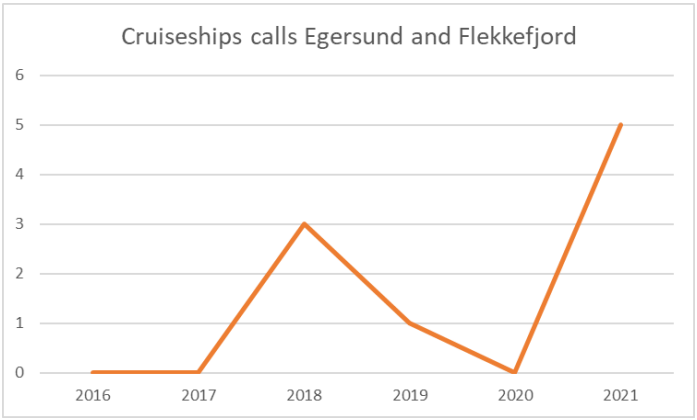

Figure 92. Yearly number of cruise ships visiting Magma Geopark.

4.6.2.2 No. of people employed under tourism activities

In 2017 made the configuration of Norwegian Enterprises an report that stated that 682 inhabitants in Magma Geopark was employed in a company working in tourism. This is 2.0% of the total population and 4.2% of the working population.

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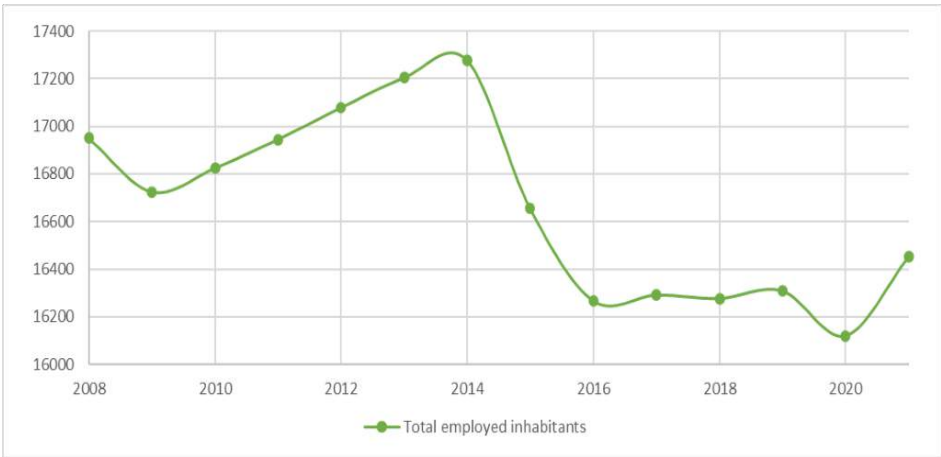

Figure 93. Total amount of inhabitants in Magma Geopark that are employed in a company. In 2017 4.2% of this was employed in tourism.

4.6.3 Conflicts/issues

Locally, there are some conflicts with local landowners due to the increasing amount of tourist in certain locations, however Magma is actively supporting the local communities within agreement with municipalities and with its own resources to build infrastructures, like parking places.

4.7 Inari

4.7.1 Brief description of the hub

Inari is one of the most important and international tourism destinations in Lapland and the largest municipality in Finland (Figure 71). It has a surface area of more than 17,000 km2. As a tourist destination it is also multifaceted: Saariselkä is a ski resort with an abundance of tourism services from accommodation to activity programme and resides beside the UKK national park, Inari is a village beside Lake Inari and is the one of the main places of indigenous Sámi people, while Ivalo is a bigger village with bigger variety of services. A popular place among hikers is Kiilopää which is near Saariselkä and very close to the national park. The park is the second biggest in Finland with its 2550 km2 of which 62 km2 are in Inari, and more than 370 000 visits were made to the park in 2020. Day visitors near Saariselkä form the biggest visitor group in the national park. Altogether, 72% of the municipality's area is protected wilderness, while 13% is water. Inari is also a popular place to stop when visitors travel to the most northern tip in Europe, North Cape. Together with the attractiveness of Lake Inari this makes the area popular tourist destination also in summer and not only in winter which is the high season in other parts of Lapland. A specific activity related to tourism has been gold spanning, both mechanized and manual. The mechanized digging has been prohibited lately. Beside of tourism Inari has long invested in cold technology and tire testing, and the investments are yielding results. Internationally renowned tire and car brands are conducting cold weather testing in top-grade testing centers in Inari. (Inari.fi.)

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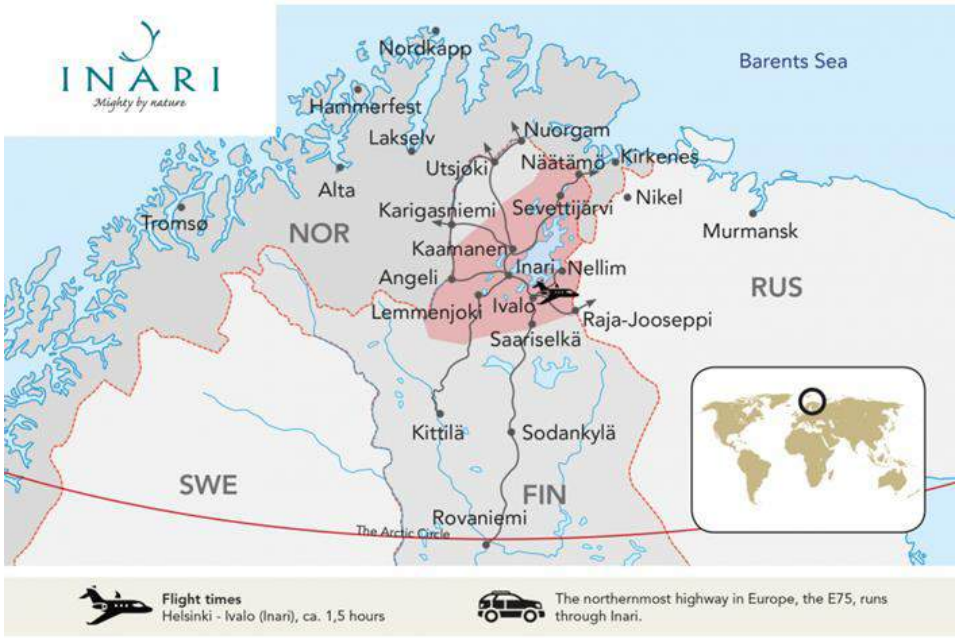

Figure 94. Inari is marked in red on the map. It shows how large the municipality of Inari is in terms of surface area. *Source: inari.fi (a)*

4.7.2 Tourism industry

Inari has always been a special destination, and it can look back on a long history of foreign tourists visiting the area. English nobles, for instance, came for fly fishing as early as the 1900s. (Kull, 2019, p. 110.) Inari is a tourist municipality with nature as its strong asset. Inari, Saariselkä Kakslauttanen, Kiilopää and the surrounding destinations offer beds for a total of 15,000 tourists. Tourism business is quite international, as almost 60% of overnight stays are international. The tourism industry is also continuously growing and attracting new investments in the region for example, Hotel Kaunispää and hotel Isomus projects which are told the preliminary concept emphasizes Lapland, nature and local culture. The strong development of tourism is also boosting other industries, such as construction. (House of Lapland, 2022).

Annually around half a million tourists visit the area. They arrive mainly by plane or private car. Hiking, skiing, cycling and snow mobile and husky safaris are the most important activities. Lake Inari is popular among fishers. Besides the tourism industry, the main livelihoods are reindeer herding, fishing, forestry, training services and other private services. (Inari.fi b.)

Inari is also an important destination for people heading to the North Cape, with many staying over there. Companies in the area are thus motivated to provide better summer activities, including angling, canoeing, mountain biking, other outdoor activities and wellness in order to encourage people to stay longer and extend the seasons. (Kull, 2019, p. 106.)

4.7.2.1 Accommodation for visitors (overnight stays, hotels and other accommodation)

According to statistics, in June 2022 there were 31 registered accommodation establishments in Inari. There were a total of 2,010 rooms and 5,600 beds and 210 Airbnb and Vrbo accommodation establishments, 210 apartments and 360 rooms. In June 2022, the room utilization was approximately

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30%. (Visitory a, 2022; Visitory b, 2022.) The amount of accommodation capacity has increased slightly in the last ten years (Figure 72).

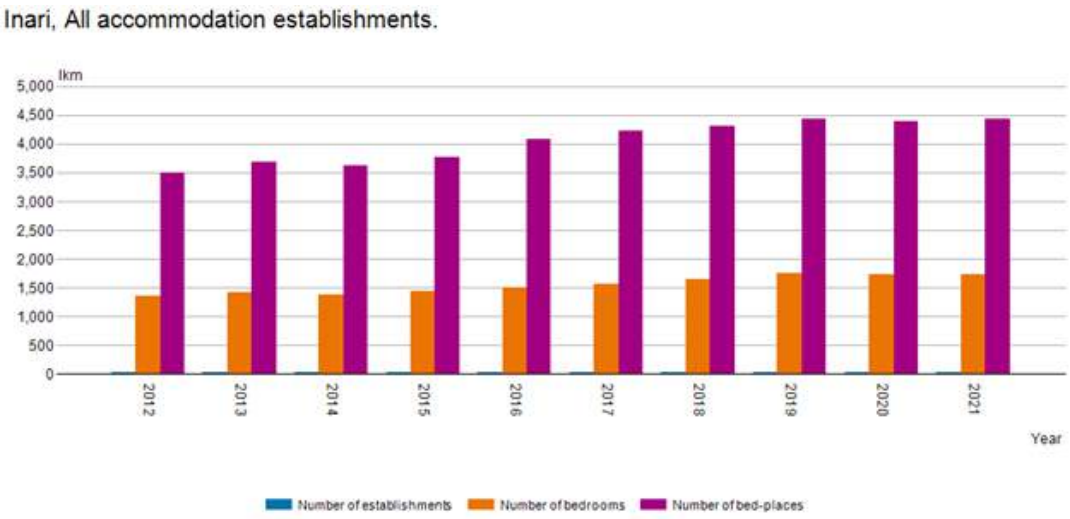

Figure 95. Capacity of accommodation growth has been moderate. *Source: Statistics Finland, Accommodation statistics, 2022.*

The pandemic period caused a drop in the number of overnight stays, especially for international tourists. At the end of the last decade, the number of overnight stays has been over half a million per year (Figure 73).

Figure 96. Covid-19 pandemic caused a drop in the number of overnights. Source: inari.fi (b)

The number of tourists in the 2010s was increasing, which was also reflected in the number of hotel nights in Inari (Figure 97).

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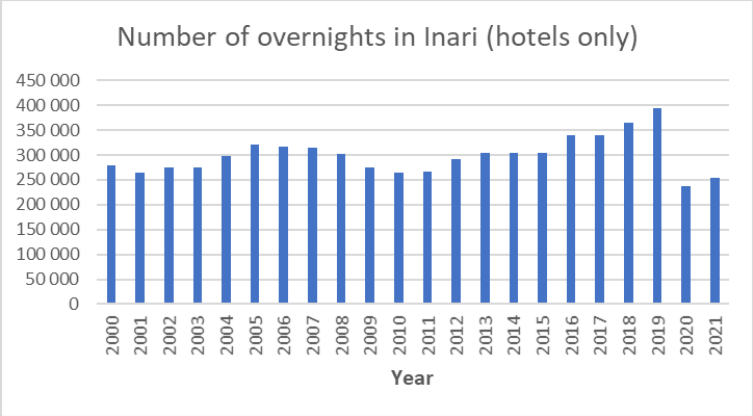

Figure 97. In the statistics of the 21st century, there is a wave movement in the number of overnight stays.
Source: Statistics Finland, Accommodation statistics, 2022

4.7.2.2 Passenger transport (air, railway, water, road)

The northernmost airport in the European Union, Ivalo International Airport offers direct flights to European cities during the high season of winter. Year-round, flights can connect through Helsinki. Buses connect Inari to the rest of Lapland and Finland, as most villages lie along European highway E75. (Kull, 2019, p. 117.) After the increase in the number of passengers in the 2010s, the pandemic significantly reduced the number of air passengers (Figure 78).

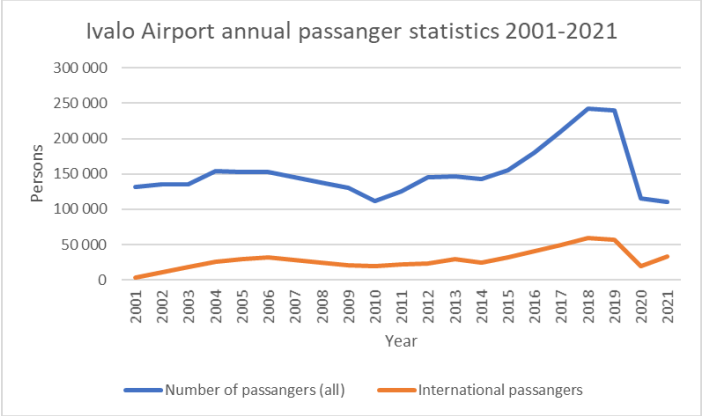

Figure 98. The number of air passengers has started to increase again after the easing of travel restrictions.
Source: Finnavia.fi

An important contributor to the positive economic trend in the area is the international airport at Ivalo. This is particularly important for the business sector, linking rural and Arctic Inari to the wider world.

4.7.2.3 Educational level

At the Inari Adult Education Centre it is possible to study languages and take general education courses. The Sámi Education Centre in Inari provides education on the Sámi language and culture, vocational education and training, and short trainings for supplementing prior competence. REDU Lapland Education Centre is the largest vocational education provider in Lapland, and it operates

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throughout the region. In addition, educational institutions around Finland offer remote studies so people could complete studies elsewhere while based in Inari. (Inari.fi)

4.7.3 Conflicts/issues

According to the PPGIS survey and interviews conducted in Inari, it is obvious that there are conflictual issues between local community, reindeer herding and tourism. Our PPGIS survey which was targeted especially to reindeer herders shows that what comes to tourism activities, husky sleds have the most negative effects on reindeer herding. Other tourism-related conflictual issues for reindeer herders are hunting tourists and tourism routes. Tourism in large is considered as both negative and positive, and for example mountain biking is not seen as a problem at all although it is one of the growing activities and uses long routes in herding areas. In our other PPGIS survey concentrating especially on tourism, the view of tourism's influence on reindeer herding was extremely divided, around half of the respondents saw that tourism influences reindeer herding negatively and the other half saw that the effects were positive. In this tourism PPGIS the most important problems mentioned are crowding, noise, littering, landscape deterioration, husky sleds and terrain wear.

In general, the effects of tourism were regarded as positive when it comes to job and income and local services while more negative effects are related to the worsening of the quality of own living area (Figure 99).

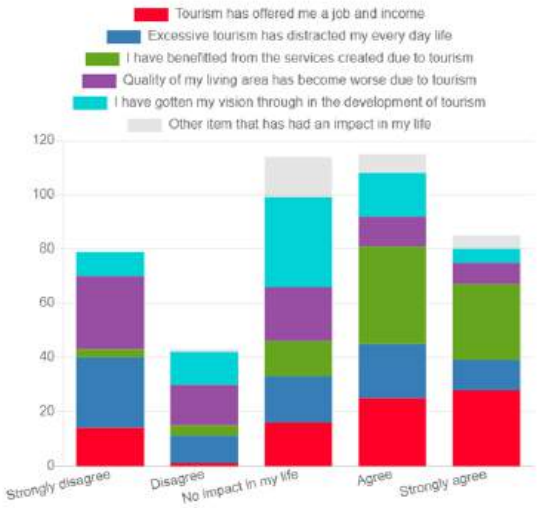

Figure 99. Effects of tourism in Inari.

The interviews give more detailed picture of the problems. It is described by one interviewee how the phenomenon of not respecting locals' privacy is seen everywhere in Inari village. This might be since private lands may look like no-man's land as the areas are not strictly fenced. One interviewee also sees that husky business is not ethical in that area and the problem is especially the location of the dog farms of which the locals are not asked beforehand – they only can make claims afterwards and then it is more difficult to change things. Also, big snowmobiling groups cause disturbance.

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From tourism entrepreneur's point of view there are conflicts with reindeer herding districts but they regard that the herders are against everything just out of principle and it is difficult to discuss the issues.

Inari is an important Sámi centre and the Sámi Parliament has made ethical guidelines for Sámi tourism [17]. These have been summarized into these seven principles:

- Recognizing and Respecting the Value and Richness of the Sámi Cultural Heritage;
- Protecting and Maintaining the Vitality of Sámi Cultural Heritage for Future Generations;
- Mutually Beneficial Understanding and Co-operation;
- Issues Featured in Sámi Tourism – Their Recognition and Correction;
- Positive Impact of Sámi Tourism on Sámi People, Their Culture and Environment
- Responsible and Ethically Sustainable Marketing and Communications of Sámi Tourism and;
- High-Quality Visitor Experiences – Quality Assurance.

4.8 Kittilä

4.8.1 Brief description of the hub

Kittilä municipality is located in northwestern part of Finnish Lapland and has about 6,400 inhabitants, over a vast area of more than 8000 square kilometers. Kittilä's location, comprehensive services, functional transport links and nature provide a good setting for residents, tourists and businesses. The terrain is shaped by several stately fells, extensive marshes and the large and free Ounas river flowing through the municipality. The municipality is one of the few municipalities in Finnish Lapland which has had net migration. In 2016, the municipality was chosen as the 6th attractive municipality in Finland. According to the population forecast for 2030, Kittilä will be one of the most growing municipalities in Lapland. The largest industries in the Kittilä region are tourism and mining. Situated in Kittilä village of Sirkka, Levi is Finland's leading year-round tourism and events centre and the Kittilä mine operated by Agnico Eagle Finland Oy is the largest gold mine in Europe. Kittilä Airport is international and lively, with plenty of connections from Finland and other parts of Europe.

4.8.2 Tourism industry

The largest ski resort in Finland, Levi, is located in Kittilä. Levi has around 750 000 visitors per year, 25 000 beds, 60 restaurants and 43 ski slopes. Thus, its' centre is a city-like environment. In the surrounding forest, fell and bog areas, it has hundreds of kilometres of scooter tracks and skiing, hiking and biking trails. Almost all tourism in Kittilä concentrates on Levi which offers jobs for many in other parts of the large municipality, and tourism together with mining is the most important livelihood for the municipality. Levi has, to a some extent, a conflicting reputation: it is seen as a party place for tourists from southern Finland but it is also an outdoor destination with many outdoor activities. Although only a part of the Finland's most visited national park, Pallas-Ylläs, is located in Kittilä, the

[17] https://www.samediggi.fi/ethical-guidelines-for-sami-tourism/?lang=en

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village of Raattama in Kittilä is an important gate to the park, and the tourist resort of Ylläs is partially located on the Kittilä side. Also, river Ounasjoki is an important although slightly undeveloped fishing and water activity destination.

4.8.2.1 Accommodation for visitors (overnight stays, hotels and other accommodation)

According to July 2022 registered accommodation statistics, there were 19 accommodations establishments, 1,300 rooms and 4,000 beds in Kittilä (Figure 100). There were 410 Airbnb and Vrbo accommodations establishments, 400 apartments and 920 rooms. (Visitory c, 2022.) It must be taken into account that there is clearly more unregistered accommodation capacity in Kittilä than what is included in the statistics. The ratio of unregistered and unregistered accommodation does not seem to be directly dependent on the municipality's population or tourism profile. (Satokangas & Vieru, 2017 p. 23.)

There have been no significant changes in the number of accommodations establishments in the last 10 years (Figure 101)

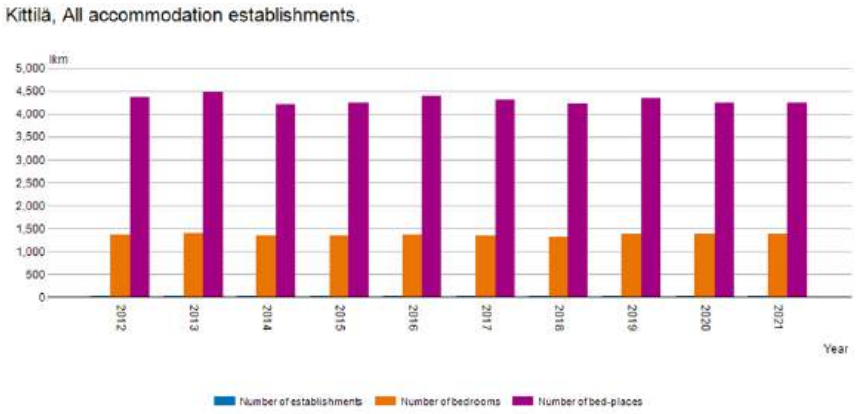

Figure 100. Accomodation in Kittilä. *Source: Statistics Finland, Accommodation statistics, 2022.*

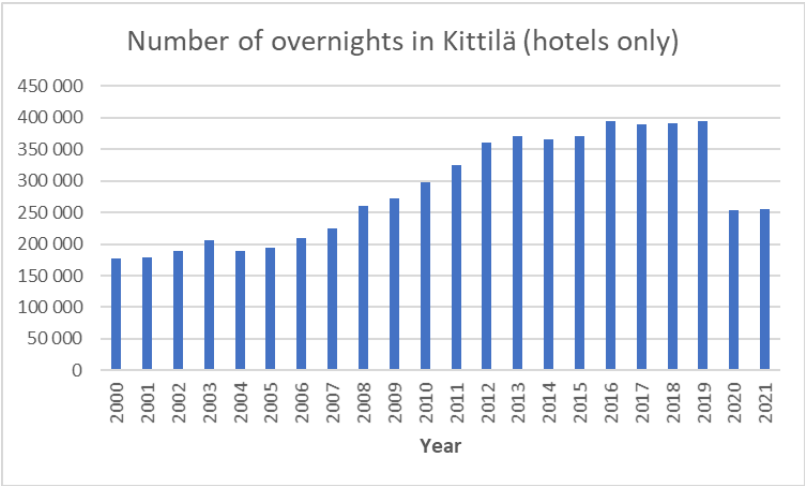

Figure 101. Number of overnight stays in Kittila. Source: *Statistics Finland, Accommodation statistics, 2022.*

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4.8.2.2 Passenger transport (air, railway, water, road)

The number of air travellers was growing strongly before the pandemic began (Figure 102). The number of air passengers decreased strongly during the pandemic, but the number of the air passengers have increased due to the lifting of travel restrictions.

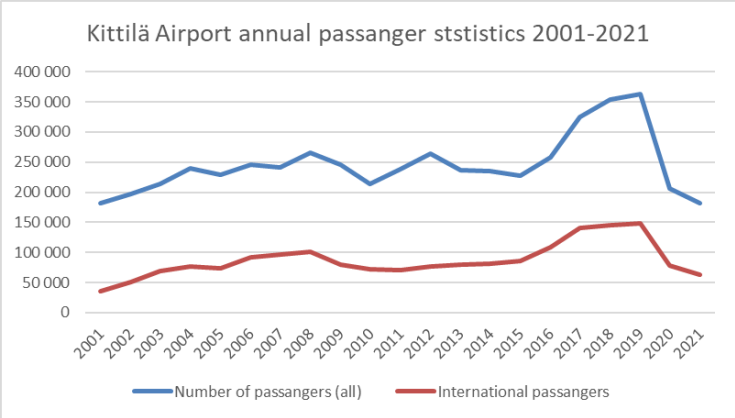

Figure 102. The pandemic drastically reduced the number of air passengers. Source: finavia.fi

4.8.2.3 Number of tourism enterprises

The structure of enterprises is also related to the importance of tourism as the number of small enterprises dominates in March 2022 the number of business establishments was 766. The largest sector was travel agencies, tour operators and booking services. 88% of the businesses had less than 5 persons, 7% had 5 to 9 persons, and 5% had 10 or more people. (Kittila.fi)

4.8.2.4 Number of people employed under tourism activities

The importance of tourism is visible in these statistics of unemployment during 2015-2022 (Figure 103). Unemployment rates became really high when Covid 19 started, and this was especially due to the termination of tourism as the situation did not affect e.g. to the mining industry:

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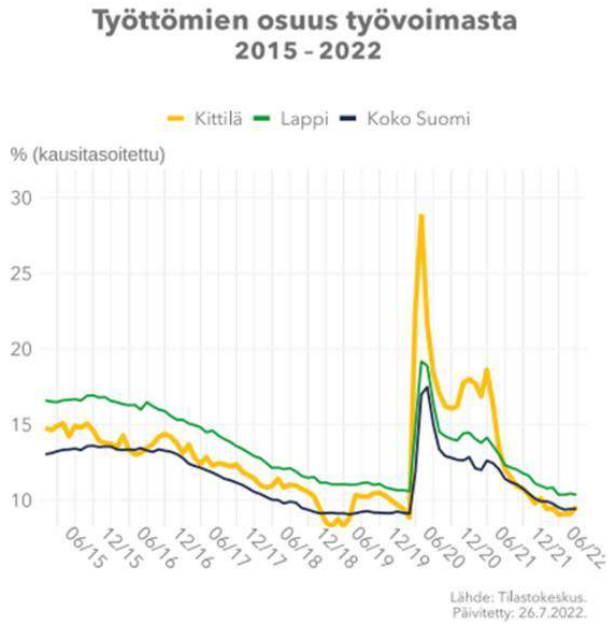

Figure 103. The share of the unemployed in the labor force rose more than the national average in Kittilä during the pandemic. *Source: Statistics Finland, 2022*

4.8.2.5 Tourism income and other country/Arctichub specific tourism characteristics

In 2016, Kittilä's tourism income, including indirect effects, was more than 200 million euros, which is about half of the total turnover of Kittilä's companies (Table 30). Years of long-term development work have produced results and the prospects for future development are good. Approximately 200 companies operate directly in the tourism center and indirectly the tourism industry has an impact on a large part of the companies in the Kittilä area. (Levi4 -raportti, 2018, p.5.) There are approximately 16,000 restaurant places in Kittilä. (Kideve.) Tourism is one of the largest industries in Kittilä, and many other industries are also indirectly related to tourism. Along with tourism, the mining industry is an important industry. Tourism employment in Kittilä in 2020 was 765 man-years. (Satokangas, 2022.)

Table 30. The direct income effects of tourism in Kittilä in 2017.

	Total turnover €	**Share of tourism %**	**Tourism income €**
Retail	70 789 000	55	38 933 950
Accommodation and catering,	67 874 000	86	58 371 640
Entertainment and recreation	45 062 000	91	41 006 420
Transport	22 642 000	51	11 547 420
Total	**206 367 000**		**41 639 740**

Source: Satokangas, 2019, p.9.

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4.8.3 Conflicts/issues

Contradictions between livelihoods are mainly related to land use. According to one of our interviewees, reindeer husbandry and other natural livelihoods are usually competing for the same areas, as tourism, mining or now wind power. These activities are taking space from reindeer husbandry. There are some contradictions between the touristic routes and reindeer husbandry as well, but mainly tourism is working well with other livelihoods, because it is so centered in Levi resort. And some of reindeer herders are in the tourism business as well, benefiting from it. In Kittilä, both mining and tourism are big industries. However, differently than in many other places, they do not collide much.

As Levi resort is so big totally different kinds of issues arise. They are not related to land use but to the social problems such as drug use among young people and a big number of divorces.

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3. Overview of the Tourism hubs in Italy as a Learning Case

3.1 Alagna Valsesia

Alagna ("Im Land" in Walser German language) is an alpine town of Upper Valsesia, NW Alps, Italy. It is the access point to the North face of Monte Rosa. It was settled by Walser colonist from Valais, Switzerland in the 14th century: since then, it has preserved its Alemannic language, culture and architecture. Present day permanent resident population is about 600 inhabitants, while during winter season over 5000 tourists per day are present at Alagna Valsesia. Due to its particular alpine geomorphological conditions Alagna Valsesia is nowadays internationally known for being the freeride ski capital of the Alps. The local industry of tourism included Alagna Valsesia in the "Monterosa Paradise Ski", a huge ski-resort (180 km of runs) at the foots of Monte Rosa served by a series of cable cars and ski-lifts.

New development of the industry of tourism are now under regional and local debate from an environmental point of view, because of possible issues related to: 1) interactions with the Sesia Val Grande UNESCO Global Geopark and Alta Valsesia Regional Park; 2) climate change effects on both mountain environment and the potential of ski resorts; 3) energy consumption and waste production related to increasing tourism infrastructure. By conducting research on local natural and cultural resources and developing discussion among public administrators, environmental managers and other stakeholders we aim at developing a participating environmental assessment and sustainable tourism planning in the Alagna Valsesia area.

Background information

Tourism – Ski
Company: Monterosa 2000
Ownership: regional - publicly owned company with the participation of the Piemonte region.
Location: Frazione Bonda, 19 13021 Alagna Valsesia (VC), Italy
Activity: alpine ski resort, public transport (mountaineers, trekkers, bikers)
Spatial extent: ski area ca 5 km2, ropeways 9 km
Natural resources used: soil, water
Production (winter season): ca 116.000 first entrances/year (skiers starting from Alagna), ca 1.100.000 transits/year (total, also coming from the neighbouring valleys)
Employment (winter season): ca 50 employees
Waste production: organic waste from canteen; special waste from maintenance activities (exhausted oil, lubricating greases, ferrous materials), rubber and plastic material (roller rings). Waste transportation service: waste from high mountain facilities to valley bottom infrastructures.
Energy demand: artificial snow production ca 350.000 kWh, ropeways ca 1,5 mln kWh.
Energy production: hydroelectric power plant 800.000 kWh, the other required amount coming from certified green energy.

Permits:

- special environmental impact assessment ("valutazione di incidenza") for new infrastructure projects within Sites of Community Interest (SIC) and Special Protection Zones (ZPS);

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- screening for environmental impact assessment ("Verifica di assoggettabilità a VIA"), hydrogeological/landscape restriction, building permits;
- agreements and economic compensation with landowners for private land use (e.g., minimum amount from law prescription and discount for ski-facilities use);
- water withdrawal subject to concession by the provincial government. Constraints on: withdrawal volume, maximum and medium watercourse discharge, minimum vital flow, designated use (multiple uses: hygienic, energetic and snow production).

Infrastructure development

Since the year 2000, Monterosa 2000 started the renovation of the ski resort with the following important steps:

2000 - demolition of the old cable car replaced by one gondola and one fixed-grip chairlift;

2004 - interruption of the old Punta Indren cable car service, building of the funifor allowing the high-altitude connection with Monterosa Ski resort (Aosta Valley);

2003-2004 - creation of the Olen ski track;

2005 - programmed snow-making system building of the Bocchetta delle Pisse-Pianlunga-Alagna sector;

2017 - building of the Cimalegna detachable chairlift in order to increase skiers' flow;

2019 - building of the Mullero Competition ski track and the related snow-making system, completion of the programmed snow-making system on the Cimalegna plateau;

2020 - artificial water reservoir construction to support and empower the existing snow-making system.

Data from https://www.monterosa2000.it/

Data collection

The following section refers to different data gathering inherent to the Alagna Valsesia municipality. These data were collected for the period 2017-2021, which was inevitably conditioned by the restrictions to stem the sanitary emergency due to Covid-19. The only aspect that is useful to underline before starting the analysis is that from the 1st of January 2022 the Alagna Valsesia municipality has been merged with Riva Valdobbia municipality. It explains why, in some cases, there is a sudden increase in the information reported.

Social data

These data were collected from the national social-demographic database ISTAT that provides very accurate information. Anyway, except for the over-mentioned union of the two municipalities Alagna Valsesia and Riva Valdobbia, there is not any specific aspect to underline.

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Table 31. Alagna Valsesia and Riva Valdobbia social data 2017 - 2021

Data variables	Fonte	N year	2017	2018	2019	2020	2021
n. of tot. residents	ISTAT	5	430	448	730	725	729
n. of female residents	ISTAT	5	202	214	349	351	352
n. of male residents	ISTAT	5	228	234	381	374	377
n. of employed residents	ISTAT	2		212	348		
n. of unemployed residents	ISTAT	2		186	299		
average income from self-employment (€)	ISTAT	3	14.682	70.887	78.028		
average salary as an employee (€)	ISTAT	3	23.368	21.016	23.526		
n. of residents without educational qualifications	ISTAT	3		4	15	16	
n. of residents with primary school license	ISTAT	3		70	112	107	
n. of residents with secondary school license	ISTAT	3		129	202	206	
n. of residents with high school license	ISTAT	3		169	287	276	
n. of residents with a degree	ISTAT	3		37	58	66	

Residential data

These data were collected from *Alagna Walser Green Paradise* report and through questions addressed directly to the municipality of Alagna Valsesia. These data could show hypothetical increase or decrease in the urbanization of this area, though in this case they do not show any relevant change.

Table 32. Alagna Valsesia residential data 2017 -2021

Data variables	Fonte	N year	2017	2018	2019	2020	2021
n. of first houses							
n. of second homes							
n. of houses rented to seasonal workers	Comune di Alagna	not available					
n. of tot. vehicles	AWGP; ACI	4	406	423	778	799	
n. of cars and motorcycles	AWGP; ACI	4	311	326	557	580	

Economic data

Economic data are inherent to the employment situation in the municipality of Alagna and they were collected from both regional (Rupar Piemonte) and national databases (ASC.Istat and MES). Unfortunately, the available information stops at 2019, so it is not possible to understand the impact of Covid-19 restrictions on the workers' situation, even if the Gross Regional Product suggests an economic growth during the years. It could be useful to know the data related to 2021, that would explain the path across the pandemic period.

Table 33. Alagna Valsesia economic data 2017 -2021

Data variables	Fonte	N year	2017	2018	2019	2020	2021
n. of local business units (no accomodations)	Rupar Piemonte; ASC.Istat	3	89	95	96		
n. of farms							
n. of tot. workers	Rupar Piemonte; ASC.Istat	3	363	435	448		
n. of employees	Rupar Piemonte; ASC.Istat	3	196	254	274		
Gross regional product (€)	MEF	4	8.202.040	12.639.088	13.420.199	14.397.176	
Value added - contribution of agricultural sector to the GDP							
Value added - contribution of tourism sector to the GDP							

Touristic data

The origin of these data is heterogeneous, because they were collected by different kinds of documents and databases. Anyway, most of these sources are regional or local. Visit Piemonte and Rupar Piemonte are regional dataset and they show more useful information to understand the touristic flows inside the municipality of Alagna. It is possible to see a sensible fall in the touristic flow

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between 2018 and 2020 (data relates to 2019 is absent), but from 2021 the number of tourists in Alagna started to rise again. Moreover, thanks to informal interviews on the territory of Alagna, it could be confirmed that the 2022 summer season was characterized by an extraordinary recovery, after the end of the sanitary emergency. In fact, the number of foreign tourists who in the past could not freely reach the Italian tourist resorts has returned to grow significantly.

Table 34. Alagna Valsesia tourist data 2017 -2021

Data variables	Fonte	N year	2017	2018	2019	2020	2021
n. of accommodation facilities	AWGP; Visit Piemonte; Rupar Piemonte; ISTAT	5	18	21	20	45	42
n. of catering activities	Rupar Piemonte	3	16	16	19		
n. of shelters							
n. of overnight stays in shelters							
n. holiday homes							
n. of travellers							
turistic flows (total overnight stays)	AWGP; Visit Piemonte	4	48.992	72.910		67.906	74.347
average stay	AWGP; Visit Piemonte	4	3,19	3,15		3,18	2,92
plastic consumption (tot. n. of plastic bottles sold)	AWGP (survey)	1			55.537		
n. of buses	ACI	4	1	1	2	2	
n. of tourist lines	Monterosa 2000	3					
bus tickets	Monterosa 2000	not available					
parking data							
ratio of tourist vs residents							

Ski data

This data was collected thanks to the collaboration with Monterosa 2000, which analyzes more detailed information about the ski flows in the area of Alagna. These ski facilities are included in a much larger area that connects Alagna to Gressoney (Aosta Valley). So, it can be assumed that a part of transit entrances concern people that come from Gressoney. Even in this case, it is easy to see a drastic fall during the pandemic period, during 2020. In the winter season of that year, in fact, the ski facilities were completely closed. Another aspect to underline is that the ski district remains open during both summer and winter seasons. People in fact use ski facilities even in summer, for walking or cycling.

Table 35. Alagna Valsesia ski data 2017 - 2021

Data variables	Fonte	N year	2017	2018	2019	2020	2021
ski slope metric development (km)	skiinfo.it	14,8					
n. of skipass (first entries)	Monterosa 2000	11	141.865	148.479	123.019	28.490	122.783
n. of skipass (transit entrances)	Monterosa 2000	11	309.040	297.210	276.594	37.110	285.316
n. of round trip skipass	Monterosa 2000	11	34.618	41.297	30.386	28.414	39.684
n. of daily skipass	Monterosa 2000	11	41.715	40.666	36.978	1.200	31.688
n. of weekly skipass	Monterosa 2000	11	7.738	7.027	5.080	3	5.532
n. of seasonal skipass	Monterosa 2000	11	1.340	1.418	1.088	73	1.277
n. of ropeways	Monterosa 2000	11	2	2	2	2	2
n. of chiarlifts	Monterosa 2000	11	2	2	2	2	2
n. of skilifts	Monterosa 2000	11	1	1	1	1	1

3.2 Germanasca Valley

Economic data

Economic data are inherent to the employment situation in the municipality of Prali and they were collected from both regional (Rupar Piemonte) and national databases (ASC.Istat and MES). Unfortunately, the available information stops at 2019, so it is not possible to understand the impact of Covid-19 restrictions on the workers' situation, even if the Gross Regional Product suggests an economic growth until 2019 and then a slight decrease in 2020. It could be useful to know the data related to 2021, that would better explain the path across the pandemic period.

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Table 36. Prali Economic data 2017 - 2021

Data variables	Fonte	N year	2017	2018	2019	2020	2021
n. of local business units (no accomodations)	Rupar Piemonte; ASC.Istat	3	26	29	33		
n. of farms	Comune di Prali	1			6		
n. of tot. workers	Rupar Piemonte; ASC.Istat	3	88	98	104		
n. of employees	Rupar Piemonte; ASC.Istat	3	28	31	32		
Gross regional product (€)	MEF	4	2.650.648	2.752.116	3.039.098	2.953.471	
Value added - contribution of agricultural sector to the GDP							
Value added - contribution of tourism sector to the GDP							

Touristic Information

The origin of these data is heterogeneous, because they were collected by different kinds of documents and databases. Anyway, most of these sources are regional and local. Visit Piemonte and Rupar Piemonte are regional dataset and they show more useful information to understand the touristic flows inside the municipality of Prali. We can see a drastic fall in the touristic flow between the period pre-Covid (2017-2018) and the period post-Covid (2020-2021), while any data relating to 2019 is shown. On the contrary from the Alagna context, in Prali municipality the tourist recovery seems slow and tiring.

Table 37. Prali tourist data 2017 - 2021

Data variables	Fonte	N year	2017	2018	2019	2020	2021
n. of accommodation facilities	Visit Piemonte; Rupar Piemonte; ISTAT	5	4	3	7	12	11
n. of catering activities	Rupar Piemonte; ISTAT	3	9	11	12		
n. of shelters							
n. of overnight stays in shelters							
n. holiday homes							
n. of travellers							
turistic flows (total overnight stays)	Visit Piemonte	4	22.545	18.344		12.586	9.532
average stay	Visit Piemonte	4	7,77	7,13		5,19	4,46
plastic consumption (tot. n. of plastic bottles sold)							
n. of buses	ACI	4	0	0	0	0	
n. of tourist lines							
bus tickets							
parking data							
ratio of tourist vs residents							

Ski data

This data was collected thanks to the collaboration with Nuova 13 Laghi, the company that manages ski facilities in Prali. Differently from the case of Alagna, the Prali ski area has no links with other ski resorts. This means that the transit entrances belong to the same people who make the first entries. Unexpectedly, the number of first entries was strongly increased during 2019 and 2020 (restriction period due to Covid-19 emergency) in respect to 2018. Another aspect to underline is that the ski resort remains open during both summer and winter seasons. People in fact use ski facilities in summer for walking or cycling sports.

Table 38. Prali ski data 2017 - 2021

Data variables	Fonte	N year	2017	2018	2019	2020	2021
ski slope metric development (km)	skiinfo.it			25			
n. of skipass (first entries)	Nuova 13 laghi srl	4		43.480	60.631	61.619	0
n. of skipass (transit entrances)	Nuova 13 laghi srl	3			672.636	682.050	0
n. of round trip skipass							
n. of daily skipass							
n. of weekly skipass							
n. of seasonal skipass							
n. of ropeways	ARPIET	4	0	0	0	0	
n. of chiarlifts	ARPIET	4	2	2	2	2	
n. of skilifts	ARPIET	4	2	2	2	2	

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4. Discussion and conclusions

Tourism is a significant part of the reginal economy of the tourism hubs as depicted in the Gross Regional Product. It contributes to more sustainable socio-economic growth. As the tourism is growing, the accommodation in the tourism hubs is increasing but the COVID 19 pandemic led to decrease in the trend for international visitors. The summary for the key characteristics across the different hubs is shown in Table 39.

Table 39. Summary of Key Characteristics for Tourism hubs

Characteristics	Suðuroy	Nuup Kangerlua	Westfjords	Svalbard	Varangerfjord	Egersund	Inari	Kittilä
Population Dynamics	Population decline after the severe economic crisis in the early 1990s. Population has remained relatively stable during the past two decades, with an upwards trend in recent years, the population is ageing.	The population of Nuuk town has increased steadily since the 1980's, while the number of inhabitants in other towns are stable or declining.	Population decreasing in both municipalities until 2011. In Vesturbyggð the population is gradually increasing. In Tálknafjarðarhreppur, it has been slowly increasing in 2022.	Since 1995 the population in Longyearbyen and New Ålesund has increased from 1,218 people to 2,552 in 2021.			Finland's population has grown steadily every year	
Income from tourism	2% GDP (before pandemic	Increasing GDP		The value creation from the tourism industry increasing (2008-2017). In 2019-2020, the incom had decreased.			Before the pandemic, the GDP remained at 2.7% but, for 2020, it decreased by a whole percentage point to 1.7%.	
Accommodation for visitors	During Covid19 trend is clearly increasing as there was a boom in domestic tourism in this period. This is	Accommodation capacity in Nuuk has increased since the beginning of registration of the overnight stay data and is likely to increase in future	Increasing trends for Icelanders while decreasing trend for other nationalities due to COVID	The number of overnight stays reached a record 166,801 guest days in 2019. The largest increase is linked to the holiday and leisure market.			The amount of accommodation capacity has increased slightly in the last ten years. The	There have been no significant changes in the number of accommodations establishments in the

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	reported to be very clear in Suðuroy, where the number of overnight stays was higher than ever before in 2020.	(Eskildsen, 2021). Between 2015 and 2019, the overnight stays from foreigners have increased by 34%.	pandemic	The number of overnight stays in this segment more than trebled from 2005 to 2019.			pandemic period caused a drop in the number of overnight stays, especially for international tourists.	last 10 years. The number of overnight stays decreased in 2020-2021.
Passenger transport	As is the case in the region as a whole, the number of tourists coming to the Faroes has increased rapidly in recent years. Passenger arrivals to the Faroes continue to increase in 2022.	If we look at the number of monthly international flight passengers to Nuuk there is a seasonal variation. The summer months are busy, while the winter period has less flight traffic. One can assume that the tourists prefer the summer months to travel to Greenland.	The increase in road traffic is particularly noteworthy within the Westfjords Hub study area as it nearly doubled in only four years between 2013 and 2016.	From 2009 to 2019 number of passengers in commercial flights is increasing. There was a dramatic decrease in 2020 due to covid-19 but in 2022, it is now increasing. Cruise tourism makes up a major part of tourism on Svalbard with a large number of operators and vessels		Egersund and Flekkefjord towns has become cruise destinations the last years, starting in 2018.	After the increase in the number of passengers in the 2010s, the pandemic significantly reduced the number of air passengers	The number of air travellers was growing strongly before the pandemic began. The pandemic drastically reduced the number of air passengers
Number of tourism enterprises		Presence of tourism operators: aviation, boat operator, and tour operators	There is a gradual increase on the issuance of operating licenses since 2017 until 2020 in all municipalities.	Increasing businesses in 2020				Small enterprises dominates in March 2022. The largest sector was travel agencies, tour operators and booking services
Cultural industry including heritage sites	The Faroese landscape is dominated by mountain pastures, which are grazed by sheep, also giving the	Nuuk has the largest cultural sector available. Most cultural heritage items in Greenland are displayed at Greenland National		Cultural monuments includes human graves, or traces of such, human skeletons, crosses, and inscriptions are				

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	islands their name, *Føroyar*, meaning "Sheep Islands".	Museum in Nuuk. In addition, there is an art museum in town, and temporary exhibitions at the cultural center Katuaq.		protected regardless of age. . Tourism is now an important industry for Svalbard, and cultural heritage is a main attraction for many visitors.				
Number of people employed under tourism activities	The number of persons employed under hotels, and lodging places as well as places serving food and beverages has increased in recent years	The majority of employees at hotels and restaurants are Greenlanders .		Increasing from 2008 to 2018 but decreased in 2020 due to Covid pandemic				The share of the unemployed in the labor force rose more than the national average in Kittilä during the pandemic.
Educational level		Different courses such as trophy hunting and guiding and so on are conducted depending on the needs in different towns to train guides over the years. The educations were designed to fulfill the Greenlandic needs with collaborations with local tourism actors		"Norway is far behind other countries when it comes to requirements for nature guides' competence. Except for NORTIND's internationally approved mountain guide education, only UiT runs a Nature Guide course with a specific and clear focus on the nature guide profession."(UiT 2018)			Education Center provides education on the Sámi language and culture, vocational education and training, and short trainings for supplementing prior competence	
Tourism income and other country/ Arctichub specific tourism	Income from tourism was estimated to 784 million Danish Kroner in 2019 (VFI 2019),	The revenue from tourism has increased following the tourism activities, until the covid-19 stopped most		Increasing snowmobiles				In 2016, Kittilä's tourism income, including indirect effects, was more than 200

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characteristics .		of the international visits to Greenland.						million euros, which is about half of the total turnover of Kittilä's companies
Conflicts /issues	Increasing tourism in Faroes lead to conflicts since not all residents agree with the strategy to increase tourism. Tourism is conflicting with other landuse practices.	Often the sectors can co-exist with non-conflictual activities. However, conflicts between tourism and other sectors also exist in Greenland, primarily within use of land and marine spaces and resources. This could be the mentioned ban on humpback hunting or hiking groups crossing local caribou hunting paths or areas.		Tourism triggers a major structural change in a community. Svalbard attracts more non-Norwegians, the turnover is extremely high plus the numbers in the population register might be inaccurate, the housing situation is described as critical, and there is a clear risk of social dumping.			Conflictual issues between local community, reindeer herding and tourism. Most important problems mentioned are crowding, noise, littering, landscape deterioration, husky sleds	Contradictions between livelihoods are mainly related to land use (reindeer husbandry, mining and other natural livelihoods)

The positive impacts of tourism are providing employment to the locals in tourism enterprises. The increasing trend on the establishment of tourism enterprises signifies increasing tourism in the hubs. Meanwhile, there are improved business opportunities. Tourism is important to sustain the culture and maintain social relationships in the hubs. Aside from cultural tourism, the potential for gastro tourism like in Nuuk can be developed to serve culinary dishes.

In terms of education, Greenland offers courses in collaboration with local tourism actors for tour guide. This contributes to long term and sustainable tourism. Similarly, Inari provides education on the Sámi language and culture, vocational education and training, and short trainings for supplementing prior competence. However, Norway is not mainly focus on requirement for nature guide's competence.

There are infrastructural investments such as development of road networks and airports to facilitate accessibility on the tourism sites. This is evident in the expansion of airports in Greenland. Further, an important contributor to the positive economic trend in the Inari is the international airport at Ivalo. This is particularly important for the business sector, linking rural and Arctic Inari to the wider world.

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All of the hubs show increasing traffic over the past years. In Svalbard, the cruise tourism primarily constitutes tourism with the increasing boat operators and vessels.

Despite the positive impacts of the tourism industry, increasing tourism affects the quality of life of the host communities. It leads to conflicts specially on areas that the residents do not agree with the strategy of increasing tourism. For instance, Suðuroy hub, tourism is in conflict with other land use practices on the construction of local housing. With the increasing demand for accommodation, it adds pressure on the housing markets, which in turn affects the living costs for local people. Further, most of the tourists demand to experience Faroese nature but, the landowners are negatively affected because of visitors on traditional fields for sheep pastures. This issue needs to reconciliation among tourism industry, landowners and concerned citizens.

Tourism also affects the community in Svalbard. There is scarcity of housing and unstable jobs due to seasonality in tourism employment. As mentioned earlier, Norway is far behind in terms of education on tourism with the threat of unskilled or uncertified guides. There is also increasing pressure on infrastructure developments that leads to environmental impacts such as emissions and noise pollution due to increasing traffic. Further, ship traffic negatively affects the marine wildlife.

In both Finnish hubs, there are also conflictual issues between livelihoods which are related to land use such as with reindeer herding and tourism. Specifically, on Inari, the problems are related to crowding, noise, littering, and on unethical issues on husky business. In terms of Kittilä, competing land use among natural traditional livelihoods are usually competing in land use with tourism, mining or currently the for wind power.

Generally, tourism has positive impacts on jobs, income and improvement of local services in the hubs while negatively affects the quality of life of the host communities. However, with the growing tourism, the hubs should develop strategies to solve sustainability issues in the forthcoming years. Reconciliation is necessary to resolve the conflicts with residents. Further, the hubs should focus on research and education/ training for the tour guides. The hubs should also develop awareness campaigns on the impacts of tourism industry. Tourism can be grown but it has to be sustainable and with social acceptability.

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1. Background and Introduction

ArcticHubs project recognize the crucial importance of indigenous and traditional livelihoods in the economy of the arctic area and in maintaining indigenous people culture and way of life. Global drivers, with their impact over industries and land and resource use, are having major effects on the viability of traditional livelihoods (ADHR II, 2014: p. 137) and further pressure is added by climate change, which is modifying the environment upon which these same livelihoods rely. For example, reindeer herders in Fennoscandia are facing conflicts with many kinds of development projects (new infrastructures, touristic activities, mines, wind fields…) that are being planned and implemented in the herding areas, interfering with reindeer migration patterns and destroying pastures (AHDR II, 2014: p.136). ArcticHubs project considers Indigenous people as threatened groups that need to strengthen their resilience to face the changing context, preserving their activities and cultures and at the same time getting their fair share of the benefits coming from the new economic and social opportunities that will open up. On the other side, considering the strong participatory approach that ArcticHubs project is trying to implement, Indigenous people, together with local communities in a broader sense, are one of the main actors that have to be included in co-creation of knowledge, co-design and co-management of the policy solutions that will be identified through the project for the sustainable and socially balanced management of Arctic resources.

The aim of the present report is to provide "a systematic overview of economic activities in the arctic regions as basis for further examination of impacts and local perceptions on these developments". This is the general aim for all the industries, but when it comes to indigenous cultural hubs the focus is not only on a specific industry, but on social and cultural systems that are impacted as a whole due to important changes in how traditional livelihoods are performed: the issues are, therefore, more complex and more difficult to address through secondary, mostly quantitative date. Nevertheless, relying on secondary data (official statistics, reports, academic literature, etc) this report will provide a preliminary analysis of the current status of indigenous livelihoods, their context and the complex interaction of traditional activities, mainly reindeer herding, hunting and fishing, with the broader socio-economic context and the other industries. Proceeding from this, deeper analysis will be conducted through qualitative data collection and analysis, relying specifically upon interviews, PPGIS and Q-methods.

As it will be described in greater details in the following paragraphs, there are some methodological considerations to be taken into account. As previously mentioned, the first "layer" of the report's content is aimed to give a descriptive analysis based on secondary data, in order to grasp the general picture of the context and the conditions in which indigenous cultures and livelihoods are set. It must be noted that the secondary data that the project team was able to collect have some major limitations in terms of comparison between hubs; furthermore, data related to many dimensions that are indeed crucial to understand the status of indigenous livelihoods are not available at the hub level, or even at broader scales (the scarcity and limited quality of data from arctic areas is a major issue that is affecting research efforts outside ArcticHubs as well: for greater discussion see ASI II, 2014). They will be briefly accounted for in the introduction, while in the hub subchapters only variables with sufficient data available will be used. In the following paragraphs the main methodological and data challenges and report limitations will be addressed.

1.1. What is indigeneity?

A core definition of indigeneity is far from being universally formulated and it is, quite the opposite, controversial and even conflictual, strongly related to the social and political context (AHDR II, 2014: p.128-129). This is clearly emerging in the ArcticHubs project: the indigenous hubs are located in

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Finland, Sweden, Norway and Greenland, but if the indigenous groups living in the first three countries are all Sami and share important features, such as the importance of reindeer herding as traditional livelihoods and some of the main challenges and land use conflict (such as mining and tourism development) very different is the situation in Greenland. In Greenland the definition of "indigenous" is problematic on a political level: it is related to the issue of the relations with Denmark (ASI II, 2014: p. 279) and there is strong debate about the opportunity to use the word itself. Furthermore, indigenous people represent the vast majority of the population (ASI II, 2014), contrary to Finland, Sweden and Norway where Sami people constitute an cultural, linguistic and numerical minority. Livelihoods are different as well: instead of reindeer herding, hunting and fishing seems to be the traditional activities to preserve and the potential resource conflicts, as well as the new sustainable development opportunity coming from for example tourism industry are different as well. The significance differences between Sami and Greenlandic people are the reason why they will be described in two separate chapters, but it's especially an important way to show and exemplify the great variety of indigenous cultures and livelihoods that can be found in today's Arctic, both sharing challenges and vulnerabilities and dealing with specific context through different strategies.

1.2. Who are Indigenous people?

A major issue to be addressed is that the definition of "indigenous" is anything but straightforward. There are many different ways to draw the line between "indigenous" and "non-indigenous", for example self-identification, language, ancestors, continuity in the relation with a certain territory. Each of them will produce a different group of people, including someone and excluding someone else. For example, is common that younger generations cannot speak indigenous languages, even if they were born from indigenous parents. Letting aside wider considerations about the philosophical and identity implications of the question that go far beyond the scope of the present report, it's important to focus on two consequences: political/institutional and methodological (ASI II, 2014; AHDR II, 2014: pp. 85-88; 128-129). On the political level, the definition of indigenous is relevant because it determines who is going to be granted specific rights (land use/ownership rights, electoral rights in relation to indigenous institutions, possibility to practice traditional livelihoods such as reindeer herding, subsidies). On the methodological level, the selected definition will determine how data are collected in statistics. In Norway, Finland and Sweden the national statistics offices responsible for census and population registers do not include ethnicity as a dimension in the census and is therefore impossible to produce statistics specifically describing Sami population starting from these data (ECONOR, 2021: p. 36). For example, we cannot understand the percentage of indigenous population in a certain municipality or the level of education of indigenous groups. **Specific surveys that have been conducted to gather data about indigenous population are producing interesting data but are using different methods and definitions from country to country** and this mean that a purely quantitative comparison is impossible according to scientific standards. For example, Statistic Norway, in collaboration with Nordic Sami Institute, uses a geographical approach, producing statistics for areas defined as Sámi settlement areas, which are the areas that qualify for support to business development from Sámi Parliament. This approach has major limitations, since many Sámi people live outside the area and therefore are excluded from the statistics and, in turn, non-Sámi people who reside in the area are included (ECONOR, 2021: p. 36-37). In Greenland the vast majority of the population has Inuit ancestors, but the official statistics are collected exclusively on the place of birth (born in Greenland/born outside Greenland): "Greenlandic" category therefore include people from non-Inuit families and exclude people born outside Greenland (most frequently in Denmark) even when from Inuit parents (ASI II, 2014: p. 168-169)

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1.3. Indigenous economies and cultures: subsistence and market

Economic data about, for example, the number of reindeers per owner or the meat produced are not easy to compare as well, because the size of the herd, the number of people involved, and the kind of ownership are different from one country to another. The meaning of the quantitative data about production are also difficult to interpret *per se*, since much of the income in indigenous areas comes from other sources, such as hunting, tourism, subsidies and compensation for killings from carnivores. Nevertheless, we included this kind of production variable to give an idea of the quantitative dimension of this livelihood and the related business. Where available, data about other livelihoods have been included as well.

A crucial factor when approaching indigenous economies is the interrelation between wage/market economy and subsistence economy **(**ASI II, 2014; SLiCA, 2007; AHDR II, 2014: p. 439). The two are strictly interconnected and mutually dependent: to conduct subsistence activities, for example hunting and fishing, expensive equipment such as GPS, fuel, snowmobiles etc are needed and they must be purchased on the market. Being part of the wage economy is therefore crucial, in order to get the cash needed to purchase equipment. On the other side, employment is subtracting time to subsistence and other traditional activities within communities, weakening social ties and making it more difficult to preserve practices and cultures (ECONOR, 2021: p. 138). Development projects, such as new mines and production sites, infrastructures and wind fields are also likely to negatively affect traditional activities due to their significant impacts on ecosystem (ADHR II, 2014: p. 163): one example is the loss and fragmentation of pastures and migration routes vital for reindeer herding (ECONOR, 2021: p. 142-143; YOUTH, 2015 p. 73-82; EALÁT, 2009: p. 14). Climate change makes activities such as fishing, hunting and herding exposed to further pressures, creating unpredictable and extreme conditions and forcing people move further away (ECONOR, 2021: p. 149; Indigenous food security in the arctic, 2021; YOUTH, 2015: p. 82). However, it is important to note that herders often do not feel threatened by climate change *per se*, but by the combination of multiple stressors, where the industrial and infrastructural development remains the most serious one, since the main form of adaptation is the flexible use of pasture areas (ELEÁT, 2009). Nevertheless, despite the need for compromises, subsistence activities are still regarded as highly important, both on the economic level (in Greenland "informal food distribution and transactions" contribute to the national economy for 1.5% of GNP. AHDR II, 2014: p. 439-440) and cultural level: they provide traditional nutritious foods and their production and sharing are one of the pillars of indigenous wellbeing (ASI II, 2014: p. 277) and heath, besides being an important part of social bonds construction and maintenance (AHDR II, 2014: p. 167; 439-). Another example of this interrelation is the commercial production of traditional art and craft, that can be sold to tourists and collectors, and the development of traditional gastronomy for reaching new group of costumers as part of a wider strategy for value creation (AHDR II, 2014. p. 168; ECONOR, 2021: p. 144-146). Another interaction is determined by policies and subsidies: for example, in reindeer herding in Norway, the industry have been restructured in a way that makes profitable to slaughter calves and to keep a very low percentage of male reindeers, while until the 1960s the composition of the herd was even in relation to males and females. This different composition is one of the reasons why herders have to rely more on pelleted feed for animals during winter, since only big male reindeers are able to break the iced layer of snow to provide access to lichens for females and calves. Furthermore, strict slaughtering regulation prevents herders to follow traditional slaughtering practices that preserve meat tenderness (ECONOR, 2021: p. 143-145). The Norwegian "modernization" of reindeer herding according to the principles of industrial, large-scale agriculture had major impacts not only on the industry itself and how reindeer herding is practiced, but also on the family structure and on the very cultural foundation of herding and its relationship with environment and indigenous understanding of economy (YOUTH, 2015: p. 57-61). Sometimes policies implemented in different

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sectors and with different goals create paradoxical outcomes: the incentives to slaughter calves, for example, induce herders to "save every female reindeer as 'production-reindeer'". On the other hand, the number of predators is increasing, thanks to conservation policies. The weaker herd generated by the high number of females (included weak females and their weak calves that are kept because it's profitable thanks to incentives but that are "bad-genetic reindeers" *per se*) is therefore more vulnerable to the (protected) predators, leading to an increasing number of killings (YOUTH, 2015: p. 66)

1.4. Governance: indigenous institutions, treaties and resource management

In the last two decades, indigenous people voice has been able to rise also thanks to the increased power of indigenous institutions from the local to the international level (Arctic Council), which paired with the devolution of power from the central government to the regional authorities (AHDR II, 2014: p. 186-187). It must be noted that some of these institutions, such as Sámi Parliaments in Sweden, Finland and Norway have a limited level of political autonomy, since they can only develop policy recommendations to their respective national parliaments, but they have only an advisory character and are not legally binding (AHDR II, 2014, p.192). In Norway, the main indigenous institution is the Sami Parliament, a national body that interacts both with national and local (municipal and county) governments. Even though its power is mostly related to culture, language, education and support to small-scale industry, the influence of this institution is increased in recent years thank to the consultation agreement, which gives to the Sami Parliament a stronger voice about legislation, planning and other concrete matters relevant for Sami Norwegian population (even if consensus is not always met and there are important challenges) (AHDR II, 2014: p. 203-204; 207). In Greenland, especially from 2009 with the achievement of Self-Rule, the degree of independence from Denmark is very close to full independence and since the vast majority of residents are Inuit, the government is *de facto* an indigenous government (AHDR II, 2014: p. 202-203). Significantly, 6 indigenous organizations are also part of the Arctic Council: even if they don't have voting status, the fiscal support is too limited to guarantee meaningful participation and they are affected by lack of personnel capacity to address all the relevant issues, they are still able to "exert influence through the state delegations of the voting members" (AHDR II, 2014: p.211-212). One of these 6 organization is Inuit Circumpolar Council (ICC) which includes Inuit people from Russia, US, Canada and Greenland. ICC is a transnational organization that "provides a voice for Inuit on an international stage" and has been involved in important international forums, especially for environmental issues (AHDR II, 2014: p. 214). For Sami people, the main international organization is Sami Council, which include members from Norway, Sweden, Finland and Russia (AHDR II, 2014: p. 216)

According to treaties, beside UN Declaration on the Rights of Indigenous People (2007) and ILO Indigenous and Tribal People Convention (1989), Indigenous people in Europe can refer to the European regional human rights system. However, it has been proven to have a limited effectiveness when it comes to land rights issues, partially because of its focus on individual rights and not group rights and because the "petitioner must first exhaust its local remedies in a state-based system that is designed to protect settler titles and land use rather than indigenous titles and uses". Another forum is Framework Convention for the protection of National Minorities (AHRD II, 2014: p.238-239). With the exception of Norway and Denmark/Greenland, the increasing attention to indigenous rights in International Law doesn't seem to be reflected in national regulations (AHDR II, 2014: p. 241)

About resource management: local systems are often informal and rely on kinship and community interaction. They are often in conflict with bureaucratic systems and, when they have emerged in a more organized way, they sometimes face limited financial and human resources (AHDR II, 2014: p.258). In many Arctic areas, such as Fennoscandia, there have been many co-management and

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adaptive co-management initiatives, where indigenous organizations have been able to increase their authority (AHDR II, 2014: p. 259). Furthermore, Indigenous knowledge, even if often misunderstood, seems to be included more in the arctic resource governance (AHDR II, 2014: p. 261). However, indigenous rights for example over the land used for reindeer herding (Swedish example: AHDR II, 2014: p. 264-269 and EALÁT, 2009: p. 47) or over fishing (example from Norway: AHDR II, 2014: p. 267-269) are far from being fully acknowledged and implemented in national legislations and resource governance. Very different is the Greenlandic situation: after gradual steps, in 2009 Greenland achieved self-governance and with it the Greenlandic government "assumed responsibility over all aspects of mineral resources" and "subsurface rights", but public participation processes are still facing important limitation in their effectiveness (AHDR II, 2014: p. 277)

1.5. Youth: education, identity and reproduction of cultures and livelihoods

The same kind of "dilemma" that is affecting subsistence activities and job for adults applies to children and young people when education is considered: they have to attend school in order to get chances to get jobs in wage economy, but this has a strong impact over cultural transmission, since young generations get to spend less time in close relationship with older generation and, this ending up in reduced exposure to indigenous language and practices (AHDR II, 2014: p. 462-463), which in turn can also have a negative impact on the willingness of youth to engage in traditional livelihoods (YOUTH, 2015: p. 28). The sustainable practice of traditional livelihoods such as reindeer herding in a "modern world" needs a specific mix of traditional and western education, therefore distance education and courses about veterinary, business, economy and law are needed for young people, in order to allow them to develop the needed "modern" skills while staying in their community and learn traditional skills and language that are vital for the livelihood (YOUTH, 2015: p. 27, 33-34).

Access to education can be a challenge in itself: sparsely populated areas are often lacking education institutions, schools closures are common and residential schools has been the more widespread response to the problem, with major negative impacts over communities (AHDR II, 2014: p. 354-355). The level of education in the area is still lower comparing to the national average, especially for indigenous people, who are also affected by a high dropout rate (ASI II, 2014; AHDR II, 2014: p. 354) and a much lower rate of post-secondary education comparing to the non-indigenous population (AHDR II, 2014: p. 383). Staffing school with properly trained teacher is also challenging in many arctic regions, for example Greenland, and especially when it comes to find educators who have a high-level quality Indigenous language (AHDR II, 2014: p. 356-358).

On the other hand, is important to note that in many Arctic areas, including Norway, Sweden and Finland, indigenous educational programs (or specific indigenous schools) are also available: here at least part of the teaching is held in Sami languages and culturally relevant subjects are taught, for example herding, culture and craft (ASI II, 2014: FOR SAMI PAG 195; AHDR II, 2014: p. 363-364). A few higher education institutions serving indigenous populations exists too, for example Sámi University College in Kautokeino, Norway (AHDR II, 2014: p. 371; YOUTH, 2015: p. 31). Tromsø, Umeå, Oulu, Helsinky and Lapland Universities and Sámi Institute in Inari are also offering Sámi studies, research centres, programs in Sámi language and Sámi-related programs at an academical level (AHDR II, 2014: p. 391). Language retention is a critical issue: traditional languages are the mean through which traditional knowledge and the related view of landscape, environment, values and practices are transmitted. Indigenous languages are endangered in the majority of indigenous areas and in the communities often only elderly people and adults are fluent in the indigenous language, while youth are generally using the majority language. The disappearance of indigenous languages constitutes a major threat to the maintenance of traditional livelihoods (YOUTH, 2015: p. 40-42). Furthermore, young people (especially females, who outperform males in formal education attainments: AHDR II,

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2014: P. 69; 364-365) tend to migrate to bigger cities in search of better education and job opportunities (ASI II, 2014; AHDR II, 2014), interrupting the reproduction of traditional gender-typical skills and crafts like sewing and cooking. In addition, traditional livelihoods such as reindeer herding are facing major pressures from climate change and especially land use change (industrial and infrastructural development) that are making these activities a less viable choice for young families (YOUTH, 2015: p. 10).

Identity is also a complex issue: being exposed and socialized not only to indigenous culture but to other potential identities as well, young people create new synthesis and re-interpret, strengthen or abandon indigenous identity along new patterns (AHDR II, 2014: p. 128. For importance of "traditional" sports competitions see AHDR II, 2014: p. 126; AHDR II, 2014: p.130) that in turn influence the willingness to practice traditional livelihoods and activities instead of looking for different kind of occupation and social and cultural life. Social media, on the other hand, have been a powerful channel for youth to express a renewed indigenous identity (for all the paragraph: AHDR II, 2014: p. 462-463).

These kind of interactions between indigenous and non-indigenous economies and cultures are highly complex and contextual and are subject to different, often conflicting interpretations. A strictly quantitative analysis, therefore, is too limited to get a deep understanding of the dynamics, setting aside the fact that relevant statistics are hardly ever available.

1.6. Health: access to services and traditional wellbeing sources

Another crucial issue that is hard to address through secondary data is indigenous heath. According to literature and reports, there are two major elements to be consider: first of all, indigenous communities live often in rural, remote and sparsely populated areas where services are scarce and difficult to access, resulting in lower health level in the Arctic areas comparing to national average (ASI II, 2014). Indigenous people in some areas suffer poorer health status compared to the majority population. In Nordic countries the difference in heath indicators between indigenous and non-indigenous people is little, while there is a bigger difference between Greenland and Denmark, in particular when it comes to suicide rate (AHDR II, 2014: p. 299-310). SLiCA research project (2007) included questions about self-evaluation of level of health, drugs and alcohol abuse, domestic violence and suicide (ASI II, 2014). To consider the latter, most dramatic indicator, suicide rate in the Arctic area is still significantly higher than the national average of the single arctic countries (ASI II, 2014). "Suicide rates among indigenous people are in general higher than the majority population, especially in the arctic region" and is being interpreted as a social disease related to historical and cultural context rather than an individual mental health issue (YOUTH, 2105: p. 20). On the other hand, indigenous health and wellbeing require access to culturally appropriate resources, such as nature and traditional foods (ASI II, 2014; Indigenous food security in the arctic, 2021). At this regard, limitation and difficulties can come from regulations, for example imposed restriction over hunting, accumulation of pollutants in the foodchain, large scale industrial resource developments, increasing pressure from predators and climate change, which is affecting both food and water security and the exposure to new pathogens (ASI II, 2014; AHDR II, 2014: p (among others) 310; 442) and is making activities such as hunting and fishing on the ice more risky and is affecting wildlife abundance and behaviours (ECONOR, 2021: p. 149; Indigenous food security in the arctic, 2021; YOUTH, 2015: p. 82)

Health at the end stages of life also calls for specific measures for indigenous elders. To be able to communicate in your own native language not only brings a sense of security and comfort when you are perhaps moved to an institution, sometimes dementia and other impairments cause Sami elders to remember only their Sami language. The same goes for food, the loss of appetite so often encountered in these situations can be remedied by serving traditional food.

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1.7. International documents regarding Indigenous People

Special rights, protection, and inclusion mechanisms that come with the Indigenous People category requires a presentation of various sources. The following is not a legal in-depth review, but merely a concise introduction of:

- International Labour Organization Convention No. 169 (ILO Convention No. 169), of 1989.
- United Nations Declaration on the Rights of Indigenous Peoples, 2007.
- World Bank Criteria for Indigenous Peoples.
- Self-Government Act 2009
- Home Rule Act 1979

1.8. Subjects of obligations and rights

The State ratifying an international convention is the subject of the obligation and the group of persons targeted by the convention are subjects of rights. The State is obliged to implement the Convention in practice and in relevant legislation and target groups may invoke the rights prescribed by the Convention.

International conventions typically have a monitoring body in which the subject of obligations (the state that ratified the convention) regularly reports on the implementation of the convention and where any disputes had involved the rights of the convention.

1.9. ILO Convention 169, Treaty Binding on International Law

The International Labour Organization (ILO) participates in the joint effort to support the special contribution of Indigenous peoples to human cultural diversity, and in 1989 ILO Convention 169 was ratified by 20 states. ILO Convention 169 is an internationally binding treaty on Indigenous and tribal peoples and their rights, and therefore has an essential role in the protection of Indigenous Peoples. Despite the modest number of formally affiliated states, reference is often made to the Convention when the terms of Indigenous Peoples are discussed, both internationally, nationally and locally.

The ILO prescribes that the special values, customs and ways of life of Indigenous Peoples have been undermined due to past and present processes of assimilation, which means that the few Indigenous Peoples who contribute to the cultural diversity of humanity are worthy of protection and must be granted special rights so that they can continue their traditional way of life.

"The content of the provisions of the Convention is sufficiently precisely formulated to be applicable by both authorities and courts. The establishment of a complaints system in relation to the application of the Convention supports the notion of a Convention which has such a character and content that its provisions are suitable to be applied by the courts and other law enforcement authorities in the resolution of specific disputes."

ILO Convention 169 describes Indigenous Peoples and their living conditions as follows:

- "... the development of the situation of indigenous and tribal peoples in all areas of the world has made it appropriate to adopt new international norms on this issue with a view to eliminating the orientation of previous norms towards assimilation; and
- ... Recognizing the desire of these peoples to exercise control over their own institutions, way of life and economic development, and to maintain and develop their identity, language and religion, within the framework of the States in which they reside; and

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- ... Noting that in many parts of the world these peoples are not able to enjoy basic human rights to the same extent as the rest of the population of the States in which they live, and that their laws, values, customs and beliefs have often been undermined, and
- ... Drawing attention to the special contribution of indigenous and tribal peoples to the cultural diversity and social and ecological harmony of mankind and to international cooperation and understanding the Convention on Indigenous and Tribal Peoples of Independent States formulates, inter alia."[3]

The aim is to promote the participation of indigenous peoples in decision-making processes

"The Convention represents a consensus reached by ILO tripartite constituents on the rights of indigenous and tribal peoples within the nation-States where they live and the responsibilities of governments to protect these rights. It is based on respect for the cultures and ways of life of Indigenous peoples and recognizes their right to land and natural resources and to define their own priorities for development. The Convention aims at overcoming discriminatory practices affecting these peoples and enabling them to participate in decision-making that affects their lives. Therefore, the fundamental principles of consultation and participation constitute the cornerstone of the Convention."[4]

The rights and control over priorities of development

"The peoples concerned shall have the right to decide their own priorities for the process of development as it affects their lives, beliefs, institutions and spiritual well-being and the lands they occupy or otherwise use, and to exercise control, to the extent possible, over their own economic, social and cultural development. ILO Convention No. 169, article 7(1)"[5]

The ILO Convention aims to promote the rights of indigenous peoples to participate in and prioritize development processes that affect their way of life.

1.10. ILO Convention 169's Criteria for Indigenous Peoples

ILO-convention 169 does not have a universal definition of the term Indigenous Peoples precisely in order to accommodate and include the diversity of Indigenous Peoples. ILO Convention 169 has established both subjective and objective criteria for Indigenous and Tribal Peoples, respectively:

- "Indigenous peoples' Subjective criteria: Self-identification Descent from populations, who as belonging to an inhabited the country or geographical Indigenous people.
- Indigenous peoples' Objective criteria: Descent from populations, who inhabited the country or geographical region at the time of conquest, colonization, or establishment of present state boundaries, and accepts a person as belonging to their group or people. They retain some or all of their own social, economic, cultural, and political institutions, irrespective of their legal status.
- Tribal peoples' Subjective criteria: Self-identification as belonging to a tribal people.

[3] https://www.retsinformation.dk/eli/ltc/1997/97
[4] https://www.retsinformation.dk/eli/ltc/1997/97
[5] https://www.ilo.org/wcmsp5/groups/public/---ed_norm/---normes/documents/publication/wcms_205225.pdf

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- Tribal peoples´ Objective criteria: Their social, cultural, and economic conditions distinguish them from sections of the national community. Their status is regulated wholly or partially by their own customs or traditions or by special laws or regulations."[6]

1.11. United Nations Declaration on the Rights of the Indigenous People

The United Nations Declaration on the Rights of Indigenous Peoples was adopted in 2007. The Declaration is not binding on international law, but with a large decision-making majority of 143 states, the Declaration is internationally recognized.

The Declaration, like ILO Convention 169, aims to protect the specific characteristics and elements of indigenous peoples in their way of life. The specific characteristics can be cultural, social, economic and political. Modern society is indirectly assumed to be the reason why indigenous peoples find it difficult to maintain their particular characteristics and elements in their traditional way of life.

The United Nations Declaration on the Rights of Indigenous Peoples is based on the purposes and principles of the Charter of the United Nations. States that have signed up to the Declaration on the Rights of Indigenous Peoples agree to the Pact. The Pact consists of several declarations, and the following two are examples justifying the need for protection:

- "Alarmed that indigenous people have suffered historical injustices, inter alia, as a result of their colonization and deprivation of their lands, territories and resources, and in this way have been deprived in particular of the opportunity to exercise their right to development in accordance with their own needs and interests, recognizes the urgent need to respect and promote the inherent rights of indigenous peoples deriving from their political, economic and social structure and from their cultures, spiritual traditions, histories and philosophies, and in particular their right to their lands, territories and resources"[7]

Former UN Secretary-General Ban-Ki-moon said in connection with the International Day of the World's Indigenous Peoples in 2014:

- "The indigenous peoples represent a remarkable diversity and are important to our cultural heritage."[8]

1.12. The UN Declaration's criteria

The UN Declaration on Indigenous Peoples, like ILO Convention 169, has no definition of who are indigenous peoples, and writes the following in the declaration:

"There is no singularly authoritative definition of indigenous peoples under international law and policy, and the Indigenous Declaration does not set out any definition. This decision was taken intentionally by the drafters based on the rationale that the identification of an indigenous people is the right of the people itself—the right of self-identification- and a fundamental element of the right to self-determination. Indigenous peoples' situations and contexts are highly variable; any single

[6] https://www.ilo.org/wcmsp5/groups/public/---ed_norm/---normes/documents/publication/wcms_205225.pdf

https://www.ilo.org/dyn/normlex/en/f?p=NORMLEXPUB:55:0::NO::P55_TYPE,P55_LANG,P55_DOCUMENT,P55_NODE:REV,en,C169,/Document

https://www.retsinformation.dk/eli/ltc/1997/97).

[7] https://www.un.org/esa/socdev/unpfii/documents/DRIPS_danish.pdf)

[8] https://unric.org/da/verdens-oprindelige-folk-spiller-vigtig-rolle-i-malsaetningen-om-en-mere-baeredygtig-fremtid/

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definition will not fully capture the full diversity of the indigenous peoples of the world. In fact, its articles 9 and 33 state that indigenous peoples and individuals have the right to belong to an indigenous community or nation, in accordance with the traditions and customs of the community or nation concerned, and that they have the right to determine their own identity."[9]

The rejection of a universal definition of Indigenous People is justified by the fact that everyone has the right to have a subjective self-identification as belonging to an Indigenous People. The absence of a universal definition should also be understood as an attempt to embrace the diverse groups of Indigenous peoples.

1.13. UN system's Indigenous People definition

However, the UN system, and not the UN Declaration on the Rights of Indigenous Peoples, has a definition of Indigenous Peoples, as formulated by then Special Rapporteur J. R. Martinez Cobo in 1986. The definition is not binding on international law. The definition consists of both objective and subjective elements:

"Indigenous communities, peoples and nations are those which, having a historical continuity with pre-invasion and pre-colonial societies that developed on their territories, consider themselves distinct from other sectors of the societies now prevailing on those territories, or parts of them. They form at present non-dominant sectors of society and are determined to preserve, develop and transmit to future generations their ancestral territories, and their ethnic identity, as the basis of their continued existence as peoples, in accordance with their own cultural patterns, social institutions and legalt system."[10]

The subjective criterion is that the indigenous people want to preserve and transfer their traditional way of life to their descendants. The group members see themselves and their way of life as different from the newcomers.

The objective element is that outside dominant actors use lands and natural resources with a different (modern) way of life. The objective element is also that the indigenous people have a historical continuity and attachment to the communities that prevailed before the colonization or invasion of these communities.

1.14. World Bank´s criteria for identifying Indigenous Peoples

The World Bank is also an important player in protecting indigenous peoples' ways of life. The World Bank provides support programs that include indigenous peoples in processes that address their future in a globalized world.[11]

The World Bank has rather not formulated a definition of Indigenous Peoples, but, like ILO Convention 169, has prepared a description of criteria that qualify someone to be an Indigenous People and which must be met if indigenous peoples want to apply for the use of World Bank programs.

For purposes of this policy, the term "Indigenous Peoples" is used in a generic sense to refer to a distinct, vulnerable, social and cultural group possessing the following characteristics in varying degrees:

[9] https://www.ohchr.org/en/indigenous-peoples/about-indigenous-peoples-and-human-rights. http://indigenouspeoples.nl/indigenous-peoples/definition-indigenous. https://www.ohchr.org/en/topic/indigenous-peoples

[10] https://www.un.org/esa/socdev/unpfii/documents/workshop_data_background.doc

https://cendoc.docip.org/collect/cendocdo/index/assoc/HASH01a2/55590d02.dir/Martinez-Cobo-a-1.pdf

[11] https://www.worldbank.org/en/topic/indigenouspeoples#1

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- self-identification as members of a distinct indigenous cultural group and recognition of this identity by others;
- collective attachment to geographically distinct habitats or ancestral territories in the project area and to the natural resources in these habitats and territories
- customary cultural, economic, social, or political institutions that are separate from those of the dominant society and culture; and
- an indigenous language, often different from the official language of the country or region[12]

In line with Martinez Cobo, the World Bank's description of Indigenous Peoples contains a subjective and objective description. The World Bank differs from the UN's description by noting that it is not only the group's self-identification, but also the surrounding society (others) that describes them as a group with a special indigenous identity. Again, we see a description of the indigenous people, who be a group associated with the ancestral land area and its natural resources. In the same way, a group with different characteristics than other groups in society is seen. Again, a "them versus us" relationship. The World Bank criteria describe that the group has an indigenous language, which is different from the country's official language. The original language is considered worthy of protection.

The World Bank supports programs only if the above criteria are met in the main proceedings. This means that the list is flexible and pragmatic, so that diverse projects can be supported. The main condition for obtaining support for an involving program is that the state is a mandatory partner in the program.

2. Sami People in Finland, Sweden and Norway

The Sámi homeland includes the northern and central parts of Norway, Sweden and Finland, as well as the Kola Peninsula in the Russian Federation (Ravna, 2013). In Sámi language this area is names Sápmi.

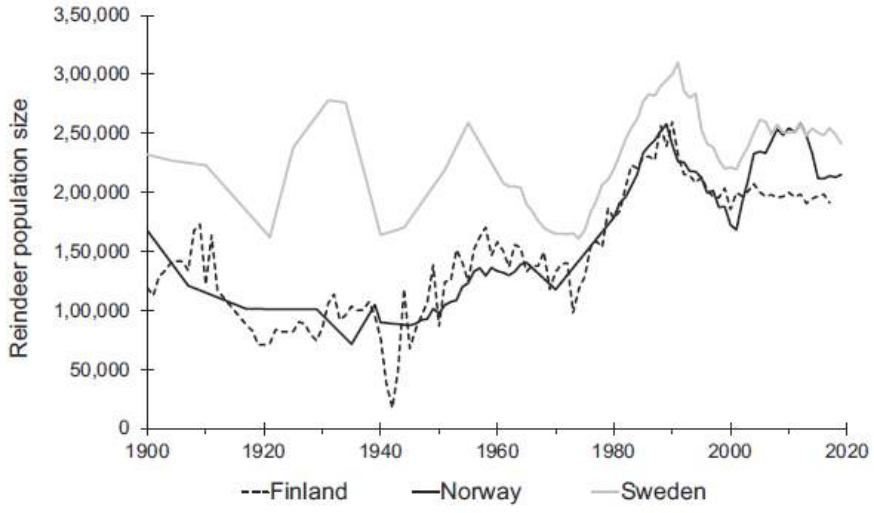

Figure 1. Population fluctuation of semi-domesticated reindeer in Finland, Norway and Sweden (Horstkotte, 2020)

[12] https://web.worldbank.org/archive/website01541/WEB/0__-2043.HTM)

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Table 1. Key statistics for 2019/ 2020 of Fennoscandian reindeer pastoralism. Reindeer numbers are for the winter herds after slaughter.

Country	*Total area of RHA (km^2)*	*# Reindeer*	*# Owners*	*Meat Prod. (tons)*[a]
Finland	123,000	188,000	4,300	2,000
Norway	145,000	213,000	3,300[b]	1,600
Sweden	226,000[c]	241,000	4,600[d]	1,260

Sources: Data from Landbruksdirektoratet (2020a, 2020b) in Norway, Swedish Sámi Parliament (2021) and Paliskuntain yhdistys (2020) in Finland.

Notes:
a Registered by slaughterhouses.
b Only Sámi owners.
c The exact boundaries of reindeer herding areas remain largely undefined in Sweden. Sandström's (2015) estimate is presented.
d Concession owners included.

2.1. Sami people in Finland

There are about 10 000 Sámi living in Finland, but because the amount of Sámi people is not statistically compiled, the amount is only an estimate (Sámediggi, 2022). More than 60% of the Sámi people in Finland live outside the Sámi Homeland (Figure 2; Sámediggi, 2022). This brings new challenges for the provision of education, services and communications in the Sámi language. In Finland, the Sámi Homeland is legally defined, and covers the municipalities of Enontekiö, Inari and Utsjoki as well as the Lappi reindeer herding district in the municipality of Sodankylä.

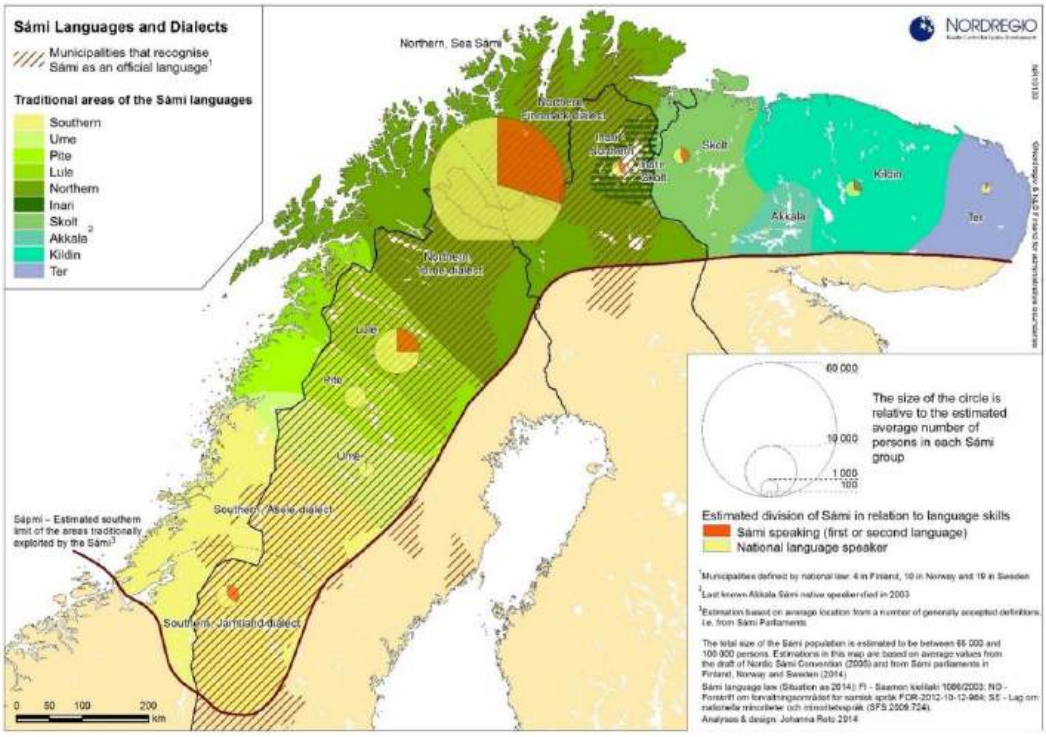

Figure 2. Sámi homeland and Sámi language areas (Johanna Roto 2015)

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There are speakers of three Sámi languages in Finland: North Sámi, Inari Sámi and Skolt Sámi (Figure 2; Sámediggi 2022). In Finland, North Sámi is spoken by approximately 2 000 people, Inari Sámi and Skolt Sámi both have approximately 300 speakers, most of whom live in the municipality Inari. Under the pressure of the dominant languages, many Sámi have lost their mother tongue. Since the ethnic awakening in the 1960s, a variety of measures have been taken to preserve the Sámi languages and bring them back to life. The Sámi Language Act of 1992, revised in 2004, made Sámi an official language. In Finland, all the spoken Sámi languages are endangered, but Inari and Skolt Sámi languages are threatened to become extinct.

Partly because of the ethnic awakening and the work for preserving Sámi languages, the amount of people speaking Sámi as their mother tongue has been rising since the start of 21st century (Official Statistics Finland, 2022). There is also a law regarding the right to use the Sámi language when dealing with the authorities (1086/2003). In 2021, the most Sámi speakers lived in the municipality of Utsjoki with 504 speakers, but a lot of Sámi speakers were living in the other parts of the Sámi homeland, as well as in the capital city area and the city of Oulu (Figure 2).

The status of the Sámi was written into the constitutional law in 1995 (17§ and 121 §). The Sámi, as an indigenous people, have the right to maintain and develop their own language, culture and traditional livelihoods. Since 1996, the Sámi have had constitutional self-government in the Sámi Homeland in the spheres of language and culture. This self-government is managed by the Sámi parliament, which is elected by the Sámi. The Skolt Sámi also maintain their tradition of village administration, under the Skolt Act (253/1995), within the area reserved for the Skolt Sámi in the Sámi Homeland. The Sámi Homeland is legally defined, and it covers the municipalities of Enontekiö, Inari and Utsjoki as well as the Lappi reindeer-herding district in the municipality of Sodankylä (Figure 2; Samediggi 2022).

The traditional livelihoods of the Sámi people are fishing, gathering, handicrafts, hunting and reindeer herding. The economic value of the traditional livelihoods is not big, but the livelihoods are crucial to the culture (Sámediggi, 2022). Some of the Sámi make their living from these traditional livelihoods, but a big part gets their income from more modern occupations.

In Finland, there are about 4400 reindeer herders in the reindeer herding area, but reindeer herding was is a significant livelihood for about 1000 households (Ministry of Agriculture and Forestry, 2022). The reindeer herding area is bigger and reaches more south, than the Sámi homeland (Figure 3). About 38% of the semi-domesticated reindeer population in Finland are found in Sami Homeland Area. On this land, it is not allowed to operate in a way, that may significantly disturb reindeer herding. From the 13 Sámi herding districts, eight districts are located in the region of Inari municipality: Ivalo, Sallivaara, Hammastunturi, Muddusjärvi, Vätsäri, Paatsjoki, Näätämö and Muotkatunturi.

Reindeer husbandry is regulated through Reindeer Husbandry Act (848/1990). Contrarily to Norway and Sweden, in Finland, it is possible for any European Economic Area (EEA) citizen, living permanently in the reindeer herding area, to herd reindeer. In the reindeer herding area, reindeer have the right of free grazing, independent from the landowner. The reindeer owners from different areas constitute 54 reindeer herding cooperatives, and every herder belongs to one cooperative (Reindeer Herders' Association, 2022a). The Reindeer Herder's Association is the steering, advisory and expert organization of reindeer husbandry. The state-owned lands belonging to the 13 northernmost cooperatives forms an area, that is specifically intended for reindeer herding.

Number of reindeer owners, number of reindeer in winter stock and the number of slaughtered reindeer has been showing a decreasing trend during the past decades (1990/91-2019/20; Figure 4; Reindeer Herders' Association, 2022b).

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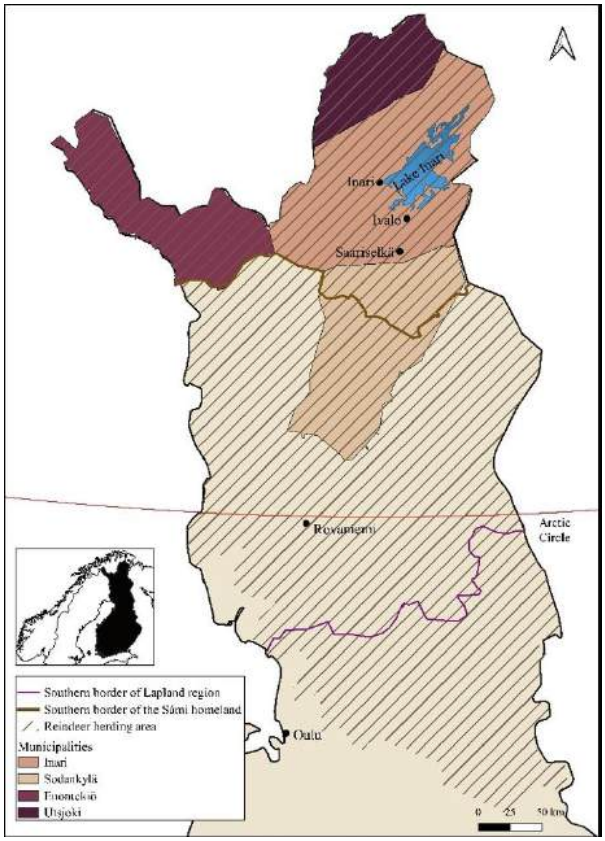

Figure 3. Map of the Inari hub and its surroundings, reindeer herding area and the Sámi homeland area (Data: Natural Earth 2022, Johanna Roto 2015, National Land Survey Finland 2022, Reindeer Herders' Association 2022. Map: Arctic Centre, University of Lapland 2022)

The number of reindeer owners has decreased from 723 to 493, the number of reindeer in winter stock from 49672 to 33344. This has also affected the reindeer meat production, and the number of slaughtered reindeer. During the past decades reindeer numbers have fluctuated due to winter conditions. In Upper-Lapland, including the municipalities of Inari and Utsjoki, there have been disputes between different land uses, like reindeer husbandry and forestry, for decades (Turunen, et al. 2020).

Figure 4. The amount of reindeer owners in Finland from 1990 to 2021 (Reindeer Herders' Association, 2022b).

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2.1.1. Inari Hub

Inari hub consists of the municipality of Inari, which is located in northern Finland, in the region of Lapland (Figure 3). The municipality of Inari is by area the largest municipality of the country. Because of its location, Inari has always been a cultural hub, and a natural passageway to the Barents Sea and Kola Peninsula, and also because Inari is located between two national borders; Norway and Russia. The status of Inari municipality is being improved by the location along the main road of Europe. The number of inhabitants is around 7 000 (Inari municipality, 2022; Figure 5), and its surface area is around 17 333 km^2, making Inari municipality an extremely sparsely populated: the population density is 0,5 inhabitants/km^2.

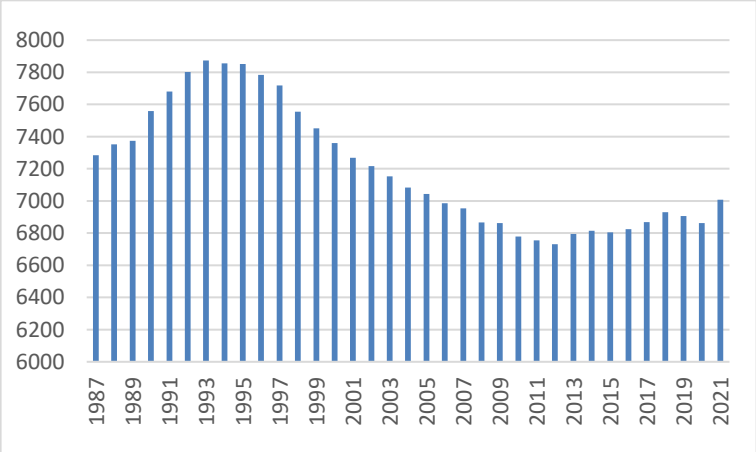

Figure 5. The population of the municipality of Inari from 1987 to 2021 (Official Statistics Finland, 2022).

From the land area 2 275 km^2 are water bodies, and there are around 10 000 lakes in the municipality. From the early 1990s, the municipality of Inari lost some of its inhabitants, as was the trend in other small municipalities in Lapland (Figure 5). But during the recent years, and Covid-19 pandemic, the inhabitant number has been rising. The economic dependency ratio in 2021 was 63,9, which is quite good compared to other small municipalities in Lapland. In 2019, 89,6 % of the inhabitants were speaking Finnish, 6,7 % Sámi, 0,3 Swedish and 3,2 other languages (Official Statistics Finland, 2022).

Inari municipality offers pre-, primary and basic education in three schools, upper secondary school education in Ivalo village and vocational college education in the Sámi Education Institute (SAKK). SAKK offers in its three campuses education as the only indigenous people's institute of post-secondary trade school in Finland.

Inari hub has a strong representation in Sámi culture and languages; In addition to Finnish, three Sámi languages: Inari Sámi, Skolt Sámi and Northern Sámi, are official languages in Inari (The Sámi Language Act of 2003), and all basic services are provided in the three Sámi languages (Inari municipality, 2022). Even though the municipal capital of Inari is the village of Ivalo, Inari village, with only 600 inhabitants, village is the capital of Sámi culture, since the Sámi culture center Sajos, the Sámi Parliament's main office, Sámi church, Sámi radio, as well as the Sámi museum are located in there. The Sámi culture is also represented well in the Skábmagovat film festival, as well as in the Ijahis Idja -music festival. As well as in the reindeer herding area in total, also in Inari municipality, the amount of reindeer owners has been decreasing from the start of 1990s (Figure 6). Partly because of that, the number of reindeer has also been decreasing in the municipality (Figure 7). Among reindeer owners, the number of males has decreased more than the number of females. The number of young and middle-aged reindeer owners is considerably high. There has also been some disputes between different land uses, like

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reindeer husbandry and Sámi culture, forestry and tourism, in Inari (Saijets & Rasmus, 2017; Turunen, et al. 2020).

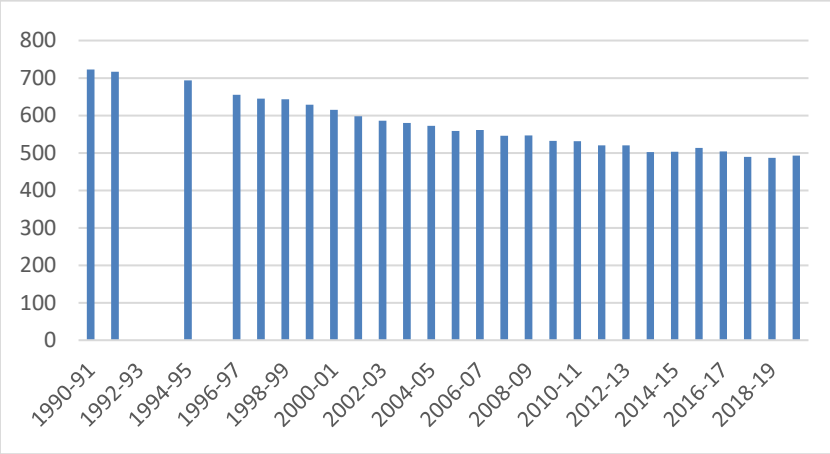

Figure 6. The amount of reindeer herders in the municipality of Inari from 1990 to 2020 (Reindeer Herders' Association)

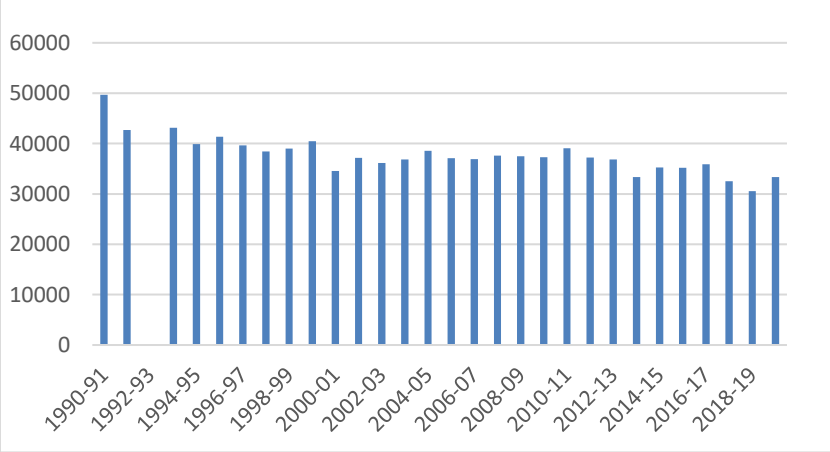

Figure 7. The number of reindeer in winter stock from 1990 to 2020 (Reindeer Herders' Association)

The Inari hub has long traditions in nature-based tourism, and the nature is bringing hundreds of thousands of tourists to the area every year (Inari Municipality, 2022). About 60% of the tourist overnights are made by foreign tourists, and the Ivalo airport, serving almost 250 000 customers annually, is helping by improving the accessibility to the area. The second biggest lake of Finland Lake Inari (Figure 2), dozens of fells, forests and river areas attract tourists for leisure, fishing or different nature-based sports (Inari municipality, 2022). Saariselkä ski resort is also located in the municipality, offering many kinds of sports activities. There are also two national parks, Urho Kekkonen national park and Lemmenjoki national park in the hub. Apart from those, a huge part of the surface area is classified as a wilderness area, where no significant land use, apart from traditional livelihoods, can take place (Ministry of the Environment, 2022). The location of Inari hub is also good for tourism, since it is on the way when one is going to a popular destination in Norway; North cape. Apart from traditional livelihoods and tourism, other major sources of income in Inari are service industry, forestry and cold climate testing (mainly for tires).

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2.2. Sami people in Sweden

Sapmi is the traditional area used by Sami ancestors for thousands of years spanning the nation boundaries of four countries. Even though no precise boundaries exist for the Sapmi area, about half of Sweden's land area is included. Neither are there precise numbers of Sami people in Sweden since ethnicity is not a factor included in the Swedish census. The number "about 20 000 Sami in Sweden" is frequently referred to, but leading scholars estimate that number to be more than three times as high[13]. In 2021, 9226 persons were registered to vote in the Sami Parliament election.

Traditional Sámi livelihoods include hunting and fishing, handicrafts and reindeer husbandry. Especially reindeer husbandry is by many recognized as the cornerstones of the Sámi culture as the provider of food and material, as well as a carrier of the Sami languages and culture.

The reindeer husbandry area of Sweden covers 55 % of the total land area. Within this area reindeer husbandry coincides with all other land uses including forestry, mining, energy exploration and associated infrastructure developments. There are no lands exclusively set aside for reindeer husbandry any longer. Ownership rights and grazing rights are equally protected by the constitution[14] and reinforced by expropriation rules, and they overlap throughout the area. Grazing rights cover state and privately owned land alike. However, a private owner is allowed to fence an area and thus hinder the reindeer. About 50% of the area is owned by small private owners, forest commons, municipalities and the church, 25 % is owned by the state and 25 % is owned by timber companies. As a consequence, these land uses are entangled in a complex mixture, continually challenging a functioning coexistence.

[13] https://samer.se/samernaisiffror
[14] Legally this right is considered an individual in this aspect, not a group right.

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Figure 8. The reindeer husbandry area in Sweden is divided into 51 reindeer herding communities. In the western part of the area reindeer are allowed year–round and the eastern part during winter.

The reindeer husbandry area is divided into 51 reindeer herding communities (RHC, in Swedish samebyar) each organized and managed separately. As of the latest statistics produced by the Sami parliament in 2020 [15], there are 280 000 reindeer divided among 4636 reindeer owners (1780 women owners). Of these 3149 operate within the 32 RHCs in Norrbotten and 324 in the seven RHCs in Västerbotten. These reindeer owners are organize into 1360 reindeer husbandry based businesses usually with no other employed personnel. Of these reindeer husbandry businesses 37 % also have a subsidiary activity. The butchering prize have varried around 70 SEK/kg. The monetary turnover for reindeer husbandry in Sweden is 230 MSEK/year.

Sami languages have been continually marginalized since about 1900 as there has been an intensified Swedishization process. The proportion of the Sami people speaking Sami languages is estimated to 40-45% and all those speaking Sami are also considered at least bilingual. Based on estimations there are 17 000 speaking North Sami, 800 speaking Lule Sami and 700 speaking South Sami[16]. Other Sami languages include Ume Sami and Pite Sami. Ume Sami came close to being extinct, with very few individuals able to use it as their every day language. A revival of Ume Sami has since occurred, driven by a group of enthusiastic individuals and spearheaded by Henrik Barruk. The publishing of the Ume Sami dictionary was a land mark celebration of the ortography of Ume Sami.[17]

[15] https://www.sametinget.se/renstatistik
[16] https://samer.se/samernaisiffror
[17] Báhkuogirjjie, Henrik Barruk, 2018, published by Kaananstiftelsen I Sverige, print Text & Kultur, Umeå, ISBN 978-983520-0-9 This dictionary also recognises the differences in Ume Sami dialects.

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A chronological summary of significant political and legal decisions made regarding Sami and reindeer grazing rights include the 1756 border agreement between Sweden and Norway giving the Sami extended rights to move across the borders; the 1873 establishment of the so called “cultivation zone”, with the purpose to protect the reindeer herding area from colonization; the first Reindeer Grazing Act in 1886 and the new Reindeer Herding Act in 1971. In 1977, the Swedish Parliament declared that the Sami are an indigenous people in Sweden, in 1993 the Sami Parliament was inaugurated and in 2011 the Sami are acknowledged as an indigenous people in the Swedish Constitution with its cultural and political rights.

Some important international laws and conventions strengthening Sami rights include the UN adopted Declaration of the rights of Indigenous People (UNDRIP) in 2007, which acknowledges indigenous peoples’ rights to self-determination and the right to own, use and control land and natural resources. The UN World Conference on Indigenous Peoples (WCIP) 2014 adopted a resolution on how the Declaration should be implemented in its member states. The Council of Europe has a Framework Convention for the Protection of National Minorities and a Minority Languages Charter. The international conventions signed by Sweden give ethnic, religious and language minorities the right to negotiation concerning questions of language, cultural life and traditional trades. Correct negotiations are necessary in order for the minorities’ rights to be realized and open up for better solutions even for the majority population. In a democracy, the majority decides. Minorities seldom have the possibility to be heard in democratic assemblies. This is why the often-called “positive discrimination” is used to protect indigenous peoples and national minorities. The purpose is to reduce injustice between ethnic groups and to preserve languages and cultures that otherwise risk disappearing.

One of the main challenges faced by Sami reindeer herders in all the hubs is forestry. For a long time, the forest industry has played an important role in northern Sweden and constitutes an integral part of the national economy. Modern stand-oriented, even-aged, monoculture forestry has expanded in Sweden since the 1950s and has had a profound effect on forest and landscape configuration and conditions and consequently on reindeer husbandry. Commercial forestry affects reindeer husbandry in a number of ways. Negative impacts on the ground lichen resource have been documented over the last 60 years. Largescale logging, intensive reforestation efforts and fire suppression have resulted in a decline in old, open pine-dominated, post-fire successional stands on low productive sites which are important habitats for ground lichens. Such stands have instead been replaced by dense, managed forests that favour mosses at the expense of lichens. The introduction of lodge pole pine and fertilization has also have negative effect on ground lichens. Furthermore, damage by soil scarification cause substantially decreases both the cover and biomass of ground lichens. Clear-cut forestry also have negative consequences for arboreal lichen which are especially important to reindeer during winters with difficult snow conditions. Forest RHCs are also affected by forestry on summer grazing lands. Loss of shady old spruce forests are of major concern. These stands are becoming increasingly important during hot summer days at the same time as they are becoming increasing rare. Improved and innovative forest activities to reduce loss of landscape connectivity as well as ground and pendulous lichen rich forests is much needed. Such goals can be achieved through improved participatory dialogue between reindeer husbandry and forestry.

Other challenges, that are more specific in each hub, include hydropower and mining developments.

2.2.1. Jokkmokk hub

The small town of Jokkmokk, population of 2 700, is located in Jokkmokk municipality with a population of 4 766. The municipality covers 19 477 km^2 making it the second largest in Sweden but with a population density of only 0.25 p/km^2.

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Jokkmokk is one of Sweden.s most prominent places for Sami culture. Thus, the hub is foremost defined by the indigenous traditional land use that includes reindeer husbandry, hunting and fishing. Young Sámi from the whole of Sapmi go to Jokkmokk for education, and here is also the principal museum of Sami culture Ájtte, which is both an arena for research and information center for mountain tourism. Ájtte is now identified as the Jokkmokk hub center.

Jokkmokk is also the meeting place for several Sami reindeer herding communities and located in the heart of their wintering areas and near their all-year-lands. The three mountain RHCs are Sirges with 15 500 reindeer, Jåhkågasska with 4500 reindeer and Tuorpon with 9000 reindeer (Figure 9, Table 2). In addition, the forest RHCs of Slakka and Udtja have grazing land nearby. The Jokkmokk RHCs have a special agreement of their common use of their winter grazing areas.

Table 2. Reindeer herding communities (samebyar) operating in the Jokkmokk hub area

Sameby	Number of members	Max. reindeer number	Number of reindeer companies
Sirges	385	15500	96
Jåhkågassska	100	4500	45
Tuorpon	105	9000	59
Slakka	10	1000	2
Udtja	50	2800	14

Other land uses in Jokkmokk include forestry and tourism, while energy production from the river Luleälven may be the most pronounced and impacting land use form in Jokkmokk. This river system is heavily regulated for hydroelectricity with 6 of the 10 largest hydroelectric plants in Sweden producing. The river produces 16.7 TWh which is 25% of all hydropower produced in Sweden. The damming of the rivers has long standing impacts on how reindeer husbandry can be carried out. Before the hydroelectric époque the lakes constituted the backbone of the reindeer migrations facilitating long range movements to and from winter grazing areas in the boreal forests all the way towards the coast of Bay of Bothnia. As these lakes now have turned to water reservoirs with unstable ice conditions the reindeer migration routes have been forced to adjacent forestlands. Consequently, hydro power development has made reindeer husbandry more dependent and affected by forestry activities. The hydro power époque lasted from 1910 when work begun in the Porjus area until about 1970 when the last lake was dammed. The impacts of these exploitation remain today.

Forestry has an even longer history in the Jokkmokk area and intensive activities are still ongoing today. There are some 5 000 km^2 of forest lands available for harvesting, while the 2 650 km^2 are formally protected making about 35% of the forests are formally protected (Figure jokk2). Yet, forestry is considered the most impending threat to reindeer husbandry by most reindeer herders. Commercial forestry is ongoing throughout the unprotected area. Productive forest lands (Figure jokk2) owned by Sveaskog AB, the National Property Board Sweden, SCA AB, Jokkmokk forest common and small private landowners provide jobs and income.

Today, there are no active mines in the Jokkmokk area. There is however, a long-time, ongoing dialogue and conflict around the establishment of the Kallak mine. Since the first exploration license was granted in 2006 by the Mining Inspectorate the conflict between opponents and proponents have divided Jokkmokk (Figure Jokk1). The conflict has gained significant international attention and is considered one of the most important environmental issues in Sweden today. The decision today sits at the hands of the government. In 2021, UNESCO stated that the mine would cause significant negative impacts on the Laponia Heritage site. The RHCs has been heavily engaged in the conflict. The proposed mining site is in Jåhkågasska Tjiellde and Sirges RHCs would have the major transportation corridor through its lands. The question of allowing this mine or not has been dividing and to some extent paralyzed the Jokkmokk community for long.

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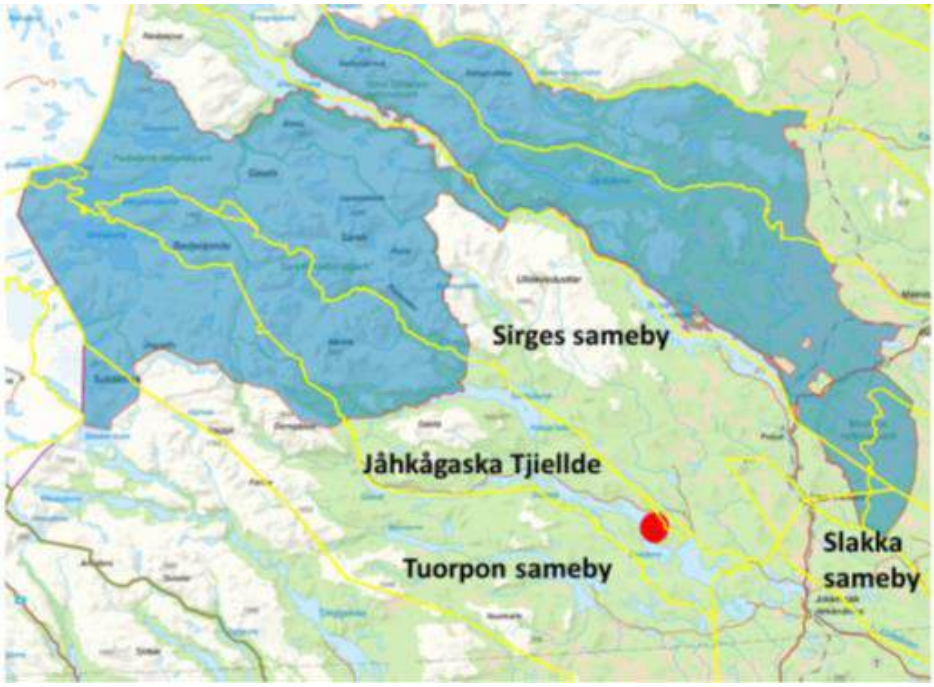

Figure 9. The town of Jokkmokk is the meeting point of several RHCs. The three mountain reindeer herding communities operating in the Jokkmokk hub include from the north Sirges, Jåhkågaska and Tuorpon, as well as the forest reindeer herding community of Slakka. Just west of Jokkmokk is the controversial and much debated proposed mine Kallak located (red dot). The National Parks Sarek, Padjelanta, Stora Sjöfallet and Muddus forms the UNESCO World Heritage site Laponia (in blue).

Figure 10. The Jokkmokk hub area as defined by the Jokkmokk municipality boundaries. Forest lands managed for forestry are shown in dark green, forested nature reserves light green. The western part of the area consists of national parks mostly above tree line. The National Parks also define the UNESCO National Heritage area Laponia described in Figure 9

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2.2.2. Gällivare

The Gällivare hub area defined by the municipality boundaries (Figure 11) is dominated by the mining industry. There are 10 500 people living in the town of Gällivare and 17 500 living in the municipality. With a municipality size of 16 800 km^2 the population density is 1 p/ km^2.

Gällivare is also lays on the traditional lands of Sami people and the town of Gällivare is the meeting point of reindeer herding communities of Gällivare, Baste Cearru, Unna Tjerusj (Figure 12). The work carried out within ArcticHubs will focus on the forest reindeer herding community of Gällivare which cover 8321 km^2 spanning from the town of Gällivare in the north to the islands and coastline of the Bay of Bothnia in the south (Figure 13). Gällivare is part of the Lule Sami area. The highest allowable number of reindeer in winter herd is set to 7000. There are 35 active reindeer companies in the RHC. Gällivare RHC is more or less separately managed in six groups where our focus will be on the Raatukka group operating in and around the Aitik mine.

Two major mines are located in or near the town of Gällivare also making the area a hub for mining activities (Fig Gääli2). The Malmberget iron mine operated by LKAB is located directly in north end of Gällivare. Currently, this mine is expanding into urban areas. Whole neighbourhoods are being torn down and residents are forced to relocate. Part of the future plans for the Malmberget mine include the major establishment of the HYBRIT and the first fossil free steel production system in the world. This new production line calls for major increase in energy production with consequent environmental impacts far beyond the Gällivare hub area.

On the south side of Gällivare, Boliden Minerals AB operates the Aitik mine and processing plant, established in 1968. Today the Aitik mine has grown into the largest open pit copper mine in Europe covering an area of approximately 50 km^2. The Aitik mine is mainly producing copper, but also gold and silver. The Aitik mine employs 770 people and many more are employed in jobs related to the mine. Aitik is expected to be in operation until 2029 but a number of expansions of the existing mine are planned and proposed which is expected to prolong operations.

Of the forested land, i.e. 649,300 hectares, some 30% is formally protected, meaning that some 454,000 hectares may be used for commercial forestry. Thereby it is an important timber resource for neighboring areas but at the same time this land is also important grazing land for the reindeer herds. Commercial forestry is ongoing throughout the area. Productive forest lands owned by Sveaskog AB, SCA AB and small private landowners provide jobs and income (Figure x, here we could add numbers from the 3.1 forest report).

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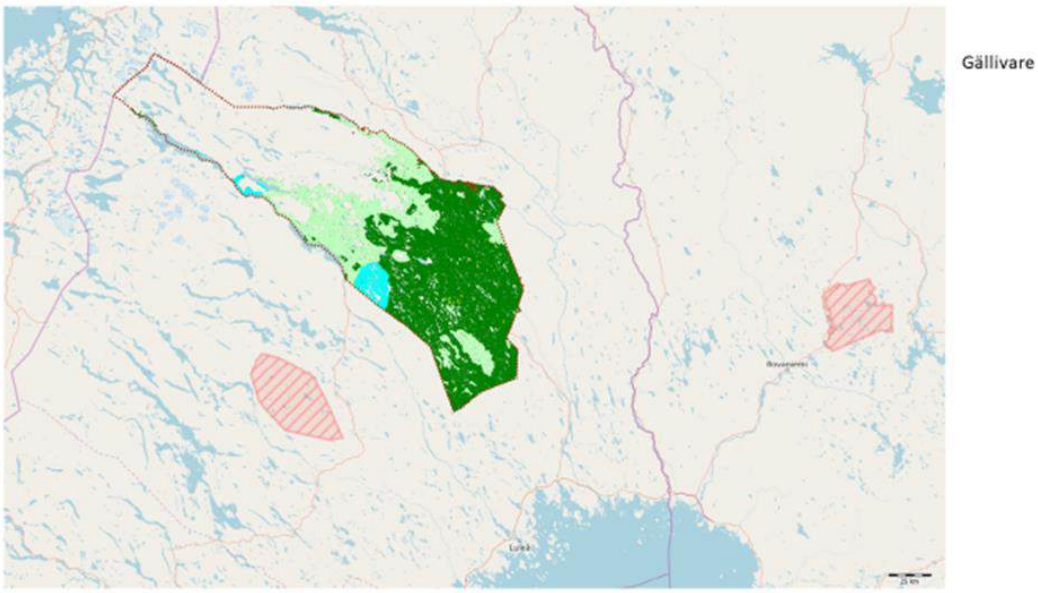

Figure 11. The Gällivare forest hub area as defined by the municipality border with forest land in dark green, nature reserves light green, national parks light blue.

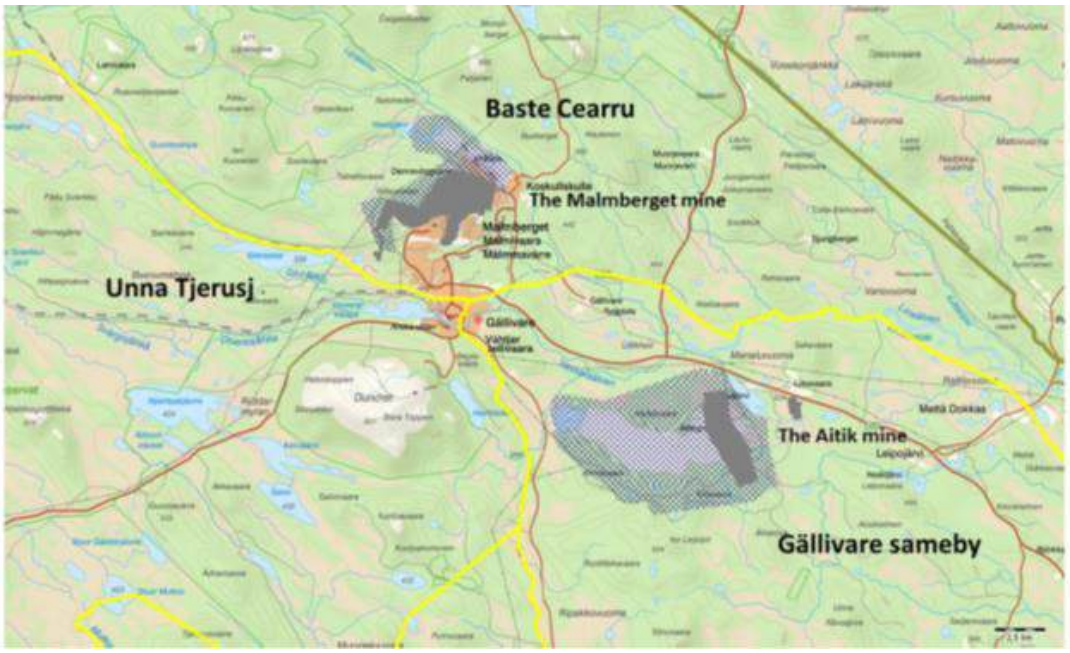

Figure 12. The reindeer herding communities residing/operating in Gällivare hub, Girjas, Baste Cearru and Unna Tjerusj as well as the LKAB mine of Malmberget and the Boliden AB mine Aitik.

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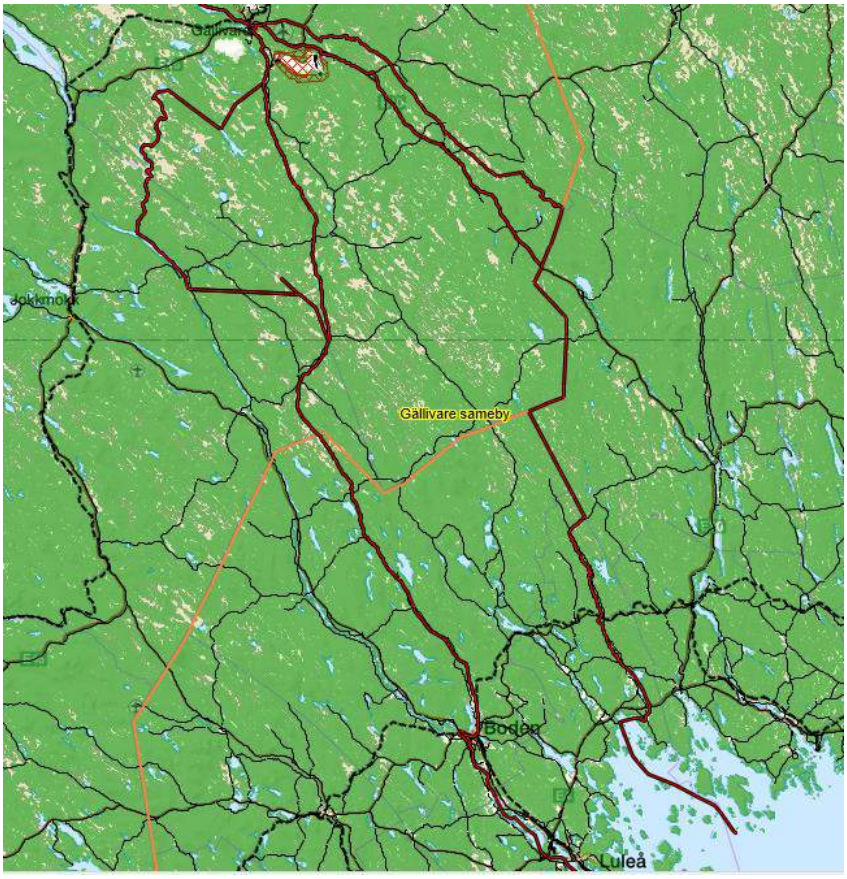

Figure 13. Gällivare forest reindeer herding community shown with dark red boundaries lays entirely in the forest (green colors). Forestry activities is ongoing throughout the area. The Aitik mine is shown in the north.

2.2.3. Malå Hub

Malå town and municipality is located in the county of Västerbotten. The population of the municipality is around 3000 with 2000 residing in the town. The size of the municipality is 1727 km^2 making the population density 2 p/km^2.

The Malå hub represents a complex land-use situation where forestry, mining, wind power developments, and infrastructure projects all overlap with the land use needs of Sami reindeer husbandry. From the forest industry perspective, the hub is defined by the Setra sawmill located in the town of Malå and its timber procurement area. This area comprises the forest lands within a radius of 100 km from the sawmill. In this area, Sveaskog AB is the major forest owner (about 60% of the productive forest land) while 37% is owned by non-industrial private forest owners. These forestlands with subsequent forestry activities overlap and affect indigenous Sami reindeer husbandry in at least 14 RHC (Figure malå1). Of these RHC, seven of them are forest RHC where activities in the forests impact reindeer husbandry year around during all grazing seasons. For the work in the Malå hub, Malå RHC constitutes our model indigenous hub case.

Reindeer husbandry in Malå RHC can be carried out in a 7713 km^2 area. The year around grazing lands (åretruntmarker) in the west, are located in Malå, Sorsele and Lycksele municipalities. Winter grazing lands go all the way to the coast (Figur Malå2). The RHC has about 100 members and 11 reindeer herding companies. The maximum number of reindeer is set at 4500. This number has been reduced during the last 10 years as a consequence of the redrawing of RHC boundaries. The RHC is in general

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divided in a northern and a southern group and during winter usually further divided into smaller groups. Malå RHC is by some considered one of the most impacted RHC in Sweden with major industrial activities on all seasonal lands.

Commercial forestry is ongoing throughout the area. Productive forest lands owned by Sveaskog AB, SCA AB and small private landowners provide jobs and income as discussed in the baseline report of Forestry hub.

Wind power energy production is a new and major land use form in the area (Figure 16). As the first industrial area was established in 2010, wind power expansion has become a major concern to reindeer herders. Several research projects carried out in Malå RHC has documented major negative impacts (Skarin et al. 2015, 2016, 2018, 2021).

Mining and prospecting have a long history in Malå RHC which has led to losses of grazing land from mining directly as well as related roads and mining related traffic. The RHC considers lands in and around the mines in Kristineberg, Storliden and Maurliden completely lost (Figure malå3). Herder's observations as well as GPS data points clearly at reindeer avoidance of areas around the Kristineberg mine. The recent closing of the Maurliden mine offers promising opportunities for restoration of lost grazing lands. The old, closed mines Näsbergfältet, Rakkejaur and Adakfältet have not yet been restored and still considered as lost grazing lands. The main mining project in the area is the Kristineberg mine operated by Boliden AB and established in 1940. The mine is a 1350 m deep underground mine containing zinc, copper, silver and gold. A considerable impact of the mine is that all ore is transported by truck to the processing plant at Rönnskärsverken on the coast. The Rävliden expansion of the Kristineberg mine has recently been given permission to proceed. Mining activities in the Kristineberg mine began in the late 1930s, where Boliden AB extracts zinc, copper, gold and silver. The ore is transported by truck from the mine site to the coastal processing plant in Rönnskär. This complex land-use situation calls for innovative participatory tools to provide an effective and inclusive dialogue in search of solutions (Figure 17).

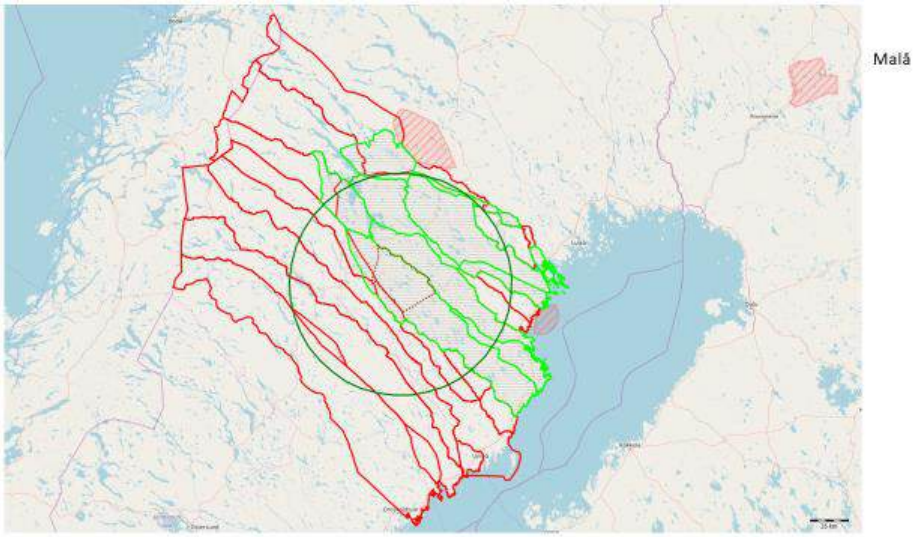

Figure 14. The reindeer herding communities residing/operating in greater Malå hub area include Ståkke, Östra Kikkejaure, Västra Kikkejaure, Mausjaur, Maskaure, Malå (Forest reindeer herding communities) and Luokta-Mavas, Semisjaur-Njarg, Svaipa, Gran, Ran, Ubmeje tjeälddie, Vapsten, Vilhelmina norra (mountain reindeer herding communities). Malå reindeer herding community lays in the center of the circle

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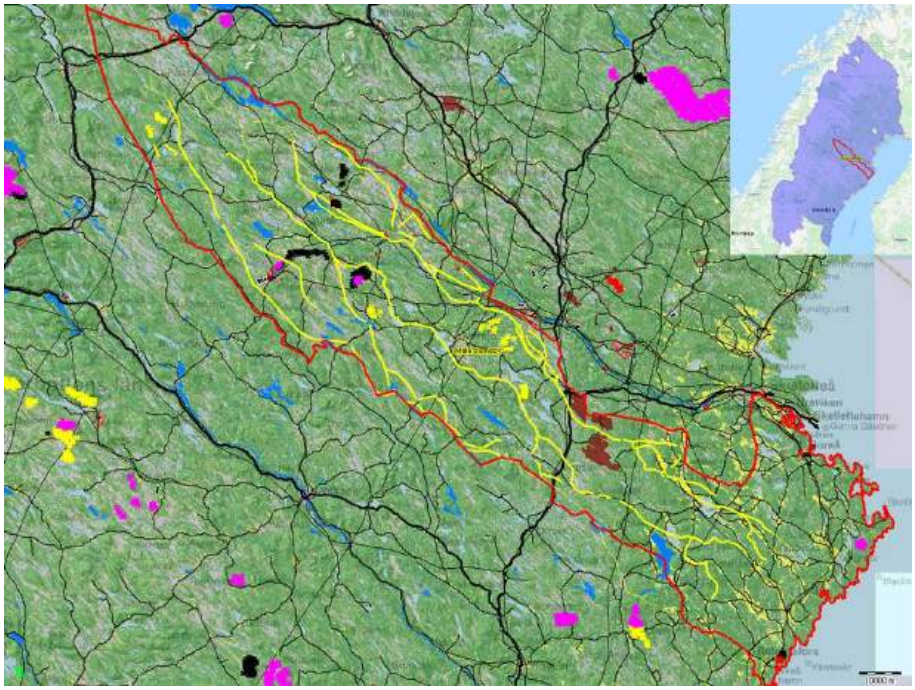

Figure 15. Malå forest reindeer herding community (red boundaries) is located in the county of Västerbotten. Yellow lines represent reindeer seasonal movement routes. Forestry is ongoing throughout the area. Built up (in black) and approved (in brown) wind power area

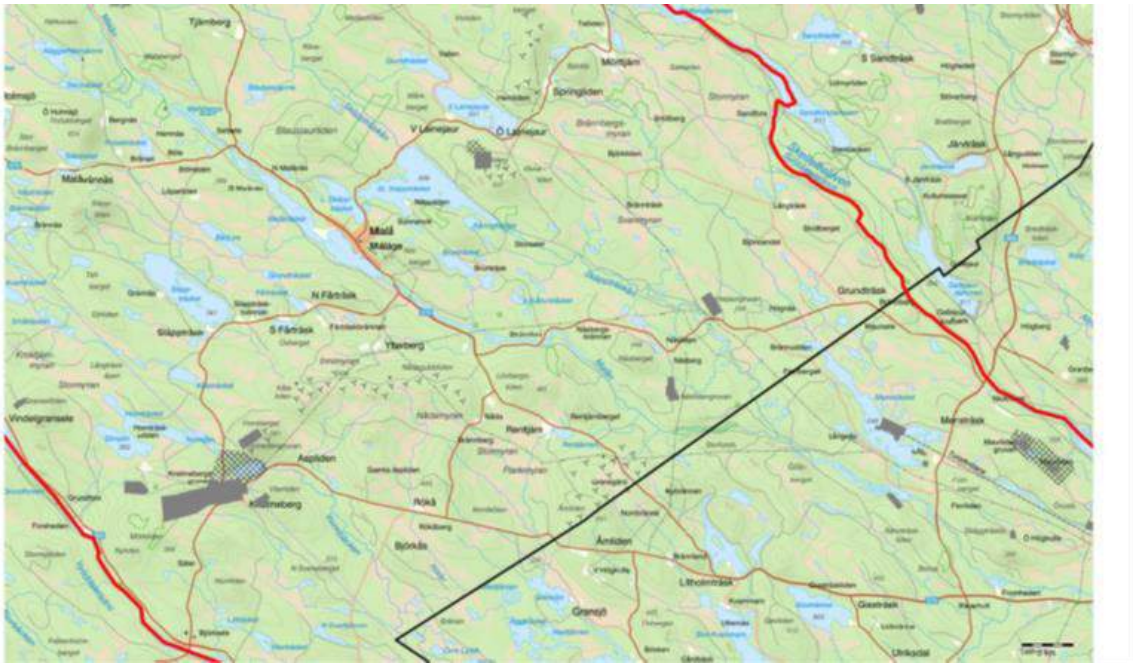

Figure 16. A number of active and abandoned mines surround the town of Malå. The largest and most active area is around the Kristineberg mine, operated by Boliden AB south west of Malå. The area is also characterized by active forestry throughout the area as well as energy production. The area has four wind power establishments Ytterberg, Åmliden, Storliden and Jokkmokksliden with several new projects approved

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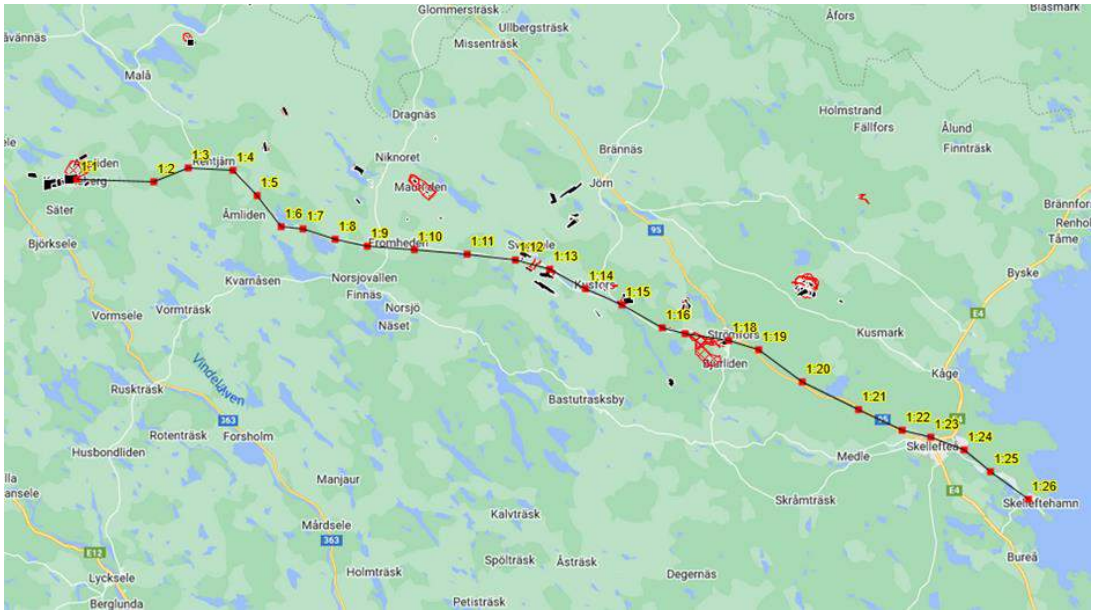

Figure 17. Schematic map showing the location of the Kristineberg mine in the west and the Maurliden, Renström, Kankberg mines along the transportation corridor to the final processing plant Rönnskärsverken in Skelleftehamn. West of the Boliden mine the transportation corridor leaves Malå RHC and enters the neighbouring Mausjaure forest RHC

2.2.4. The Gran Sameby hub: perspectives from reindeer herders

What is a reindeer herding community (RHC), what is a "sameby"? It is a legal entity and a delimited territory, but from the inside it is mostly a group of people that are by legislation bound to cooperate with each other and coexist in certain prescribed ways with the rest of society. Everything that impacts reindeer will impact the economy, family life, social life and status and also the reindeer herding of the community and thus Sami culture as a whole.

The Gran hub differs from the other hubs in the project in that the geographic delineation of the hub is the entire territory of the RHC that is also Gran (Grans sameby)[18]. It is a vast area stretching from the high mountains at the Norwegian border, along the Vindel River to Åmsele where it veers north, down to the Gulf of Bothnia. At the westernmost end of the hub we find the largest nature reserve in Europe (Vindelfjällens naturreservat) and in the easternmost we find the 11th largest city in Sweden with a thriving university/university hospital, airport and lively commerce. In between are large areas of sparsely populated but still quite intensively exploited land – from the viewpoint of a reindeer. Forestry and windmill parks[19]are right now the largest potential disruptions along with tourism.[20]

[18] Gran also has traditional grazing rights on a massive area inside Norway which is used every year as it has been since time immemorial. There is a dispute between the Swedish and Norwegian states about these cross border rights. Gran is in a position to defend their cross border rights in court in Norway successfully, but it has not come to that point yet. The details of this legal dispute is outside the boundaries of this report. It is mentioned since Gran would be seriously damaged were these rights abandoned (as the Swedish government seems happy to do).

[19] Wind mill parks can have great social consequences. The companies allocate money for local residents, maybe a new playground in the village for their kids, and pay private forest/land owners good money for being on their land. Everyone is happy until the reindeer herders protest. Imagine your children going to day care or school in those villages, small places where everyone knows ”it’s your fault” we don’t get a new playground?

[20] The corona pandemic led to an upsurge in domestic tourism. Houses/cabins in the mountain villages have risen steeply in price. This seems to be no problem for the city folk who are now buying and building and demanding infrastructure, activities and access for the weeks they are actually there. Snow mobile traffic has intensified also inside the perimeters of the villages. Newcomers fail to observe the everyday lives of the villagers and respect boundaries of for instance private properties – anything covered with snow that has no fence around it is driven upon. There is a clash in the differing senses of privacy. Some families of reindeer herders from Gran live most of the

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One very real change is the status of the ice on the Vindel river. It is relied on heavily for migration, without usable ice some stretches of the migration route is just gone. In the last 5 years the ice has not frozen with a proper core. So when thawing begins and water runs over the sheet of ice, it does not float up again as it used to. Rather, it thaws from both sides. Ice as thick as 80 cm can be gone in five days and bringing migration to a halt. If and when this happens, transport on trucks is necessary. Gran has a string of enclosures along the migration route, but has not had ones with loading facilities or in places that can carry large trucks on gravel roads in spring. The cost to build new ones is large and it is not always easy to find a good spot. Migrating on snow requires a crust and is done mostly in the very early morning hours. Trodding along on soft snow is too heavy for the reindeer.

Here is the background for choosing this somewhat hard to handle delineation. Gran is a so-called mountain reindeer herding community. These are characterized by long, seasonal migrations with the reindeer. The reindeer are all spread out on the mountains from April-May to November- December and this is where the calving and the tagging of the calves is done. During this time herding is done as a collective.[21]

In Sami ”early winter” separation of the herds begin and the reindeer are separated into family/winter groups. The territory of Gran is very narrow in the middle, and so families have since very long ago separated as a string of pearls along the land, all in their own area. Some have a relatively short migration, some migrate very far. The longest yearly migration is done by the Jonsson/Myntti family, 400 km to the coast and the same back, every year. Any disturbances in any of these areas will reverberate through all of the RHC and have direct consequences for the economy, social status and wellbeing of all.

This separation of customary winter areas in Gran is not prescribed in legislation, but by tradition. In principle, all land can be used by all reindeer herders. If there would be a true crisis in grazing, and no other options were available, this would be the case. But, you have to have somewhere to live in the winter, a house.[22]Maybe your children go to school there, maybe your spouse works there.[23] You make friends, you get to know people, the locals get to know you. The support of the surrounding community in winter is crucial. Above all; you learn your own land. Your reindeer learn where they belong which makes work easier on humans and animals alike. After decades you learn to handle your economy accordingly. Maybe staying near the sea has some advantages since snow falls a little later and thaws little sooner, but the cost of the transport is brutal. If you are furthest to the east you must wait for those closer to the mountains to migrate before you can start moving.[24] The grazing along the migration route might be all used up before the last group comes along – or maybe the ground has finally thawed enough for any grazing to be available.

Many reindeer herders are fiercely individualistic and want to test their own ideas and tend to their reindeer as they see best. Traditionally a person with a large herd had the respect and ear of the others when it came to collective decisions. He (in Gran it has been a ”he”) had proven his ideas to work as

time in Ammarnäs, the central village in the mountains in Gran. The road ends there. ”Mountain time”, which includes being in Ammarnäs, used to represent a time of relaxation in the sense that being a reindeer herder was not something exotic, even being the majority at times. This sanctuary is eroding.

[21] Gran cooperates with Svaipa RHC in Norrbotten during this time, due to the layout of the land.

[22] And somewhere to park your truck, your trailers, your snowmobiles, and to store all other equipment. Also you have a lot of heavy – at times very dirty and smelly – clothes and shoes that don't fit well in the context of apartments. You also have working dogs, most have more than one. Reindeer herders in Gran need two houses; one for winter time and one in the mountains.

[23] Families have two choices. Either ”the rest of the family” live in the mountains or in the mountain area and are apart from the reindeer herder for extended periods of time, or all migrate together. Migrating together is not so simple due to schooling and the need for a second income. Migrating together was the norm just one or two generations back for the families in Gran, now it is a mix.

[24] Migrations are financed by each group and there are many ways of handling it with quite different price tags and working hours. Sometimes a choice comes down to something as close to the ground as ”do I have a good enough dog for this?”.

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well as his stamina and talent. This said, everyone knows the importance of family.

Still, you can have a wonderful family and not ever be successful with the reindeer.

This is vital to know when discussing the structure of today's RHC and the effects it has on the collective of reindeer herders as well as all the members individually. The RHC is a specialized legal entity created exclusively to handle reindeer herding. It is not an association for cultural development or protection – even though the individuals in them going about their lives are central to Sami culture. A larger structural change in legislation was made in 1971[25] when the switch from reindeer grazing acts to a reindeer herding act was made. Focus shifted towards "herding" since the underlying intent was to make the business of reindeer herding more efficient and economically viable. The general areas and groups in them were kept, it was the structure of the administration, the rights and responsibilities of the individuals and the legal entity of the RHC that were regulated. As in most associations there are collective responsibilities and collectively owned resources that must be handled fairly. For the RHC these natural resources are grazing rights, fishing and hunting, but also actual money from calves that are not tagged come separation, compensations from exploitations and for predators.[26] This money is to be used for the collective needs of the reindeer herders work (enclosures, costs around separations, fencing, etc.). If there is money left, so to say, these can be payed out to the reindeer herders, and if there is a lack the herders have a duty to contribute out of their own pockets.

Most of the rules pertaining to voting in economic and practical issues are based on rules in registered co-operative societies and some from the law on limited companies. Every reindeer herder has to state how many reindeer he or she owns, and this is registered with the Sami parliament in the so called renlängd.[27] When it comes to voting in the RHC, any issue that will have economic or other consequences for those working as reindeer herders is voted among those according to the renlängd.[28] 1 vote per commenced 100 reindeer on the renlängd (120 reindeer= 2 votes).

The law states that for these voting purposes, all of the reindeer of "the house" belong to the actual reindeer herder (husbonde). Some complaints have been raised about the fairness of this, based on a western "rights mentality" that has crept in as fewer and fewer have taken on the heavy task of actually making a living out of reindeer husbandry. As fewer carry the burden with the reindeer and more have some reindeer on the side whilst making a nice living on something else, this majority seems to think they are owed more and more of the natural resources connected exclusively to reindeer herding.[29]

This is a reflection of a disconnect at a fundamental level among the Sami themselves.[30] Most admire reindeer husbandry, even those whose families left generations ago to live somewhere else. It is only natural that they might want to re-connect in some way, many now pursue their Sami ancestry. But they do not understand enough to be able to evaluate their own impact on the group (some believe their individual rights to be of greater importance) they seek connection with. They might argue "hunting and fishing used to be a way of Sami life, my ancestors did that and it is not going to hurt anyone if I come in the autumn to fish and hunt, the mountains are big and fish and game are plenty and by the way it should be my right"[31].

The easy on is the latter: fish and game might not be all that plenty. The is already a division of natural

[25] This change created the "samebyar", RHC:s, we have now, as Gran.
[26] For certain female predators that can be proven to raise offspring on the territory, that is, not the sum of all predators of reindeer present.
[27] Reindeer herders run their own companies, separate from the RHC. You pay tax for your personal inventory of reindeer.
[28] Some own reindeer but work mainly in other occupations, or not at all: wives, children, elderly people, relatives. It can be from one or two animals to a hundred.
[29] Like fishing, hunting and building cabins in the mountains.
[30] The large majority of Sami in Sweden are not reindeer herders and many (maybe most) have never seen a reindeer let alone worked for a day in reindeer herding.
[31] A problem fuelled by the Swedish legislators choice to go with blood lines (as opposed to ILO169).

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resources among the families, already a limitation. All resources, whether fish and game are sold or eaten, are sorely needed. Moreover, here you find the reciprocity, here lies a responsibility. Inside the RHC:s, counting in Gran, it is not unusual to share these rights among all those who actually participate, all who contribute to the wellbeing of the community. A grandmother who bakes cinnamon buns in the far out Vindelkroken and hands it out to everyone's kids, a retired reindeer herder who comes along every now and then to share his knowledge or just company.

This practice might not be to the letter of the law, but it is an expression of humanity and should be left so.

The second goes much deeper and is not often spoken out. Reindeer herders are under immense pressure from the outside world, it comes from everywhere and is unpredictable at times. Many are mentally and physically pretty run down. To demand that you have to welcome complete strangers, who might not have an inkling about your way of life, demand to be let into the very core of your life, the place where you can find peace and relax among your fellows, where you can have those intimate conversations about the future of your children, is at tall order. Put plainly – the future of reindeer herding and Sami culture depends on human beings wanting to dedicate their lives to reindeer. This means full time focus on reindeer herding.

Can the possible impact be so great, though? How come? Actual reindeer herding really is learning by doing. The loss of knowledge from the last one or two generations is massive and pretty much irretrievable, even if today's herders know things they did not. Even if you do nothing else in your life you will still be learning when you are in your 40ies and 50ies. The surroundings change with great speed, the weather conditions, the structure of your herd, you will never know everything. If you lose the core of people, make their lives miserable enough, who are willing to dedicate their lives to the reindeer, reindeer herding as we know it will die.[32]That would be a massive cultural loss – the Ethnosphere[33] would lose yet one colourful participant.

The loss of knowledge alone is already undermining reindeer husbandry as a whole. This way of life is a practice, not a theory, and it has to be taught by doing. There is no more room for so called temporary measures (as feeding in enclosures caused by disturbances from windmills) that disrupt the way of the reindeer, or one more generation the knowledge, the courage, the self- esteem, is lost. Then, reindeer herding as we know it, will be extinct.

Since reindeer herding has been badly hit economically by the changing climate, by exploitations and by the raise in living costs and now the massive increase in costs for fuel, many actual reindeer herders have been forced to take other jobs on the side. Adult reindeer herders have been forced to work extra, many turning to the mining industry up north that pays well for short periods. While this might give a short monetary relief, it bears heavy on heart and soul. Some, join together and have a try at the hospitality industry sharing different aspects of Sami way of life.[34] This has led to discussions on "who is actually a full time reindeer herder", where the herders find themselves defending their livelihood also against other members of the RHC.[35] Said straightforwardly, wanting to be classified as

[32] Reindeer herding is so much more than a job, but laws concerning reindeer herding take almost no regard to the fact that it regulates family issues, personal issues. Legislation in Sweden pertaining to workplace issues and workers' rights are very strong. One noticeable exception is if you work inside of someone's home – you can then be fired just because you don't fit with your employer since we need to respect a person's private sphere. This is acceptable to the absolute majority, this makes total sense. But there seems to be little or no understanding of how the law affects reindeer herders and their families.

[33]The term Ethnosphere was coined by anthropologist Wade Davis. He states, "You might think of the ethnosphere as the sum total of all thoughts and dreams, myths, ideas, inspirations, intuitions brought into being by the human imagination since the dawn of consciousness. The ethnosphere is humanity's great legacy."

[34] The RHC itself, the legal entity, is forbidden by law to engage in any other business than reindeer herding.

[35] A personal note from the author: as a jurist I find this question easy to solve. You are a full time reindeer herder (husbonde) if you can do

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a reindeer herder (husbonde) is always connected to a wish of receiving a right (to shoot a moose, to build a cabin) and never to carrying a responsibility (all help is received gratefully). And if you have no or few reindeer, you will never be asked to personally carry the consequences of (your) bad decisions. So, in old times you had a lot to say if you were ”big”. Today, you have more votes and more deciding power if you are ”big” – but you also run the risk of facing greater consequences.

One more note about the fact that the law states that the actual reindeer herder, the full time reindeer herder (”husbonde” in the law) votes for all the reindeer of his ”house”. This system has been challenged as unfair/gender biased, since it is almost always the case that it is a man, the husband, father, brother, cousin, that is the husbonde. This is said to unfairly affect women in the RHC since they then do not get to vote ”with their own reindeer”. This might bear some theoretical value as a discussion point, but, if someone else it taking care of your reindeer since you are not fit or able to do so, would you vote against them? Some protest against the system where the more reindeer you have, the more votes. This shows a disconnection in understanding. Sami people who are not reindeer herders, many not be even members of an RHC, think it is their right to decide over resources for their leisure time and enjoyment, no matter the impact on the reindeer herders.[36]Even some reindeer herders protest that the vote is decided by numbers. But the reason is of course that the bigger you are the more you can and will be hurt by bad decisions. There is a parallel to shareholding underlying the legislation, and there are also minority rules for the voting. A reindeer herder has his property and fortune running wild outdoors. Of course it must make a difference if you have 1000 or 100 reindeer. Like in the old times; if you have many reindeer you are doing something right. And, if the RHC decides to tax the community, you have to pay a lot more. Keep in mind that the individual, even though he or she is running their own business, they are forced to work within the RHC, by law. Since the RHC:s were created to make reindeer herding economically viable, the rules make business sense.

The members in Gran consist of two somewhat culturally diverse groups: one group that has always lived here and have Ume-sami as their language[37] and one group that were forcibly moved by the Swedish state to the area and who speak North-sami. This coexistence has now been the case for almost a hundred years. The families work alongside each other but there still is a visible divide. Some has to do with language, some with old family- and friendship ties. What cultural differences might still be there are alleviated by the fact that you are allowed to choose companions for yourself during the most work-intense periods. You do as you like and want.

Mostly the differences bring richness to the customs, by extending the scope of handicraft, traditional clothes, ways to preserve all parts of the reindeer, language and different ”joijks” (traditional song). The plight of the forcibly moved North Sami is being highlighted and discussed, books are being written and recognized. Many travel back north to find their roots and personal seek reconciliation with their family history. The impact on the local Ume-Sami is not so much discussed. They were not told someone was coming, suddenly newcomers appeared and the state had assigned them areas inside Gran. The groups could not understand each other’s language. Even if there were grudges, basically humanity took over. Once you get close enough to someone, you will find similarities, you will find

other work if and when the reindeer don’t need you. If you can participate in reindeer herding when your other job permits, you are not. Many times the RHC:s decide on their own, as they wish or as they are forced to by collective will or strong-minded individuals.

[36] There are constant investigations into ”new reindeer herding acts” that all seek to include more people in order to distribute the natural resources to more ”Sami people”. These investigations rarely discuss the impact on the reindeer herders and their families, that is, the future of reindeer herding.

[37] In fact, all active reindeer herders in Gran that spring from Gran can be traced down to one man: Jon Sjulsson (1840-1912), and his second wife Maria (who was from the neighbouring community of Ran). All other families have gone on to other ways of life. The Jonsson (son of Jon) family (as in research partners in Gran Tobias Jonsson and his son Niklas) can be traced to the Gran hub territory as far as the records go back.

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compassion for someone in need. The two groups did not herd in the same fashion and it was more commonplace for Ume-Sami women to work abreast the men. Traces of preferences dating back to those days can still be found, but now herding in Gran is more homogenous, on the whole.

2.3. Sámi People in Norway

2.3.1. The Sámi people, the Sámi Parliament and international treaties

The Sámi are recognized as an Indigenous people in Norway following the ILO Convention No. 169. The Norwegian government refer to the definition of the ILO Convention's definition (article 1, 1,b):

"*Peoples in independent countries who are regarded as indigenous on account of their descent from the populations which inhabited the country, or a geographical region to which the country belongs, at the time of conquest or colonisation or the establishment of present state boundaries and who, irrespective of their legal status, retain some or all of their own social, economic, cultural and political institutions*."

The parliament is the democratically elected body of the Sámi people in Norway. The main Task is to strengthen the political position of the Sámi people and promote Sámi interests in Norway. A consultation agreement between the Government of Norway and the Sámi Parliament is in place as a way of fulfilling Norway's commitment of consulting indigenous people.

The rights of Indigenous Peoples to participate in and influence decision-making is emphasized in numerous international conventions ratified by Norway, such as article 27 of UN's International Covenant on Civil and Political Rights (ICCPR), ILO Convention 169 articles, 6, 7, 14 and 15 and the Convention on Biological Diversity (CBD) article 8j.

Norway was the first country to ratify the ILO Convention no. 169. (Indigenous and Tribal Peoples Convention).

Sámi rights are stipulated in the Norwegian Constitution: "*The authorities of the state shall create conditions enabling the Sámi people to preserve and develop its language, culture and way of life*" (§ 108).

Securing natural resources for Sámi livelihoods and culture is a goal of two of the main acts governing land use in Norway, namely the Planning and Building Act (2008) and the Nature Diversity Act (2009).

2.3.2. Reindeer husbandry

The Sámi have an exclusive right to reindeer herding (with a few exceptions) (Reindeer herding Act §§ 9 & 32). The Norwegian Sámi reindeer herders have the right of immemorial usage ("alders tids bruk") to practice reindeer husbandry. Following the Norwegian Reindeer Herding Act (2007), access to seasonal pastures is an important material basis for Sámi reindeer herders' culture and livelihoods and should be preserved.

The management of Sámi reindeer herding in Norway is divided into six reindeer herding areas. Reindeer herding is further organized into reindeer herding districts and within each district, herders belong to siidas that collectively herd reindeer.

The County Governor has administrative and professional responsibility for carrying out reindeer policy at the regional level. They also manage legal and economic measures and give advice to the industry.

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Prior to 2014, regional councils oversaw the management of reindeer herding. Regional councils were appointed by the Sámi Parliament and the county municipality. Among the members of these councils were active reindeer herders and the secretary was a reindeer herding agronomist.

Reindeer herding is the main industry in Kautokeino and is the main focus of a strong public sector that includes Sámi institutions and the Sámi University College. The reindeer movement/trekking patterns to the coast and other municipalities implies that land use changes in these areas touch Sámi reindeer herding. The basic unit within reindeer husbandry in Norway has been the husbandry unit, the head of which is usually the concession holder, a model that dates back to 1978 (Eanandoallodirektoráhtta 2021a).

The Reindeer Herding Act of 2007 seeks to re-establish the siida as an important management unit or tool for reindeer husbandry. The siida is a community-based working group within reindeer husbandry which forms the central basis of decisions made related to grazing grounds and yearly movements and circulation. The members are often related, and the composition of the siida may change from summer to winter with larger siidas during summer and autumn. The new law has changed the term "husbandry unit" to "siida share" and slightly changed the content of this term. Following the Norwegian Reindeer Herding Act (2007) unlimited access to seasonal pastures is an important material basis for Sámi reindeer herders' culture and livelihoods and should be preserved. Together with other land uses and encroachments like tourism and mining, severe winter season conditions seem to be an ongoing and future threat to the reindeer husbandry (Vikhamar-Schuler et al. 2016).

For the following sections, note that from 2020, Finnmark and Troms counties were merged into a single county named Troms and Finnmark. Thus, official statistics for Finnmark as a separate administrative unit are only available until 2019.

2.3.3. Kautokeino-Kvalsund hub

2.3.3.1. Administrative units

Guovdageaidnu (Sámi spelling) is a municipality in the heart of the Sámi area of Norway. 95 % of the municipality's population are indigenous Sámi, being one of only two municipalities where the Sámi people are in majority; the other one being Kárášjohka, which is the neighbouring municipality, where the Norwegian Sámi Parliament is located. Guovdageaidnu is the largest municipality in Norway covering 9 707 km^2 of land, including lakes and rivers. A large part of this area is suitable for reindeer grazing. Sámi is the primary language in the municipality and nearly all inhabitants speak Sámi. Exact ratios of Sámi-speaking inhabitants are not available.

Kvalsund was a separate municipality until 1 January 2020 when it was merged with the Hammerfest Municipality. The former Kvalsund Municipality covered ca. 2 000 km^2, of which 1 739 km^2 was on land, while the remaining part was fiords and sounds. Reindeer siidas with winter grazing areas in Kautokeino, migrate to Kvalsund for summer grazing. This is the major reason why these two separate areas are treated together in one hub, and why the hub is called "Kautokeino-Kvalsund". Kvalsund is traditionally a Sea Sámi community, where a large proportion speak Sámi or are descendants of Sámi-speaking people. An unknown ratio of the inhabitants speak Kven (a Finnish-derived language), while nearly all inhabitants also speak Norwegian either as first or second language.

2.3.3.2. Guovdageaidnu: reindeer herding, academia, wider societal impacts, and potential land use conflicts

The importance of the reindeer husbandry for the community in Guovdageaidnu-Kautokeino (West Finnmark) is illustrated by the fact that in 2021 there are 25 pasture districts, 36 summer siidas, 53 winter siidas, 213 siida shares, 1 507 reindeer owners, and 76 335 reindeer (Eanandoallodirektoráhtta

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2021a). With a total population of ca. 2 900, this means that slightly more than 50 % of the population in Kautokeino are reindeer owners. A high proportion of the remaining population are family members of reindeer owners. Thus, nearly the whole population of the municipality is in one way, or another involved in reindeer husbandry.

Inaugurated in 1989 in Guovdageaidnu-Kautokeino, The Sámi University of Applied Sciences (Sámi allaskuvla) has slightly more than 100 employees and receives ca. 120 million NOK (ca. 12 million EUR) annually in governmental and other financial support (Anon. 2022). The University is a cornerstone in the Guovdageaidnu-Kautokeino municipality and for the entire Sámi community. The tax revenues from the University's employees are an important contribution to the economy for the municipality. Moreover, the university secures competence development in all aspects related to Sámi way of life, influencing positively all Norwegian Sámi societies, even Sámi societies in neighbouring countries, as many of the students are international. Number of students are provided in the table below.

Table 3. Students enrolled at Sámi allaskuvla 2014-2021 (Statistics Norway)

Level	2014	2015	2016	2017	2018	2019	2020	2021
Bachelor	144	147	150	198	193	129	69	151
Higher	11	12	21	60	68	45	45	35
Total	155	159	171	258	261	174	114	186

Sámi allskuvla has, at least in recent years, had more female than male students. In 2021, 81.7 % of students were females.

Biedjovággi is an abandoned open mine in the south-western part of Guovdageaidnu-Kautokeino. Copper ore with traces of gold were extracted in two periods, first between 1970 and 1975 and later between 1985 and 1991. In the last of these two periods, the mining company in the area (the Finnish company Outokumpu) was the largest employer in Guovdageaidnu-Kautokeino.

Recently (August 2022), it has been publicly announced that a Swedish mining company (Arctic Minerals AB) has applied for permission to re-open the mining activities in the area to extract cobalt, tellurium, gold, and copper from an extended area surrounding the existing mining pit. A similar proposal from the same company (then named "Arctic Gold AB") was in 2013 voted down by the majority of the Municipality Board. The current Municipality Board is also against new mining activities in Biedjovággi due to the large negative effects it will have on reindeer husbandry in the area, according to a recent interview with Deputy Mayor Ole Hætta published by the Norwegian Broadcasting Corporation (NRK). See below for further information on conflicts between mining and reindeer husbandry.

2.3.3.3. Kvalsund: reindeer herding, wider societal impacts, and potential land use conflicts

For the Kvalsund part of the hub, there are 3 pasture districts, 3 summer siidas, 5 winter siidas, 28 siida shares, 166 reindeer owners and 9 544 reindeer (Eanandoallodirektoráhtta 2021a).

Kvalsund is a traditional sea Sámi community and is used as spring, summer, and autumn pastures for reindeer husbandry, some of them with winter pastures in Kautokeino. Mining has taken place in the area of Kvalsund for shorter periods, last time in the 1970s. Kvalsund needs new employment and a more diversified industrial structure as young people leave the area for more opportunities in the cities. Nussir ASA, a new Norwegian mining company, dependent on foreign investments. For 10 years, an opening of a copper mine has been under planning. Nussir received an operating license from the Government in 2019, supported by the local council but plans for a sea deposit in the fjord caused

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protests from environmental NGOs, Sámi organizations and other user groups. Another development is a planned facility for green energy at Markoppneset not far from the Nussir mine.

Kvalsund was a separate municipality from 1869 until 2020 when it was merged with Hammerfest. Thus, data relating to Kvalsund as an administrative unit are only available until 2019.

Kvalsund is affected by industrial development such as mining and other land use changes. The physical barriers and pasture fragmentation resulting from cabin resorts in Kvalsund-Repparfjord as well as infrastructure development (e.g., roads, power lines) have adversely affected the distribution and movements of reindeer from the 1990s and onwards (Bradshaw et al. 1997, Nellemann and Cameron 1998, Vistnes et al. 2008, Skarin & Alam 2017). However, unemployment rates in this municipality reveal a need to find alternative employment and business development.

2.3.3.4. Economy of siidas

The table below provides relevant data on district level within the Kvalsund-Kautokeino area.

Table 4. Income of siidas in Kvalsund-Kautokeino area

District	Siida units	Persons involved	Production per reindeer (kg)	Total meat income (MNOK)	Other income (MNOK)[38]	Compen-sation (MNOK)[39]
Fiettar[40]	14	107	5.4	2.1	n.a.	n.a.
Fálá/Kvaløy	6	26	3.2	0.6	n.a.	n.a.
Gearretnjárga	8	35	2.7	0.5	n.a.	n.a.
Guovdageaidnu-East	53	364	5.9	9.2	11.3	6.7
The whole of Guovdageaidnu[41]	212	1 535	5.7	39.14	39.91	29.0

n.a. = data not available

Data are from 2019 and retrieved from Eanandoallodirektoráhtta 2021 a, 2021b.

The following table shows total meat production in metric tonnes for Kautokeino for the years 2009/10 to 2019/20.

Table 5. Total meat production in metric tonnes for Kautokeino

Area	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20	Var.
E	122	188	154	144	135	166	193	142	166	103	130	169	187
C	204	259	301	101	208	213	257	197	197	159	170	177	298
W	148	186	220	97	117	159	218	186	145	132	133	143	227
Total	475	634	675	345	461	539	669	525	508	395	434	490	196
%	30.9	38.0	34.5	23.3	27.5	33.7	39.4	29.9	27.7	28.5	25.4	29.9	

Retrieved from the official resource accounting for the reindeer husbandry (Eanandoallodirektoráhtta 2021b). E = eastern zone, C = central zone, W = western zone. % = Proportion of total national reindeer meat production. Data from 2020/21 and 2021/22 are still not published. Var. = range in per cent (Year with highest productivity / year with lowest productivity) x 100

[38] Subsidies from the Ministry of Agriculture, hunting and fishing + other types of income
[39] Compensation for predators and loss of area
[40] Fiettar, Fálá and Gearretnjárga are reindeer herding districts within the former Kvalsund Municipality, now part of Hammerfest Municipality
[41] This includes three zones, of which Guovdageaidnu-East is one of these zones. The siidas with winter-grazing areas in Guovdageaidnu-East are the ones who migrate to Kvalsund for summer grazing. The siidas in the other two other zones migrate to summer grazing areas in the west (Kvænangen, Alta, etc.). Data for the whole of Guovdageaidnu is provided to show the situation for the municipality as a whole.

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For the separate zones, meat production between years varied between 187 and 298 %, rendering an overall variation of 196 %. This means, for the total area, that in the best year within this period, the production was nearly the double of the worst year. Regarding the separate zones, we see that variation is highest in the central zone, with nearly three times higher production in the best year compared to the worst year. The main reasons for the large year-to-year fluctuations are high mortality caused by challenging winter grazing conditions, which are covered in several of the other work packages of ArcticHubs, and loss to predators. The table shows that productivity was highest in the years 2009/10, 2010/11 and 2014/15, and lowest in the years 2011/12 and 2017/18.

The monetary value of meat sold via slaughterhouses is available for the years 2016 to 2020 (Eanandoallodirektoráhtta 2021a). Here are the average values in NOK per kg for the years 2016-2020 for the three zones in Kautokeino, and the total value of the meat produced.

Table 6. Monetary value of meat sold

Year	2016	2017	2018	2019	2020
NOK per kg	62.24	72.07	73.82	70.46	72.35
Total value (KNOK)	38 119	35 434	30 748	39 140	26 453

These data show that from 2019 to 2020 there was a 32 % reduction in monetary value of the total meat produced.

These two reports cited above on resource accounting also include time series on meat production per individual, and loss of calves and adults during winter, in addition to some other statistics, for example comparison between reindeer herding districts. If any of these time series could be of any interest, check the URLs to look through the two reports. NINA can help in translating if Google Translation is not sufficient.

2.3.3.5. Municipality-level economy

Nearly any economic activity in Kvalsund-Kautokeino beyond the direct income from reindeer husbandry is of relevance from an indigenous perspective. The Guovdageaidnu-Kautokeino municipality administration's annual income per inhabitant was 88 789 NOK in 2021 and 82 305 NOK in 2020. These values do not provide much information without comparing them to other municipalities. The national average was 65 717 NOK in 2021 and 60 867 NOK in 2020, meaning that Guovdageaidnu-Kautokeino has a 20 % higher income per inhabitant than the national average. This is positive. On the other hand, in 2021 Guovdageaidnu-Kautokeino municipality spent 45.5 % of its revenue on gross investment costs. This is much larger than the national average, which is 14.5 %. In 2020 the investment costs in Guovdageaidnu-Kautokeino were only 4.6 %. Overall, the official statistics on the income and costs draw a picture of a municipality that performs above the national average.

Kvalsund Muncipality had a mean income per year per inhabitant of 93 087 NOK for the years 2015-2018, thus much larger than the national average for these years. Its gross investment costs in the same period varied between 12.3 and 19.1 % of the gross income.

There was no commercial forestry in these two municipalities in the period 2018-2021. Statistics on agriculture is not available on municipality level. Data available on county level shows that agriculture is in decline in Finnmark. For example, from 2007 to 2019, the number of properties defined as agriculture with buildings and settlement declined by 20.6 %.

There is no available data on the revenue from tourism on municipality level. There are numerous tourists, both domestic and international, visiting Guovdageaidnu-Kautokeino during a year. In the municipality, there are several tourist-related businesses offering activities in all seasons. Near the

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centre there is a large, modern hotel. The hotel is probably much used by tourist buses during summertime. activities (some of which are strongly connected to the Sámi culture) that attract domestic and international tourists are, among others, history, handicraft, nature, reindeer, birdwatching, fishing, hunting, cross-country skiing, dog sledging, and last, but not least northern lights spotting. Numerous airborne tourists arrive at Alta and take shorter trips to Guovdageaidnu-Kautokeino on guided day trips, and some international tourists also stay overnight in Guovdageaidnu-Kautokeino.

Kvalsund receives fewer tourists, but numerous tourists drive through Kvalsund en route to North Cape or Hammerfest. The village Skaidi is a popular destination for domestic tourism. The village hosts a large village of leisure houses (cottages) and a hotel. Salmon angling attracts some tourists.

Overall, much of the tourism is, at least in part, related to Sámi culture, but it is nearly impossible to put a monetary value on this. See, for example, Olsen (2016) for more information on Sámi-related tourism in Guovdageaidnu-Kautokeino. A report from 2017 (Iversen et al. 2017) estimated the tax income from tourism to be 2.3 mill. NOK for Guovdageaidnu-Kautokeino. For Finnmark as a whole, the economic productivity from tourism increased by 230 % from 2004 to 2017.

2.3.3.6. State of nature

The state of biodiversity in nature, as measured by the Norwegian Nature Index (2020), is considered as good (quantitatively evaluated on a scale from 0 to 1) for the Kvalsund-Kautokeino area. The only exception is the state of forests, which is moderate in most of the country, including the whole of Finnmark. A main reason for this is a general decline in abundance of old-growth forest trees (especially aspen, rowan and large willows), small rodents and several bird species. Forest state in K-K increased from 2014 to 2019 – from below moderate (0.35) to moderate (0.45) and, this improvement was concomitant with a similar improvement in most of the country. Data on state of nature from Kautokeino-Kvalsund are mostly indirect, meaning that rather few datasets are retrieved within the hub, but time series collected elsewhere are given validity on regional level.

2.3.3.7. Employment rates

Number of people with employment is here first described on county level. Corrected for population changes, the employment rate for inhabitants in Finnmark (i.e., people with postal address in the county) decreased by 1.3 % from 2008 to 2019. In 2008, 52.0 % of the inhabitants in Finnmark were employed, while in 2019, this number was 50.8 %. However, the total number of people with employment in Finnmark increased by 4.4 % during the same period. This suggests that Finnmark provides jobs to people who have a home address elsewhere in Norway or abroad, and that this type of employment has increased. This is typical for people working in petroleum, mining or fishery industries, which are not typical jobs in Guovdageaidnu-Kautokeino or former Kvalsund municipality. Thus, county-level employment time series are not much informative for this hub.

The total number of inhabitants in Guovdageaidnu-Kautokeino Municipality with employments is given in the tables below. Data on employment are available for the period 1986-2022, while industry-specific data are available for the period 2008-2021. The first table includes inhabitants between 20 and 64 years old, reflecting the potential working force.

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Table 7. Total number of inhabitants in Guovdageaidnu-Kautokeino Municipality with employments

Year	Male (*n*)	Females (*n*)	Total (*n*)	Ratio (%)[42]
1986	835	743	1578	88.55
1987	843	748	1591	89.28
1988	861	754	1615	90.63
1989	862	771	1633	91.64
1990	895	789	1684	94.50
1991	907	803	1710	95.96
1992	934	812	1746	97.98
1993	944	847	1791	100.50
1994	954	873	1827	102.52
1995	971	899	1870	104.94
1996	985	900	1885	105.78
1997	993	906	1899	106.56
1998	993	901	1894	106.28
1999	985	906	1891	106.12
2000	983	892	1875	105.22
2001	990	892	1882	105.61
2002	1 004	878	1882	105.61
2003	984	870	1854	104.04
2004	992	871	1863	104.54
2005	990	875	1865	104.66
2006	985	868	1853	103.98
2007	991	845	1836	103.03
2008	979	848	1827	102.52
2009	981	858	1839	103.20
2010	968	842	1810	101.57
2011	959	854	1813	101.74
2012	946	840	1786	100.22
2013	957	833	1790	100.45
2014	951	813	1764	98.99
2015	939	813	1752	98.32
2016	943	832	1775	99.61
2017	911	822	1733	97.25
2018	932	807	1739	97.59
2019	934	789	1723	96.69
2020	921	776	1697	95.23
2021	924	781	1705	95.68
2022	901	757	1658	93.04
Mean	947	835	1 782	100.00

The latter table (Table 8) shows that there is a declining trend in the number of people working in agriculture, i.e., for this municipality this means reindeer husbandry. However, caution must be taken, given that information on type of work is not available for the total potential workforce. For example, in Year 2021, information is lacking for 250 (15 %) of the potential workforce (difference between 1 455 and 1 705; see values in the two tables). However, it may also mean that of the 1 705 inhabitants between 20 and 64 years in 2021, only 1 455 had jobs. It is likely that a relatively high number of the 250 inhabitants between 20 and 64 years were students or unemployed. So, the trend provided in the table is probably reflecting actual trends. Statistics on unemployed inhabitants are not given on municipality level. Thus, it is not clear how many inhabitants in Guovdageaidnu-Kautokeino who were actually seeking jobs, i.e., who had registered as unemployed at the public employment agency office.

[42] Total number of employed inhabitants of a specific year as a function of the long-term average.

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Table 8. Employed inhabitants in Agriculture (including reindeer husbandry)

Year	Employed inhabitants [43]	Agriculture (incl. reindeer husbandry)	Ratio (%)
2008	1 518	253	16.7
2009	1 504	259	17.2
2010	1 508	224	14.9
2011	1 459	221	15.1
2012	1 503	246	16.4
2013	1 476	248	16.8
2014	1 485	237	16.0
2015	1 456	204	14.0
2016	1 472	214	14.5
2017	1 504	201	13.4
2018	1 516	203	13.4
2019	1 489	199	13.4
2020	1 464	196	13.4
2021	1 455	199	13.7
	Trend (*r*) 2008-2021	− 0.85	− 0.83
	Change (%) 2008-2021	− 21.3	− 17.9

Kvalsund (2008-2019) shows a declining trend in the number of employed inhabitants, from 507 in 2008 to 427 in 2019 (i.e., the last year with data, before Kvalsund became part of the larger Hammerfest Municipality). Only between 3 and 7 persons within Kvalsund worked in agriculture (reindeer husbandry or as farmers), according to this dataset. It reflects that reindeer herding within Kvalsund is largely undertaken by inhabitants of neighbouring municipalities, including Guovdageaidnu-Kautokeino. Tables for Kvalsund are not provided here.

3. Inuit People in Greenland

3.1. The first people of Greenland

The Historical immigration of Greenland has occurred over two major rounds. The first group of settlers were the Paleo-Eskimos (Green arrow in the figure below), and then the Neo-Eskimos (Red arrow in the figure below).

DNA studies show that the first people - the Paleo-Eskimos - inhabited the Arctic for about 4,000 years without contact and exchange with other populations. The Paleo-Eskimos migrated from Siberia via the Bering Strait to the Arctic. "The last vestiges of these great paleo-Eskimos date back to the years 1300-1400 after which they completely disappeared. Until then, they have not been mixed with other population groups that have lived at the same time as those in the Arctic and Greenland. For example, the Vikings in southern Greenland did so in an overlapping time period. Nor have they mixed with seafaring Europeans or North American Indians."[44]

700 years ago, around the 1100s, a new population group came to the Arctic - Thule Inuit - who are the ancestors of the living Inuit in Greenland. At this time, the Paleo-Eskimos disappear from the Arctic region. " The Thule culture brought more efficient means of transportation such as dog sleds and skin boats, more complex tools such as hunting bows made of tendons and harpoons for hunting the large whales. It is believed that the fact that they could hunt the large marine mammals as food and for survival made the culture more sustainable than the cultures that lived by fishing and hunting of

[43] Number of employed inhabitants for which information on type of industry is known.

[44] http://www.dagensgronland.dk/file/240/096_DNADeForsvundnePalaeoEskimoersHistorie.pdf

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terrestrial animals. This should be the best reason why the Thule culture could spread so quickly throughout the eastern Arctic and eventually replace the other cultures."

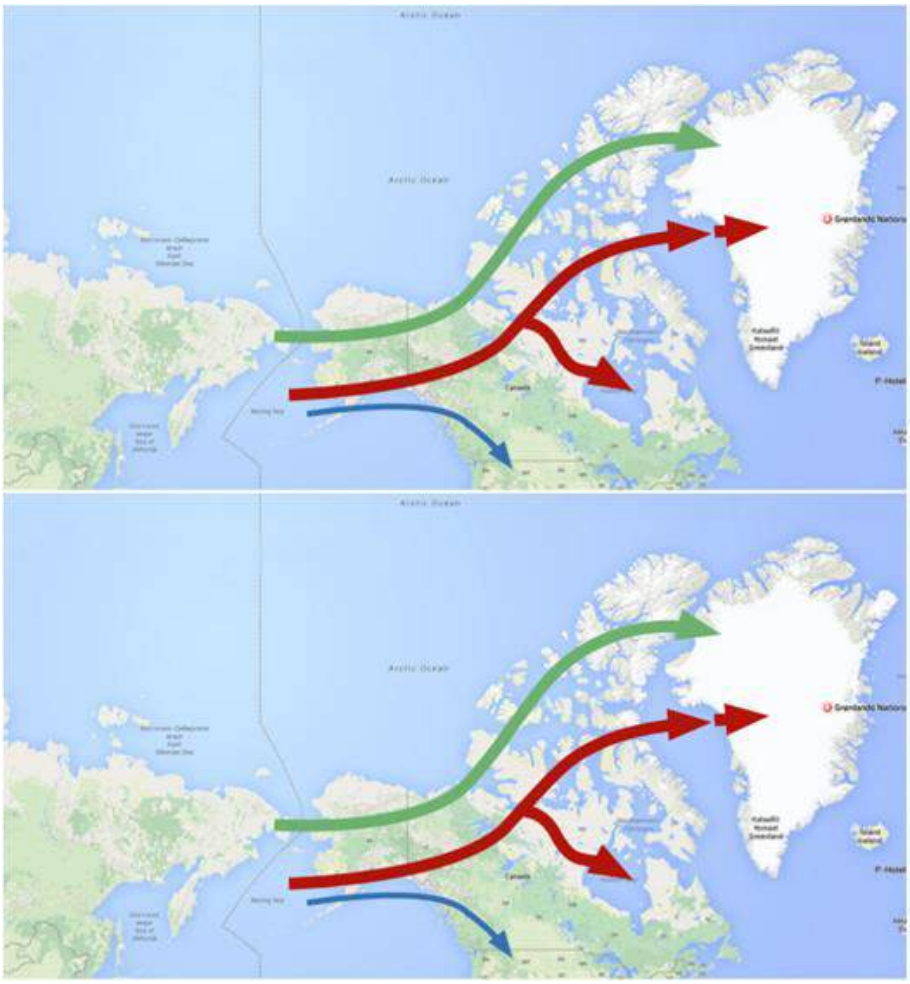

Figure 18. Historical immigration of Greenland

The majority of the population in Greenland is descended from the Thule Inuit group also called the Neo-Eskimos, who immigrated from the Aleutians, across Siberia, Alaska and Canada to the Thule area and continue down West Greenland.

Thule-inuit are the oldest population group in Greenland and genetic testing shows that the Greenlandic people are descended from this people.

Norse and Vikings immigrated South Greenland in the 980s.

"In the year 982, Erik the Red arrived in Greenland with his Icelandic brothers and in 986 the settlement "Østerbygden" was founded in the southwestern part of Greenland. This early immigration was the start of a connection between Greenland and first Norway and 400 years later Denmark. The Vikings disappeared from Greenland around the year 1500, but it is still unknown what the reason was for their sudden disappearance.

The Vikings came to Greenland in the year 985 and settled in small settlements in southern Greenland. Here they lived for about 500 years. This means that the Vikings overlapped temporally with both the Paleo-Eskimos (Late Dorset) and the Thule culture in Greenland. The Vikings lived in Greenland during a climatic warm period, and unlike the other cultures in Greenland, were peasants. There was both

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forest and the opportunity to grow different crops in southern Greenland, and the Vikings also had farm animals with them."[45]

"Greenlanders called themselves Inuit until the beginning of the last century. The contemporary term Kalaaleq (plural: kalaallit) derives from the "peeling" of the Norse. ...Kalaallit is also used as an expression of a common nationality designation for everyone in Greenland regardless of the grouping or background the individual may belong to or have.

3.2. Colonization, incorporation and a county in Denmark

Greenland was colonized in 1721 by Denmark. In the period 1945-54, Greenland was on the list of non-self-governing territories under Chapter XI of the UN Charter. During this period, Denmark had to regularly submit regular reports on the situation to the UN. With the Constitutional Amendment in 1953, Greenland became an integral part of the Kingdom, and reporting to the UN ceased. Thus, the Constitution also applied to Greenland. In 1979, Greenland was granted home rule within the framework of the Commonwealth,3 but where a number of matters were gradually to be transferred to Greenland. (Source insning: Greenlanders called themselves Inuit until the beginning of the last century. The contemporary term Kalaaleq (plural: kalaallit) derives from the Norse "peelling.").

3.3. Today's people in Greenland

Today, Kalaallit Nunaat/Greenland is inhabited by Kalaallit/the Greenlandic people and few newcomers primarily from Denmark. The population has been relatively stable in recent decades at around 56,000 and is 56,562 in 2022.

Table 9. Population Estimates by January, 1st 2013-2022

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Total	56.370	56.282	55.983	55.847	55.860	55.877	55.992	56.081	56.421	56.562
Men	29.838	29.730	29.555	29.543	29.493	29.489	29.553	29.551	29.749	29.803
Women	26.532	26.552	26.428	26.304	26.367	26.388	26.439	26.530	26.672	26.759

Source: Statistics Greenland – See table in StatBank https://bank.stat.gl/BEESTA

Table 10. Extended place of birth 2013-2021

	2014	2015	2016	2017	2018	2019	2020	2021	2022
I alt	56.282	55.983	55.847	55.860	55.877	55.992	56.081	56.421	54.840
A Født i Grønland med to grønlandskfødte forældre	46.371	46.290	46.246	46.245	46.316	46.386	46.350	46.460	45.843
B Udenlandskfødte med 2 udenlandskfødte forældre	4.939	4.720	4.696	4.656	4.591	4.620	4.782	4.907	4.073
C Grønlandskfødte med 2 udenlandskfødte forældre	378	376	349	350	361	365	362	373	337
E Udenlandskfødte med én grønlandskfødt forælder	661	667	656	674	669	657	635	652	628
F Grønlandskfødte med én udenlandskfødt forælder	3.534	3.517	3.485	3.496	3.490	3.497	3.475	3.528	3.462
G Udenlandskfødte med to grønlandskfødte forældre	399	413	415	439	450	467	477	501	497

Source: Statistics Greenland – See table in StatBank https://bank.stat.gl/BEEST9

[45] http://www.dagensgronland.dk/file/240/096_DNADeForsvundnePalaeoEskimoersHistorie.pdf).

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3.4. Different names for Greenlandic people: Inuit, Kalaallit, native, indigenous people

The Greenlandic people are categorized or described in different terms: Inuit, Eskimos, natives, permanent residents, an Indigenous people, Kalaallit, the Greenlandic people. The many terms have been used both on the international stage, in national politics and by the citizens themselves. What is the intent of using changing designations? And what are the criteria for the different designations?

What is the purpose of calling oneself an Indigenous People? Through the categorization as an Indigenous People comes some rights and protection mechanisms. For example, indigenous peoples have special rights in relation to the use of territory, natural resources, or in efforts to preserve cultural characteristics and traditional way of life.

Can terms be interpreted in such a way that they may have relevance in various dispute situations? Disputes about, for example, access to territory and natural resources or in efforts to preserve cultural characteristics?

Indigenous peoples sometimes find it difficult to have their say and are therefore not heard or involved sufficiently in decision-making processes that influence their way of life. It may concern situations of existence where their use of territory and/or natural resources is restricted and where they therefore need international protection.

The use of the category of Indigenous People can therefore be understood in the light of the need for special rights and protection mechanisms. Furthermore, in certain contexts, the category enjoys recognition, and users of the term are more closely heard, especially in international contexts. It may therefore be attractive as well as necessary to use the different designations.

An underlying layer in the discussion of rights and the need for protection are inclusion- versus exclusion mechanisms and dominant versus non-dominant positions. Indigenous peoples are referred to as being in a subheading or non-dominant position, where outside actors possess dominance and forms of power that give them access, and in some cases priority, to the use of the territory and its natural resources. An inappropriate situation with exclusion mechanisms.

There may be situations where land areas or resources are sought to be used for new business activities. A situation where historical users no longer have access to the area or resources. However, where the planned new business activity is to benefit the common good (and not a smaller population) and where the initiators such as industries or project companies are therefore granted the right to use the land or natural resources and where the historical users are excluded from the use of the same land area or resources.

3.5. The right to use a wide-ranging microphone from a recognized platform

Indigenous peoples may need to use the term Indigenous Peoples as a platform with its far-reaching microphone from which the group's needs and interests are heard, recognized and included in decision-making processes around the use of territory and the area's natural resources. One way to do it is to appeal to the documents and treaties presented in the introduction.

In relation to ILO Convention 169, it should be noted that the Self-Government of Greenland has repatriated certain matters from the Danish state and thus has both legislative and executive powers within these areas. The Self-Government is therefore the subject of obligations in relation to compliance with the Convention nationally, but not the international subject of duty, as it is Denmark that ratifies the international conventions. In 1996, the Danish government ratified ILO Convention No. 169. In this connection, the Danish government declared the people of Greenland the indigenous population – Inuit – in the sense of the Convention. A special folk society within the Danish kingdom.

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"In Denmark, there is only one indigenous people in the sense of Convention No. 169. These are the indigenous population of Greenland or Inuit. Act no. 577 of 29 November 1978 on Greenland Home Rule introduced a Home Rule for Greenland. Home Rule consists of an elected assembly, the Landsting, which is elected by the resident population of Greenland, and a politically elected leadership, the Landsstyret, which is elected by the Landsting. It is clear from the said Home Rule Act that Greenland constitutes a special people's society within the Danish kingdom."[46]

Here we see that the surrounding society (others), especially the Danish state, describe the Greenlandic people as a group with a special, original identity.

With the adoption of ILO Convention 169 by the Danish Government, the Danish state is obliged to implement the convention's intentions.

3.6. Does Greenland meet the criteria for Indigenous Peoples?

Since neither the UN Declaration for the People of the People nor ILO Convention 169 uses the definition of an indigenous people, it is left to the international bodies, national courts and authorities to decide whether persons who invoke the right to belong to an indigenous people are also according to the criteria of the conventions.

The Greenlandic people are descendants of Thule-Inuit. But does this mean that they have the right to invoke special rights as an Indigenous People?

Today's Greenlandic people are a diverse people with hunters who live traditionally and with fewer material goods and limited modern infrastructure in rural. In addition, there are populations that live a modern life in the Western sense with a Western educational background and hold jobs in the Western-inspired welfare system of big cities and especially I Nuuk. Can you describe everyone and think that this diverse Greenlandic population is an indigenous people? Or is it only the hunters in the rural districts who can claim special rights and the title of Indigenous People, where the educated Greenlanders in Nuuk and in the modern cities cannot bear the title?

What about the Greenlandic women who prepare traditional Greenlandic foods such as fermented cod and seal soup? Can or should they be categorized as an Indigenous People because they carry on an important cultural heritage through cooking, teaching their children to speak Greenlandic and sewing traditional national costumes, even though they may live a modern life with technological equipment and possess a western education? Both the modern Greenlander in the towns and the traditional hunters in the settlements have in common that they are descendants of the native Inuit, speak Greenlandic and practicing traditional cultural customs. Both groups apply and pass on various traditional elements and values to their descendants, even though they live a traditional and modern life, respectively. But are both groups equally entitled to invoke special rights on protection mechanisms and the right to territory and natural resources?

And what about the citizens who have Danish parents but were born in Greenland and live a modern life and only speak Danish. Can they designate themselves or be designated as indigenous peoples according to the Self-governments act? Yes, they can if they have residential address in Greenland

In relation to UN´s declaration of Indigenous People, subjective criteria for the Indigenous People definition, the kalaallit population in Greenland has the right to self-identify as an indigenous people. In relation to the objective criteria, the Greenlandic people are descendants of the first immigrant Thule-Inuit. The Greenlandic language is part of the Eskimo-Aleutian language tribe. Greenland is a former colony of Denmark. The Danish state has implemented modernization processes in Greenland,

[46] https://www.retsinformation.dk/eli/ltc/1997/97

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the so-called G-50 and G-60 policies. A modernization process for better or worse, with assimilation processes in which parts of the traditional Greenlandic culture have been lost, but with improved infrastructure and housing conditions.

According to the Danish state's ratification of ILO Convention 169, the Greenlandic people are an indigenous people. Both the Danish state and the Government of Greenland are obliged to protect the Greenlanders' culture, language and use of natural resources.

3.7. The rights to be the Greenlandic people

On 25 May 2022, a question debate was held on who has the right to call themselves a Greenlander in Inatsisartut (Greenlandic Parliament). The question debate was tabled by the Independence Party Naleraq. The party Naleraq wants a public debate on the term the Greenlandic people and asks the question: "Who are the Greenlandic people who are recognized as a people under international law? Is that you? Is that me? Is that another one? Are the Greenlandic people based on language? On history? On genes or place of residence?... Today we can state that being a Greenlander is not based on residence or language, but is a question primarily based on genes."[47]

Perhaps this query not only about the title as Kalaaleq/Greenlander but also about who has the right to participate in the future vote on an independent Greenland as who has the right to apply for a license grant for the use of lands and natural resources.

During this time, we see that several special indigenous cultural traditions are practiced anew in today's Greenland. In addition to the language struggle and the question of identity, tattoos with

[47]https://ina.gl/dvd/FM%202022/pdf/media/2552066/pkt52_fm2022_foresp36_hvem_er_groenlaender_naleraq_da.pdf

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original patterns done on the face and hands have become popular among the younger generation, especially in the capital Nuuk and the larger cities.[48]

These examples are included to exemplify that Greenland is going through a time with Greenlandization processes, in which both young, elected politicians invoke the importance of cultivating particular cultural characteristics, and of identifying with and being categorized as an Indigenous People. Is this a possible backlash to assimilation mechanisms and the desire for more openness about decolonialization processes? Perhaps a form of conscious choice to adopt indigenous Greenlandic cultural values and practices as a counterpoint to previous blind assimilation participation.

Former Chairman of the Greenland Council for Human Rights Sara Olsvig criticized the Danish and Greenlandic governments for not implementing the UN Declaration for the Rights of Indigenous Peoples adequately back in 2020. Sara Olsvig sees the new currents with groups invoking the right to be an Indigenous People as an expression of a lack of knowledge of ILO Convention 169 and the UN Declaration on the Rights of Indigenous Peoples, as well as the right to self-identification as an Indigenous People. Sara Olsvig believes that this was due to an information "missing link" and therefore suggests that the Danish government and the Government of Greenland implement the rights of indigenous peoples through the Danish-Greenlandic Arctic Strategy[49]

3.8. The relationship with Denmark

3.8.1. Home Rule Act

In 1979, Greenland was granted home rule within the framework of the Commonwealth, but where a number of areas of affairs were to be gradually transferred to Greenland. The Home Rule Act entailed the establishment of the Greenlandic Landsting (the legislative authority) and the national government Landsstyre (the executive authority). Among the areas of responsibility transferred to Home Rule were the internal system of governance, taxes and duties, fishing within the territory, hunting, agriculture, national planning, nutritional and competition law, social conditions, labor and occupational conditions (except for the working environment), education and culture, and health care. In 1982, Greenland voted out of the European Communities and from 1985 was granted the status of an overseas country in relation to the EU.

After 20 years with the Home Rule Scheme, Greenland wanted to have it evaluated. Initially, the Greenlandic Self-Government Commission was established. The Commission's recommendations were, among other things, that the Greenlandic people should be recognized as a people.

In 2004, the Commission's work led to the establishment of the Greenlandic-Danish Self-Government Commission. This purpose was, among other things, to ensure the greatest possible equality between Greenland and Denmark and to increase the self-determination of the Greenlandic people as far as possible, this was to be done within the framework of the Commonwealth and the Constitution of the Danish Kingdom. Based on the Greenlandic-Danish Self-Government Commission's report, the proposal for a law on Greenland's Self-Government was finally adopted, after an indicative referendum in Greenland, by the Danish Parliament in June 2009 and the Greenlandic self-government was then a reality on 21 June 2009. The Law is based on the principle of international law on the right of peoples to self-determination, which is expressed, among other things, in Article 1, part 2.6 According to Section 8 of the Home Rule Act, "The permanent resident population of Greenland has fundamental rights to Greenland's natural resources[50]. This collective right to the use of land and natural resources

[48] https://www.polarfronten.dk/trommedans-og-inuit-tatoveringer/
[49] https://www.altinget.dk/arktis/artikel/raad-for-menneskerettigheder-groenland-og-danmark-skal-genfinde-den-indre-rettighedsforkaemper
[50] https://www.retsinformation.dk/eli/lta/1978/577

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can mean that everyone, regardless of where in the country they live, must have some kind of interest in the use of land and natural resources, regardless of whether these activities may take place far away from their inhabited territory.

3.8.2. The Self-Government Act and the Greenlandic People

On 19 May 2009, the Act on Greenland's Self-Government (Self-Government Act) was passed and entered into force on Greenland's National Day on 21 June 2009. The Self-Government Act replaces the Home Rule Act of 1979. The Self-Government Act defines the population as the Greenlandic people:

"Recognizing that the Greenlandic people are a people under international law with the right to self-determination, the law is based on a desire to promote equality and mutual respect in the partnership between Denmark and Greenland. Accordingly, the Act is based on an agreement between Naalakkersuisut and the Danish government as equal parties."[51]

With the adoption of the Self-Government Act in 2009, the people of Greenland were given the right to designate themselves as the Greenlandic People under international law. A significant change from the Home Rule Act, which used the terms "a special people's society" and "the resident population". The Home Rule Act was introduced in 1979 and had some inherent assimilation elements. An example is section 9, which stipulated that the Greenlandic language is the main language, but the Danish language had to be thoroughly taught, and both languages can be used in public matters[52]. The Self-Government Act does not contain this element of assimilation in the same way and merely prescribes in section 7 that "The Greenlandic language is the official language"[53]. We therefore see that official Greenland prioritizes a Greenlandinizing process, according to the language use and distance taking to assimilation processes to a greater extent than before.

With the Self-Government Scheme, the raw material area was taken home. Inatsisartutlov no. 7 of 7 November 2009 on mineral raw materials and activities of significance for this (the Mineral Resources Act) stipulates that the Government of Greenland has the right of ownership to dispose of and utilize mineral raw materials in the underground[54].

In Inatsisartutlov no. 17 of 17 November 2010 on planning and land use, it is prescribed in § 1 that the purpose of the Inatsisartutloven is to ensure that the country's land is used on the grounds of a societal overall assessment. And that (as stated in paragraph 4) the population should be involved in the planning of land use. It is clear from § 5 that Naalakkersuisut must prepare a spatial planning and overview of the essential societal interests in spatial planning, and in section 7 it is stated that Naalakkersuisut must initiate an information effort and public debate on the national land use planning objectives[55].

The National Land Use Act (Lov om arealanvendelse) provides for the involvement of the population in the planning through information and public debate. Whether the law is adequately implemented in practice and whether the public feels heard is another side of the issue.

And in Landstingslov no. 12 of 29 October 1999 on hunting, it is prescribed in § 4 that: Hunting may only be carried out by persons with permission to do so. The permit is granted in the form of a commercial hunting certificate or a recreational hunting certificate, cf. however, section 7.(2). Permission for commercial hunting and recreational hunting can only be granted to persons who 1)

[51] https://ina.gl/media/2526795/d-inatsisartut-website-inatsisartutgl-media-10562-selvstyreloven-web-a4-dk.pdf
[52] https://www.retsinformation.dk/eli/lta/1978/577
[53] https://ina.gl/media/2526795/d-inatsisartut-website-inatsisartutgl-media-10562-selvstyreloven-web-a4-dk.pdf
[54] http://lovgivning.gl/lov?rid=%7B4F8B6CD0-3E04-4476-A332-2A814FBA35A1%7D
[55] https://lovgivning.gl/lov?rid={8DA79884-6A1B-4512-A5BE-E963287A2F51}

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have permanent ties to the Greenlandic society; 2) are registered in a population register in Greenland and have had a population register address in Greenland for the past 2 years.

In the same Landstingslov no. 12 of 29 October 1999 on hunting, it is prescribed in section 2, paragraph 3 that: In connection with the administration of hunting conditions, emphasis must be placed on the involvement of hunter- and user knowledge implemented, among other things, via relevant main organizations as well as the Catch Council.

The Self-government legislation in the field of hunting does not use the term indigenous people and is open to granting licenses to applicants who have permanent ties to the Greenlandic society and have had a registered address in Greenland for the past 2 years.

This means that it is the Greenlandic authorities who decide the use and procedure for the use of the land and the underground/subsoil, with the involvement of the residents.

The rights of property of Greenland and the Greenlandic underground/subsoil have been definitively established in the Self-Government Act as belonging to the Greenlandic people. The Greenlandic people thus have, through the Self-Government, a collective right to the Greenlandic territory and its exploitation. Regardless of whether they are Greenlandic or newcomer, cannot own land in Greenland, but can, on the contrary, get a right to use an area for the purpose of the inventory of physical installations. It is therefore assumed that the starting point for access to and use of the Greenlandic territory is a collective right to all Greenlanders. Outsiders which settle Greenland will also be able to access and use the territory."[56]. And this particular aspect is causing concern among some stakeholders.

According to the Self-Government´s legislation on the use of land areas and natural resources, the population must be involved in the planning of utility activities and public debate must be held about land-use planning. Nevertheless, the elected Greenlandic politicians do not always succeed in pursuing a policy that has the support or acceptance of the population. Disputes arise about wishes for the use of lands and natural resources.

Raw material extraction companies, tourism companies and ordinary citizens can thus apply to the Self-Government/Municipality to use an area to install a business or leisure activity.

Anyone with a registered address in Greenland can apply for a license for hunting, use of land and exploitation of natural resources. All regardless of whether you have historical ties to the country or are newer newcomers. A law that often creates disputes.

Whether ILO Convention 169 and the UN Declaration on the Rights of Indigenous Peoples should remedy these disputes between Naalakkersuisut, affected citizens, and international project companies is an important question. The Greenlandic government is a democratically elected government that must develop the country based on a societal overall assessment and which must take everyone into account. All population groups, both those who cherish the traditional way of life and the residents who want a new modern and international way of life. Living modes there can have very different forms and purpose of use of land and use of natural resources.

3.8.3. Self-determination and autonomy

Under what conditions the Self-Government and the Greenlandic people have the opportunity to achieve full self-determination and independence by referendum should not be mentioned here. The

[56] http://awsassets.wwfdk.panda.org/downloads/rastofaktiviteter___beskyttelse_af_gronlandernes_kollektive_rettigheder__december_2013.pdf, page 37-38

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economic premise is one side of the matter, while the legal option in an international law sense is another discussion. Nor will a description of international law and whether the Greenlandic people lose the right to designate themselves as an indigenous people if or when Greenland achieves the status of a state with sovereignty and thus no longer meets the majority of the criteria for an Indigenous People. Post-colonial processes will also not be mentioned, even though they are intrinsic elements of the Self-Government Act and, for example, Martinez Cobos's definition of Indigenous Peoples.

3.8.4. Equality rather than under and over positions

The preamble to the Self-Government Act expresses a declaration of intent on equality and mutual respect in the commonwealth's partnership. Whether this is an expression of a showdown against a partnership with a dominant and non-dominant party must remain as an open question in this report. However, it is close to mentioning that the Danish state still has important areas of expertise, such as foreign affairs and security. The Danish state's investment in the development of Greenland is significant: first under colonizing conditions and later according to the welfare model in the Commonwealth. Greenland has undergone and continues to undergo a modernization process, which is also be some referred to as a modernization process. At the same time as this modernization process, a vigorous Greenlandinizing process is taking place, whereby the Self-Government establishes a Constitutional Commission to formulate the basis for an independent Greenland. The current government has formulated a coalition agreement noting that the Greenlandic language must take precedence in the work of the Government of Greenland, and the current government will have drafted a new tourism law to ensure that the country's citizens take precedence on all fronts in this new business development potential, etc.

Despite Greenland's circumstance with a mixture of part in the Commonwealth with assimilation and modernization processes and Greenland's participation in a more globalized world with exports and trade and other forms of international alliances via the ICC and in UN forums, parallel nationalization and Greenlandization processes are flourishing. The diversity is easy to spot. Strong characteristic elements still exist from the special indigenous and traditional way of life, with a strong sense of attachment to the land and natural resources. In the face of Greenlandic traditional life, the modern way of life is seen rapidly appearing throughout Greenland.

To sum up, Greenland's Self-Government with Greenland's own legislative body – Inatsisartut – and the executive power – Naalakkersuisut, and its own influence on repatriated areas, and the Greenlandic people as a majority you can question if this harmonize with the overall concept of indigenous peoples. A concept that refers to indigenous peoples as one of the most impoverished, marginalized and persecuted people in the world who face systematic discrimination and exclusion from political and economic influence.

But at the same time, there are some other criteria that harmonize with the fact that the Greenlandic people can be categorized as an Indigenous people. The Greenlandic people are descendants of the Inuit people. The Greenlandic people pass on the set of values and special characteristics from the indigenous traditional way of life to their descendants (Hunting life, language and traditional gastronomy etc.).

The Danish state continues to have the right of highness over Greenland, which can be reflected in a dominant and non-dominant partner relationship between Denmark and Greenland. Greenland does not have control over certain conditions in the Self-Government. These conditions may necessitate the use of the term Indigenous People, as a platform with its far-reaching microphone, from which the

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needs and interests of the Greenlandic people are heard, recognized and included in decision-making processes regarding the use of land and natural resources.

The question is whether other methods of involving dialogues, optmize paragraphs in the legislations and guidelines are more obvious to develop and implement rather than the category Indigenous People, in order to ensure that the greenlandic people's needs and interests for the use or the protection of land and natural resources are recognized and involved in decision-making processes?

3.8.5. The Greenlandic language: protected de jure, challenged de facto

According to the Greenlandic Language Act and the Self-Government Act, the official language is Greenlandic and Danish. The current government's coalition agreement states that the Greenlandic language shall take precedence in the Government of Greenland. The easily worded good and protection-oriented intentions are temporarily difficult to put into practice for several reasons. The majority of government officials are called in from Denmark due to too few academically educated Greenlanders, and the Danish language is therefore dominant in the Self-government's administration. The Government's Danish-language administrative body must serve the elected politicians and the population who have Greenlandic as their mother tongue, which for some is the only language used. Likewise, we see that the language of instruction is often Danish, because the majority of the teaching material is from Denmark and is in Danish. These ambivalent circumstances contain exclusion mechanisms that create a protection need for some actors.

While Greenlandic politicians want to give priority to the Greenlandic language, Greenlandic linguists emphasize that the original Greenlandic language does not have terms that describe the Western scientific disciplines, and that the Greenlandic language has difficulty striking in modern working life. The political ambitions are therefore not easy to live by in reality.

Languages are tight connected to culture and identity. "Languages have complex implications for identity, communication, social integration, education and development. They are also of enormous political importance. When a language is suppressed or poorly translated into the dominant political language and discourses, important worldviews and inputs too are lost."[57].

"At the beginning of the 20th century, especially, Greenlandic flourished and was actively developed in literature, poetry and in the educational system. But, with the 1953 amendment of the Danish constitution where the colonization officially ended and Greenland was turned into a Danish County, the Greenlanders were forced to more or less abandon their mother language in favor of learning Danish. Danish was prioritized in primary schools and the language quickly came to dominate childcare, hospitals, public administration and industry." [58]

The spoken language has evolved significantly over the past 30-40 years, where more and more primarily Greenlandic speakers also speak Danish, and fewer people are single language (Frederiksen & Olsen, 2017). In a population survey in Greenland 2018, with participants aged 15-34 years, shows that about half of the participants from Nuuk were fully bilingual and 9% spoke exclusively Greenlandic.

[57] https://unric.org/da/sprog-og-politik-i-groenland/
[58] https://unric.org/da/sprog-og-politik-i-groenland/

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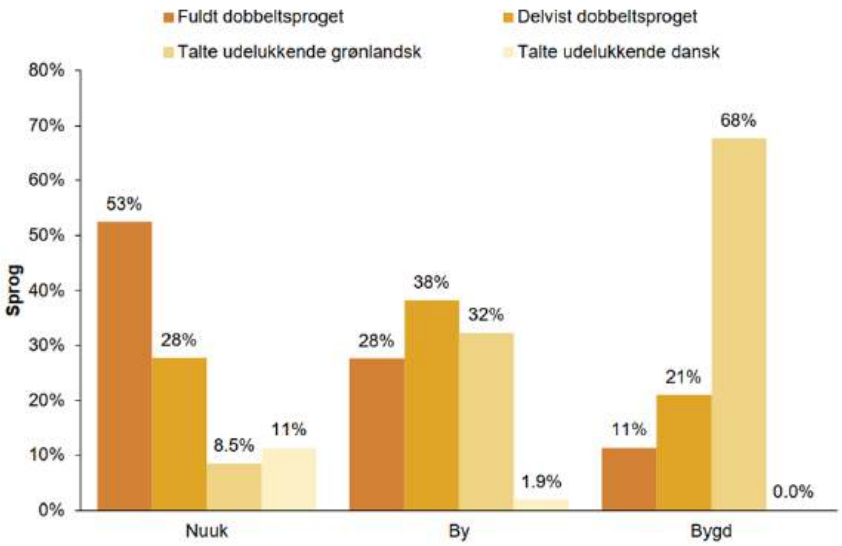

Figure 19. Results of Survey on Language Spoken among Greenlanders

According to another survey (Langgård 2001b:3)in which Greenlanders were asked to rate their language skills, 15 percent said they speak only Danish, 70 percent said they only speak Greenlandic, while the remaining 15 percent speak both languages.

Even though Greenlandic is today the official language, there are still tensions between the mother tongue Greenlandic and the Danish language.

The political and administrative elite in Greenland primarily speak Danish, while the majority of the population speaks Greenlandic. It gives rise to the democratic question of whether a country can be ruled in a language spoken only by a minority of the population."

According to Katti Frederiksen and Carl Christian Olsen, who have authored a report, the priority given to Danish in political and administrative affairs entails that some voices are considered more important than others. The Greenlandic voices are, in other words, easily overheard or disregarded.... the linguistic discrepancies bring about conflicts and discrimination in education, workplaces as well as in public administration and political life."

"The UNESCO Director-General, Audrey Azoulay, has said that: "A language is far more than a means of communication; it is the very condition of our humanity. Our values, our beliefs and our identity are embedded within it. It is through language that we transmit our experiences, our traditions, and our knowledge. The diversity of languages reflects the incontestable wealth of our imaginations and ways of life."

"The history and politics of language in Greenland make evident that language is also a source of power and that important worldviews and experiences are lost in political discourses if linguistic diversity is suppressed."[59]

It is obvious that the Greenlandic language must be promoted and practiced ensuring the preservation of traditional cultural elements and values, but also as a tool for better involvement of locals in decision-making processes.

[59] https://unric.org/en/the-politics-of-language-in-greenland/

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3.9. Greenland socio-economic data

3.9.1. Population in Greenland in locations

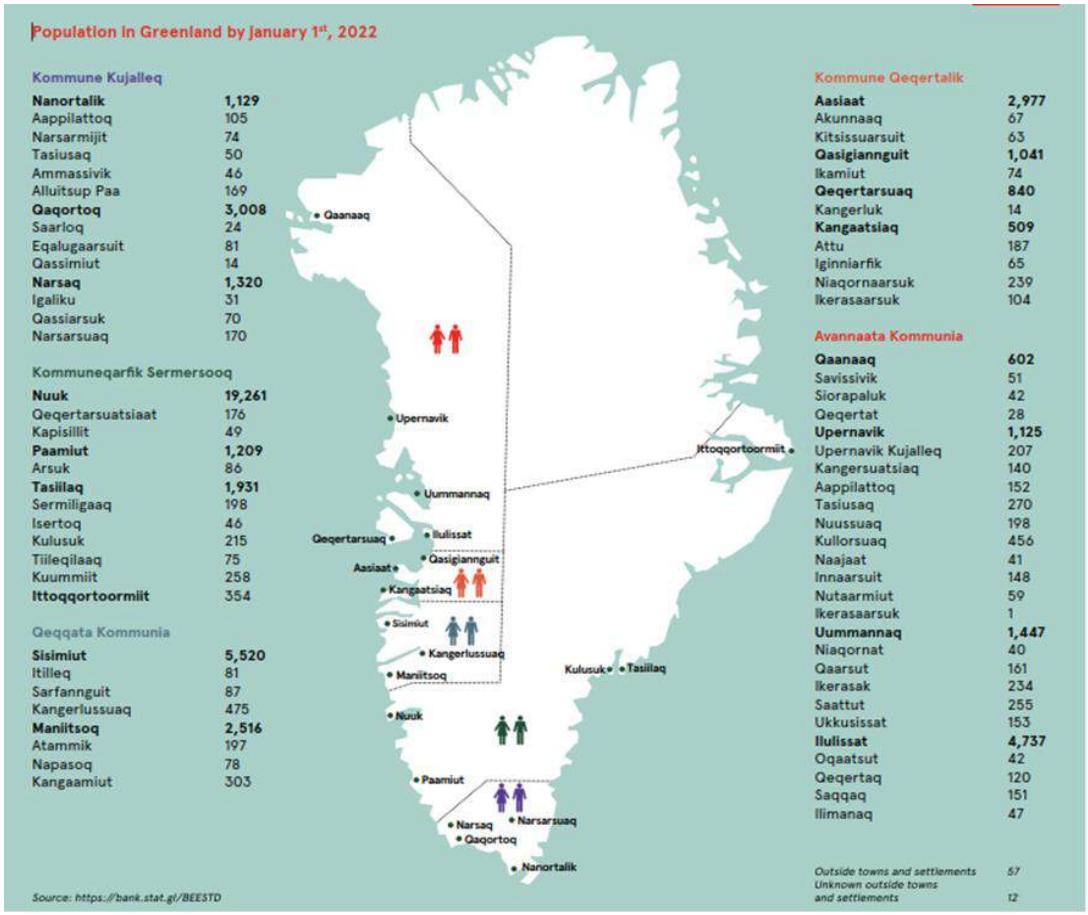

Figure 20. Greenland's Population per Location

Greenland´s population lives exclusively at the coast; in towns and settlements. About 60 per cent live in the five largest towns – Nuuk, Sisimiut, Ilulissat, Aasiaat and Qaqortoq. Most of the population is born in Greenland. The Nuuk-hub host 19,261 residents out of a total at 56,562 in year 2022.

After the 1960´s, the populations in the towns grew rapidly, as they absorbed the net population growth as well as the migration from the settlements. This trend has been continuing for the last 50 years.

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Table 11. Population by locations

Population by locations	1982	1992	2002	2012	2022
	Total population				
Total	51,435	55,385	56,513	56,749	56,562
Capital city	9,717	12,233	13,884	16,181	19,261
Main settlements	13,819	15,564	15,767	16,642	16,242
Larger settlements	14,777	15,045	14,818	13,739	12,558
Settlements	8,025	6,885	7,575	5,492	4,377
Smaller settlements	4,103	5,015	4,052	4,235	3,590
Smallest settlements	531	395	157	271	470
Other localities	463	248	260	189	64
	Born in Greenland				
Total	42,120	47,388	49,921	50,491	50,388
Capital city	6,606	8,850	10,673	12,698	15,314
Main settlements	11,724	13,697	14,237	15,216	14,862
Larger settlements	12,710	13,532	13,809	13,024	12,012
Settlements	6,717	6,271	7,198	5,237	4,201
Smaller settlements	3,959	4,667	3,813	4,028	3,519
Smallest settlements	396	354	134	242	459
Other localities	8	17	57	46	21

Source: https://bank.stat.gl/BEESTA

3.9.2. Migrations

Compared to the population size in Greenland, the internal migrations are significant, and have a big impact on the populace composition. An internal migration from outer districts to towns, primarily to Nuuk, has been going on for the last 50 years.

The majority of migrants are citizens of the Danish Kingdom, who move from Denmark to Greenland or vice versa. Greenland´s constant need for a summoned workforce requires the net emigration of foreign nationals to be continuously countered by immigration. Over time, the foreign net immigration is at a balance, but is not the case for the Greenlandic-born population segment.

3.9.3. Foreign nationals

Greenland´s international twist is growing, now representing 2.7 per cent of population total. The largest immigrant groups are Philippines, Thai and Icelanders.

3.9.4. Population by gender and age

Greenland has a total populace overweight of men. This goes for those born in Greenland, especially for those born abroad, for which 2/3 are men and 1/3 are women.

Men and women born in Greenland have a shorter life expectancy than the average of the western world. This is primarily due to a high mortality rate caused by accidents and suicide. In Greenland, men live to the age of 69.2 years on average, while women live to the age of 74.0 years. In 2011, 14,718 Greenlandic born lived in Denmark. In 2022, the number has risen to 16,801.

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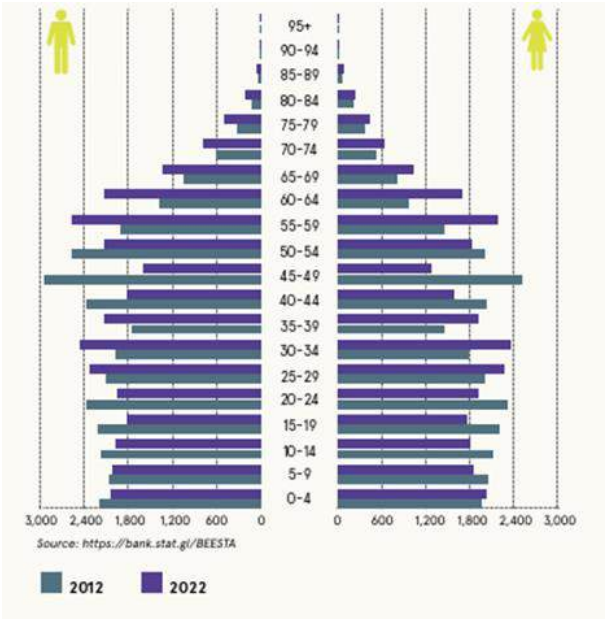

Figure 21. Population by Gender and Age

3.9.5. Education system

Ten years of primary and lower secondary education is mandatory in Greenland. Children start primary school at the age of six. Children from small settlements need to leave their home and move to the nearest town in order to attend 8th-10th grade. Danish is taught as a second language from the first grade and English is taught from the lowest grades. After finishing elementary school, about half of the children do one year at a continuation school in Greenland or Denmark. Only 1 in 7 pupils proceed directly to upper secondary education.

Many young people have to move to bigger town to pursue an upper secondary education. Only four towns have high schools, and most vocational educations are offered at ten main vocational colleges. The vocational educations alternate between theoretical classes and practical training in apprenticeships.

Many young people in Greenland do not attain an upper secondary education. Among the 18-25 years old, nearly 6 out of 10 have yet to complete, or are still active in, high school or vocational educations.

Greenland´s University, Ilisimatusarfik, is located in the capital Nuuk. It offers 11 bachelor programs and 3 master programs. Short-cycle higher educations are also offered at some vocational schools. As only a few higher educations are offered in Greenland, around 30 per cent of the students study abroad, the majority in Denmark. Education is free, and students receive a monthly student grant. Apprentices usually receive salary from the apprenticeship. Students that need to move to another town for studies are entitled to a dormitory room.

Though increasing, the education level in Greenland remains the lowest in the Nordic. Over half of the population of all 25-64 years old has no education above the lower-secondary level, compared to about ¼ in other Nordic countries.

Women attain an education above lower-secondary level more often than men. 1 out of 10 men choose to start a higher education, while the number for women is 1 out of 5. Women primarily choose educations within welfare, business or higher education. Men primarily choose educations in engineering, construction, and transport services.

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	Greenland	Abroad
	High school	
2010	260	18
2015	346	31
2020	284	28
	Vocational education	
2010	311	14
2015	443	20
2020	380	27
	Higher education	
2010	107	86
2015	182	75
2020	168	94

Source: https://bank.stat.gl/UDEISC11D

Figure 22. Number of educations completed

3.9.6. Labour market

A large proportion of the Greenlandic labour market is public jobs in municipalities or the Government of Greenland. In towns, most people work as employees. In settlements, a large proportion are mainly huntsmen and fishermen. In general, the Greenlandic labour market follow the Scandinavian model having employee- and employer organizations, wage agreements and an extensive legislation for worker protection, arbitration, vacation and worker´s compensation. Persons without Danish or Nordic citizenship can have a residence and work permit. The unemployed part of the work force has a high proportion of unskilled workers. Around 82 per cent have no education, apart from primary school. For the highly educated, the unemployment rate is very low.

Over 40 per cent of all jobs are found in the public sector. More than 60 per cent of employed women are working in the public sector. For men, fishing, hunting, agriculture and public administration and service are the most popular choices.

3.9.7. Income

In settlements, income level is considerably lower than in towns. However, the size of this difference depends on the municipality. The difference in average gross income between settlements and towns is most significant in Kommuneqarfik Sermersooq. Here, the average income of a Nuuk resident is more than twice the average income of a settlement resident.

The income inequality in Greenland is higher than the Nordic average.

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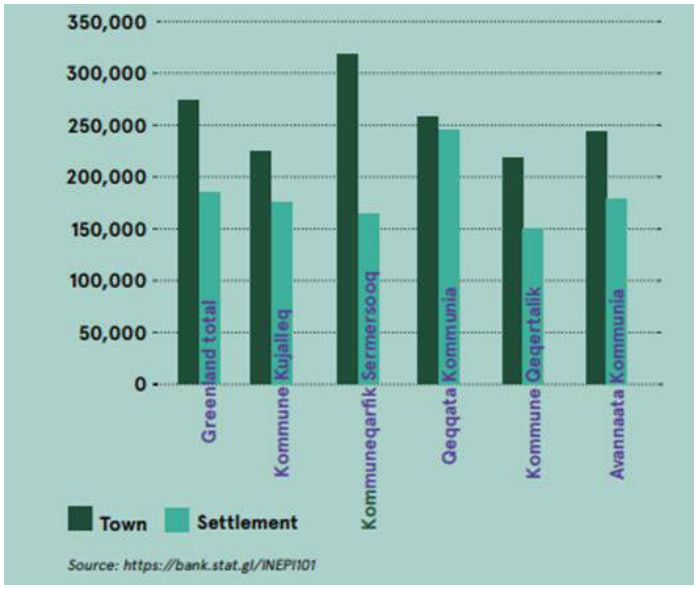

Figure 23. Average gross income by place of residence and municipality, 2020 Gross Income, DKK

3.9.8. Fishing

Fishing is Greenland's single most important trade. Fishing for prawns and Greenlandic halibut and some other species is regulated by quota and license regulations decided by the government. Fishing comes in two breeds; coastal - and offshore fishing. Coastal fishing supplies land-based seafood buyers, while the offshore fishing fleet primarily consists of factory vessels with on-board production. The land based fishing industry is dominated by two companies; the government-owned Royal Greenland, and the private owned Polar Seafood. Royal Greenland is Greenland's largest company. In recent years, a number of private seafood enterprises have appeared on the scene.

In 2021, Greenland´s fishing fleet consists of 282 vessels, 1,716 dinghy boats, 256 dog sleds and 549 snow mobiles licensed for fishing.

3.9.9. Hunting

Hunting has been a way of life in Greenland for generations. Even today, hunting provides an important supplement to household economy. Hunting is regulated by means of seasons and permissions. A general hunting license is mandatory for anyone, who wants to hunt. The general license comes in two categories: professional and recreational. In addition, a specific license is needed when hunting species limited by quota. The quota system regulates the number of animals available for hunting. Professional hunting license holders usually do not make a full living from hunting. In addition, they will often do dinghy fishing in summer and ice fishing in winter.

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Figure 24. Number of Issued Hunting Licenses

The number of sports or recreational hunters is increasing and is more than twice as many as professional hunters.

Seal still plays an important role. The sealskin is usually traded, while the meat is consumed or used for dog fodder in sled dog districts. About 50 per cent of traded sealskin is tanned by Great Greenland, the country´s only tannery.

A number of whale species have hunting quota. The meat and the skin are consumed in Greenland only.

Reindeer and musk ox are the most important land species. Sheep and lamb are butchered at Neqi A/S. Skin of land mammals are traded as well. Bird hunting is regulated by means of quota. A number of species are not quota-regulated. In general, the police enforce the hunting regulations.

3.10. Nuuk Kangerlua Hub

It is not easy or it is rather complicated to choose topics to present in this paragraf about indigenous in Nuup Kangerlua – Nuuk the capital of Greenland. One of the reasons is that the Danish government, in consultation with the Greenlandic government, has ratified ILO-169 and therefore defines the Greenlandic population as an indigenous people. In addition, the Act on Greenland's Self-Government stipulates that the people of Greenland are the Greenlandic people. Therefore, it is difficult to mention only fishermen and hunters in this section, as other populations are also defined as indigenous peoples or Kalaallit. As mentioned in the above section on international declarations on Indigenous, it is difficult to define who can use the title Indigenous. Therefore, it has also been difficult to select population groups and topics to write about in this paragraph. Only to write about fishermen and hunters in Nuuk will be to exclude important groups that carry on important elements from the original culture such as Greenlandic women who sew national costumes, cook traditional food, and teach their children to speak Greenlandic. A third important group is linguists and other language actors who make an effort to preserve and promote the original Greenlandic language and terminology, both through language legislation, value policy and in educational contexts. All mentioned groups apply and pass on various traditional elements and values to their descendants. Just as we could have chosen to write about local Greenlanders' (newcomers as well as locals with Inuit as ancestors') participation in tourism

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development and their use of land and natural resources and how it creates conflicts between other resource users in the area.

Another objective of the Declarations on Indigenous Peoples is to ensure involvement in decision-making processes regarding the use of land and natural resources. The Greenland Government's Hunting and Fishing Acts, the Land Use Act and the Mineral Resources Act prescribe the involvement of locals in decision-making processes. However, describing how legislation is put into practice is not the purpose of this report.

In addition, there are no statistics that specifically look at indigenous peoples in Nuuk. However, we have tried to include some relevant statistics that deal with locals in Nuuk.

Nuuk is the capital and largest city of Greenland and contains a third of Greenland's population and has doubled since 1977.

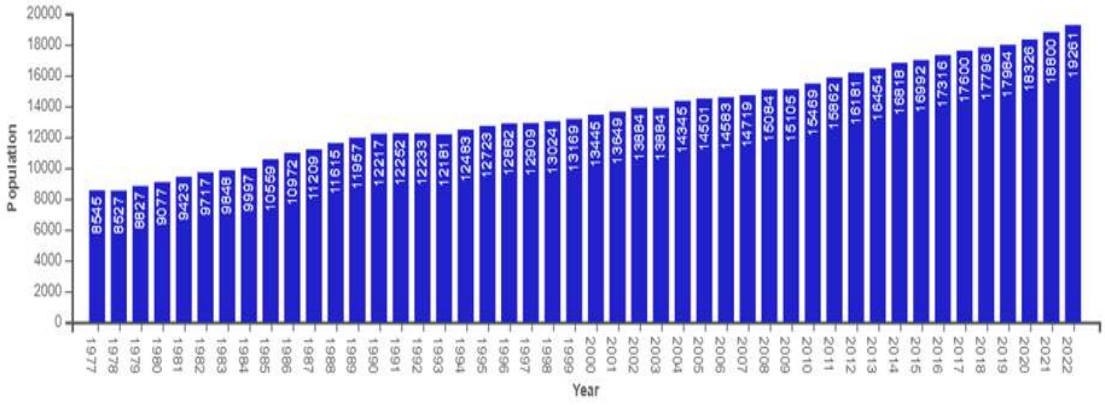

Figure 25. Population in Nuuk

Nuuk is Greenland's center of politic, economic, culture and education. Nuuk is the seat of the parliament and government and containing all of the important government buildings and institutions. All of Greenland's major political parties have their headquarters in Nuuk.

The public sector bodies are also the town's largest employer with high wages. Danes have continued to settle in the town. Today, Nuuk has the highest proportion of Danes of any town in Greenland. Half of Greenland's immigrants live in Nuuk, which also accounts for a quarter of the country's native population.

Nuuk has developed trade, business, shipping and other industries. It began as a small fishing settlement with a harbor, but as the economy developed rapidly during the 1970s but during 1980s, the fishing industry in the capital declined. The port is nevertheless still home to almost half of Greenland's fishing fleet. The local Royal Greenland processing plant absorbs landed seafood amounting to over DKK 50 million (US$7 million) per annum, mainly (80%) shrimp, but also cod, lumpfish and halibut. Reindeer and seal is also sold in Nuuk's local fish markets.

The catch statistics for fish and shellfish is predominantly for the offshore fishery, which does not affect the Nuuk region – except providing a great income to the town. The commercial spices are prawns, monkfish roe, halibut and cod are shown in the following tables.

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Table 12. Procurement of prawns distributed by district, 2018-2021

	Ton				1.000 kr.			
	2018	2019	2020*	2021*	2018	2019	2020*	2021*
I alt	**48.254**	**51.272**	**54.380**	**54.750**	**448.359**	**513.541**	**495.143**	**473.951**
Nanortalik	-	-	-	-	-	-	-	-
Qaqortoq	-	-	-	-	-	-	-	-
Narsaq	-	-	-	-	-	-	-	-
Paamiut	-	-	-	-	-	-	-	-
Nuuk	9.584	11.027	10.854	11.892	91.449	95.833	89.966	98.077
Maniitsoq	-	-	-	-	-	-	-	-
Sisimiut	14.619	16.479	15.682	18.720	118.241	160.499	142.992	164.941
Kangaatsiaq	-	-	-	-	-	-	-	-
Aasiaat	10.199	9.900	14.068	12.273	112.121	112.435	129.887	104.627
Qasigiannguit	-	-	-	-	-	-	-	-
Ilulissat	13.852	13.866	13.775	11.864	126.548	144.774	132.298	106.306
Qeqertarsuaq	-	-	-	-	-	-	-	-
Uummannaq	-	-	-	-	-	-	-	-
Upernavik	-	-	-	-	-	-	-	-
Qaanaaq	-	-	-	-	-	-	-	-
Tasiilaq	-	-	-	-	-	-	-	-
Ittoqqortoormiit	-	-	-	-	-	-	-	-
Udenfor inddeling[2]	-	-	-	-	-	-	-	-

[1] Pandalus Borealis.
[2] Indhandlingsskibe og indhandling uden stedoplysning.

Table 13. Procurement of monkfish roe distributed by district, 2018-2021

	Ton				1.000 kr.			
	2018	2019	2020*	2021*	2018	2019	2020*	2021*
I alt	**1.004**	**1.096**	**1.326**	**1.136**	**40.693**	**41.538**	**45.365**	**22.833**
Nanortalik	17	0	17	19	595	15	547	422
Qaqortoq	6	52	29	36	224	1.758	921	789
Narsaq	52	67	50	34	1.962	2.384	1.620	627
Paamiut	177	159	198	155	5.894	5.396	6.398	3.333
Nuuk	360	307	448	327	15.182	11.703	16.626	7.097
Maniitsoq	232	197	284	257	9.823	7.901	9.914	5.606
Sisimiut	18	13	39	34	565	459	1.145	734
Kangaatsiaq	12	12	12	13	539	480	362	194
Aasiaat	39	106	100	117	1.797	4.258	3.379	1.758
Qasigiannguit	30	40	25	28	1.383	1.650	739	390
Ilulissat	-	-	1	-	-	-	16	-
Qeqertarsuaq	61	140	123	116	2.730	5.523	3.698	1.881
Uummannaq	-	-	-	0	-	-	-	2
Upernavik	-	-	-	-	-	-	-	-
Qaanaaq	-	-	-	-	-	-	-	-
Tasiilaq	-	0	-	-	-	9	-	-
Ittoqqortoormiit	-	-	-	-	-	-	-	-

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Table 14. Procurement of halibut distributed by district, 2018-2021

	Ton				1.000 kr.			
	2018	2019	2020*	2021*	2018	2019	2020*	2021*
I alt	**32.007**	**35.638**	**30.589**	**32.592**	**594.243**	**673.481**	**578.493**	**584.913**
Nanortalik	83	50	83	33	1.803	1.130	1.733	622
Qaqortoq	32	17	27	27	759	419	599	463
Narsaq	253	78	131	270	6.325	2.003	3.019	5.076
Paamiut	296	1.031	306	763	6.649	17.064	4.561	9.648
Nuuk	1.118	835	857	898	28.619	21.761	18.976	15.027
Maniitsoq	1.789	2.639	1.716	629	23.980	40.139	22.953	7.130
Sisimiut	0	-	20	11	0	-	310	177
Kangaatsiaq	16	56	52	101	360	1.406	1.272	1.939
Aasiaat	1.499	1.517	441	1.391	25.211	25.573	7.711	19.913
Qasigiannguit	2.399	1.671	1.385	1.568	43.765	30.709	24.300	20.656
Ilulissat	7.518	8.493	7.249	8.828	156.686	191.781	154.689	166.332
Qeqertarsuaq	240	254	107	66	5.643	6.176	2.254	1.263
Uummannaq	8.678	9.598	9.537	9.372	161.862	168.030	173.713	185.581
Upernavik	6.806	6.697	7.501	8.204	110.039	116.442	140.614	144.324
Qaanaaq	252	221	175	184	3.720	3.376	2.679	3.016
Tasiilaq	274	330	308	247	4.981	5.995	5.848	3.746
Ittoqqortoormiit	-	-	-	-	-	-	-	-
Udenfor inddeling[1]	754	2.150	694	-	13.842	41.478	13.261	-

[1] Indhandlingsskibe og indhandling uden stedoplysning.

Table 15. Procurement of cod distributed by district, 2018-2021

	Ton				1.000 kr.			
	2018	2019	2020*	2021*	2018	2019	2020*	2021*
I alt	**27.595**	**24.159**	**20.186**	**19.696**	**159.123**	**168.549**	**118.668**	**96.184**
Nanortalik	1.830	2.793	1.454	3.775	12.255	26.628	11.481	19.865
Qaqortoq	1.760	1.615	1.302	1.939	13.510	10.014	7.347	10.235
Narsaq	342	986	1.255	357	2.306	6.977	7.181	1.666
Paamiut	853	447	435	194	5.567	2.783	2.560	938
Nuuk	7.410	8.521	5.394	3.083	48.304	65.883	32.460	13.434
Maniitsoq	8.136	5.021	6.589	5.119	38.690	29.150	37.808	26.257
Sisimiut	1.752	1.094	1.603	1.096	8.988	6.106	8.643	4.564
Kangaatsiaq	2.997	1.537	520	938	15.468	8.725	2.784	3.969
Aasiaat	367	85	203	96	1.927	456	969	454
Qasigiannguit	376	108	216	145	1.941	567	1.118	605
Ilulissat	1.304	1.107	481	446	7.694	6.564	2.532	1.838
Qeqertarsuaq	106	31	66	112	585	179	288	466
Uummannaq	311	667	443	295	1.636	3.722	2.255	1.266
Upernavik	-	-	0	44	-	-	1	182
Qaanaaq	-	-	-	-	-	-	-	-
Tasiilaq	51	147	223	286	244	795	1.232	1.148
Ittoqqortoormiit	-	-	-	-	-	-	-	-
Udenfor Inddeling[1]	1	-	3	1.771	7	-	9	9.297

[1] Indhandlingsskibe og indhandling uden stedoplysning.

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Table 16. Procurement of sealskin by city and settlement, 2018-2021[60]

	Stk.				1.000 kr.			
	2018	2019	2020*	2021*	2018	2019	2020*	2021*
I alt	**29.663**	**28.228**	**23.138**	**32.188**	**9.135**	**9.944**	**8.351**	**12.278**
	Byer							
Byer i alt	**10.116**	**11.155**	**10.218**	**16.974**	**3.432**	**4.151**	**3.863**	**6.744**
Nanortalik	499	344	273	389	165	132	108	153
Qaqortoq	1.258	790	803	1.531	483	311	320	620
Narsaq	1.617	1.974	1.567	2.387	597	779	582	971
Paamiut	1.238	1.827	1.155	2.953	442	724	460	1.200
Nuuk	13	-	-	2.093	20	-	-	851
Maniitsoq	1.661	966	1.348	1.937	588	380	536	786
Sisimiut	511	384	649	956	175	151	259	388
Kangaatsiaq	284	1.345	1.067	156	91	495	420	63
Aasiaat	562	513	806	2.073	187	186	320	839
Qasigiannguit	7	-	-	-	2	-	-	-
Ilulissat	2	-	-	-	1	-	-	-
Qeqertarsuaq	-	-	-	-	-	-	-	-
Uummannaq	79	686	276	-	24	225	104	-
Upernavik	998	1.164	1.079	595	269	370	356	221
Qaanaaq	5	-	-	55	1	-	-	17
Tasiilaq	1.275	1.026	917	1.514	371	354	311	532
Ittoqqortoormiit	63	136	278	335	16	44	87	104

Nuuk host the National Library of Greenland and have several educational institutions of higher learning. The University of Greenland, several vocational education institutions. Most courses are taught in Danish, although a few are in Kalaallisut as well. In connection to the educational institutions there are several dormitory buildings.

Table 17. Education level among citizens in Nuuk

				2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Nuuk	Lower secondary education	Women	16-74 years	2,879	2,854	2,856	2,859	2,837	2,790	2,729	2,700	2,693	2,675	2,702
		Men	16-74 years	3,555	3,547	3,535	3,570	3,637	3,694	3,614	3,581	3,614	3,609	3,666
	Upper secondary education	Women	16-74 years	426	492	540	565	589	604	604	637	615	645	664
		Men	16-74 years	350	383	411	452	457	465	509	538	538	572	580
	Vocational education and training	Women	16-74 years	876	913	944	975	999	1,045	1,113	1,105	1,118	1,104	1,152
		Men	16-74 years	1,590	1,643	1,663	1,659	1,677	1,713	1,752	1,809	1,810	1,861	1,934
	Short-cycle higher education	Women	16-74 years	219	230	238	247	251	271	289	295	313	326	346
		Men	16-74 years	311	313	329	317	305	320	329	339	371	384	403
	Bachelors programme	Women	16-74 years	72	72	80	98	105	105	114	127	129	145	150
		Men	16-74 years	64	71	68	76	73	82	88	80	85	95	100
	Professional bachelors programme	Women	16-74 years	720	752	768	796	784	791	822	859	875	933	940
		Men	16-74 years	354	357	353	362	366	370	383	398	395	419	456
	Masters programme	Women	16-74 years	283	308	304	339	358	377	408	437	459	490	513
		Men	16-74 years	378	393	393	403	405	429	424	432	424	434	442
	Phd. Programmes	Women	16-74 years	11	11	13	15	19	17	18	17	21	20	22
		Men	16-74 years	14	16	19	12	16	19	27	31	28	25	23

[60] https://stat.gl/dialog/main.asp?lang=da&version=202211&sc=FI&subthemecode=INDHANDLINGER&colcode=I

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The table above shows the education level among citizens in Nuuk, but without considering their origin.

Nuuk also hosts the National Hospital, which receives patients from the rest of the country in addition to citizens from Nuuk.

Katuaq is National cultural center used for concerts, films, art exhibitions, and conferences. Katuaq contains two auditoria, the larger seating 1,008 people and the smaller, 508. The complex also contains meeting facilities, administrative offices and a café.

The Nuuk Art Museum is the only private art and crafts museum in Greenland.The museum contains a notable collection of local paintings, watercolours, drawings, and graphics, some by Andy Warhol; and figures in soapstone, ivory, and wood, with many items collected by archaeologists.

Nuuk as Greenland's capital consists of a mix of traditional ways of life with fishermen and hunters, in the middle of a rapidly developing welfare city strongly influenced by Danish conditions that characterizes the citizens' way of life and identity

4. Discussion and conclusion

As mentioned in the introduction, this report shows how various the indigenous societies and cultures are in the Arctic, even when we focus exclusively on the countries that are included in the ArcticHubs project. In this mosaic is hard to compare one tile to the other: each one has to be primarily understood within its own context to face specific challenges and develop unique opportunities. This is not only true when we consider, on a macro level, Inuit and Sami, but also when we look at different Sami communities in Sweden, Finland and Norway, and when we consider different understandings of the indigenous term in Greenland. However, indigenous people share some common elements, first of all the fact that they are generally perceived as vulnerable minority groups, whose cultures, livelihoods and traditions are threatened by colonization, neo-colonial land exploitation, outmigration, language loss etc. We will therefore try to summarize similarities and differences according to the features that have proven to be crucial in our analysis.

Legal status and political autonomy

As discussed in the introduction, there are a few important international treaties to which indigenous people can appeal to try to enforce their right over land and resources or to protect their cultures and languages. However, the definition of “indigenous” is far from being straightforward and the treaties themselves do not provide a specific one, relying instead on different sets of criteria. The definition of indigenous, beside being contextual and potentially based on different elements (language, descendance…) is deeply political: as we saw, in the Greenlandic context the use of the term indigenous is highly contested, Greenlanders have strong and different opinion about it and it’s often used in the wider political debate about the relationship with Denmark, in relation to administrative and political independence and to process of cultural and linguistic decolonization. the “legal status” of indigenous people coincides, in this case, with the political status of a whole country, making the “indigenous issues” at least partially overlapping with the “national issues”. Sami case is different: in all the three countries considered here, Sami people have a special status granted in the country’s Constitution and some kind of political and administrative autonomy, enforced through a Parliament. They also have cultural institutions, educational programmes and language programmes to keep their traditions and languages alive. However, their general status is that of a minority group included in a nation with a different culture, language and tradition, where the state authority is, on one hand, legally acknowledging and financially supporting initiatives to allow indigenous people to preserve

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their cultures but, on the other, often implementing national policies that generate conflict with indigenous livelihoods, such as major mining, energy and infrastructure developments.

Language, traditional knowledge and cultural institution

Languages are a crucial element of indigenous cultures, since they allow for the transmission of the traditional knowledge, its preservation and innovation along generations. At the same time, indigenous languages are struggling to survive after long colonial dominations, where the dominant language was the only one taught in school, used in administration and work etc. Again, we can notice important differences between Greenlandic Inuit and Sami people: in the first case, even if Danish is still strongly dominant in politics, education and administration, the vast majority of people speak Greenlandic as their first language and the language seems to not be vulnerable or in danger of extinction. Quite the opposite, despite the official status granted to Sami languages in the areas with widespread indigenous population and their introduction in different educational programmes and institutions, Sami people in Finland, Norway and Sweden struggle to keep their languages alive. however, the situation is very different along the hubs and between different languages: indeed, there are languages with just a handful of native speakers who are close to extinctions, and other that thrive much better. Significant is the fact that many of the selected Sami hubs (Jokkmokk in Sweden, Inari in Finland and Kautokeino-Kvalsund in Norway) are indigenous capitals of their country and host schools, universities and cultural centres through which languages, traditional knowledges and livelihoods are taught, preserved and innovated. It's interesting to note how these institutions represent a solution to merge the need to enhance formal education for indigenous people and, at the same time, develop culturally relevant programs: traditional cultural elements are therefore "institutionalized", to be transmitted and thrive in a compromise with the dominant, western understanding of "education".

Population

Estimating the number of indigenous people is another challenge. Not only the lack of a universal definition makes precise count and comparison impossible, but no one of the considered countries include ethnicity in the census. Examples of different approaches that can be used to estimate the indigenous population have been already discussed in the introduction. However, again, we can underly a significant difference between Greenlandic Inuit and Sami: in the first case, even if the people born in Denmark from Greenlandic parents are excluded from the count and, vice versa, people from Danish families born in Greenland are counted as Greenlandic, the vast majority of people is of Inuit descendant and can speak Greenlandic. Sami communities are, on the other hand, often small, composed by few thousands or even hundreds of people, and many of them migrate to cities.

Indigenous livelihoods and conflicts

When it comes to economic and/or subsistence activities, we see that they include mostly hunting, whaling and fishing for Greenlandic Inuit and hunting, fishing and reindeer herding in the case of Sami people. In both cases there are people who are practicing hunting and fishing on a recreational level, combining a traditional activity with a job in the mainstream wage market, and people who are professional and full-time hunter, fishers and herders. It must be noted that, especially in the case of Sami people, there are many jobs that are not "traditional" per se, but are still directly related to the Sami communities: this is the case, for example, of administrative jobs in Sami institutions, jobs related to culture and teaching, cultural tourism and handicraft etc. On the other side, traditional livelihoods, for example reindeer herding, are today carried out in accordance with modern industrial practices: as we already mentioned in the introduction, the focus on meat production for example has modifies the structure of herds, and the conflict with predators has pushed many herders to adopt farming practices during winter.

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According to what we saw in the report, traditional livelihoods share two main features: first of all, they are the crucial material basis for a culture and identity to survive: traditional livelihoods shape social relations, cultural practices, traditional knowledge and the very language itself, and for this reason have to be preserved and supported. Second, they have a complex relation with mainstream market economy: on one hand, they are entangled and co-dependent (for example, reindeer and game meat is sold on the market, to restaurants etc), on the other they are threatened by the expansion of a different use of natural resources that is functional for the global economy and has almost no link at all with the local livelihoods themselves: this is not only the case of the already mentioned mining expansion, but also of conservation measures that restrict or ban some of the traditional activities such as whaling.

Furthermore, traditional livelihoods are still administrated through formal regulation, such as hunting and fishing licences and quota, herding district and registered companies, maximum number of reindeer allowed per area, ban or strong limitation in predators hunting etc. Not all the regulations are managed by indigenous authorities, and they can generate conflict with state authority when they are not consistent with indigenous knowledge: a better inclusion of it through participative policy design and implementation appears to be urgent.

At this regard, it's important to go through the main source of threat to indigenous livelihoods, and therefore, indigenous cultures and societies: the large-scale exploitation of the lands and resources upon which they rely by other (often globally driven) industrial sectors: mining, tourism, renewable energy production (hydroelectric and wind fields), transports and forestry. These sectors often coexist in the same area and make indigenous livelihoods exposed to multiple pressures. in addition, climate change is also negatively affecting natural resources and creating unpredictable and unsecure conditions. However, these sectors could offer potential benefits to local and indigenous communities and, if properly planned with meaningful inclusion of indigenous group, their impacts could be mitigated or at last properly compensated. The positive example of Sami cultural and educational institution could serve as a metaphor and practical case of merging of different ("indigenous" and "global") needs: this shows that, through participation, inclusion and support of indigenous autonomy and self-determination is possible to produce innovative and sustainable solutions.

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