

Issue #01  
—March 2017

# BUSINESS INDEX NORTH

— A periodic report with insight to business activity and opportunities in the Arctic

## Production

Focuses on renewable energy and growth in the BIN area

## Business

Highlights the BIN area's innovations, business activities and cooperation

## People

Gives overview of population structure, human capital and employment in the BIN area



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**Cover photo**

Windmills at Kjøllefjord, Finnmark  
Photo: Statkraft

**Design**

by north

# What is BIN?

Business Index North (BIN) is a project that contributes to sustainable development and value creation in the Arctic. The overall goal is to set up a recurring, knowledge-based, systematic information tool for stakeholders such as businesses, academics, governments and regional authorities, as well as media, in the Arctic states. The BIN project is based on an international partner network and coordinated by the High North Center for Business and Governance at Nord University Business School (Norway). Nordland County Council and The Norwegian Ministry of Foreign Affairs provide basic funding for the project.

This is the first “Business Index North” periodic analytical report that focuses on the BIN area (figure 1), including eight northern counties of Norway (Finnmark, Troms, Nordland), Sweden (Norrbotten and Västerbotten) and Finland (Lapland, Northern Ostrobothnia and Kainuu). For the second issue of the report, we would include Russian territories of High North. Our further plan is to gradually include the northern territories of the USA, Canada, Denmark (Greenland), and Iceland.

The present report shall contribute to the understanding of the role and place of the BIN area in the development in Nordic countries Norway, Finland, and Sweden. Furthermore, it gives a nuanced picture of the socio-economic development and business opportunities inside the BIN area. Businesses should be able to use it to get better knowledge about economic developments, investment opportunities and challenges in the Nordic Arctic. Local, regional and national authorities will be able to identify problems and regional development opportunities, and take decisions for political and regulatory support focused on the BIN area as a whole. For media stakeholders, the report will make it easier to describe the development in a reliable way.

Our definition of the BIN area correlates with the EU concept of a macro-region<sup>1</sup>. The BIN area runs across country borders has common characteristics and challenges. The BIN area can be viewed as a strategic layer across countries for future development and cooperation.



<sup>1</sup> an area including a territory from a number of different Member States or regions associated with one or more common features and challenges (EU definition)



# Executive summary

The overall goal of the project is to contribute to the economic, social and environmental sustainability of Arctic Communities through increased global awareness of business opportunities in the circumpolar Arctic and High North Economic Region. The BIN report provides comparable indicators and indices that reflect wider social processes and economic change in the BIN area<sup>1</sup>.

## Key findings:

- The BIN area population growth rate is only one third of the average for the Nordic countries<sup>2</sup>
- The BIN area's population is ageing, population aged 65+ grew by 23.4% while population aged 0-19 declined by 5.9% during 2006-2015, rural peripheral areas experienced shortage of female population
- Human capital in the BIN area measured as tertiary education attainment for 20-59 year olds lags 5 % behind the average of the Nordic countries, tertiary education attainment is growing in the age group 40-49 and 50-59 year olds
- Job creation speed in the BIN area is less than half of the average speed in the Nordic countries
- Employment in the BIN area is affected by the loss of jobs in mining, quarrying and manufacturing and jobs creation in the services
- The intensity of patenting activity in the BIN area is 2.5 times lower than the Nordic countries' average. However, three counties within the BIN area (Northern Ostrobothnia, Norrbotten and Västerbotten) demonstrated relatively high patenting activity.
- The BIN area is a substantial provider of renewable energy and represents 25 % of the hydropower production and almost 40 % of the wind power production in the Nordic countries
- The population of active enterprises in the form of limited liability companies grew by 27.4 % in the BIN area, while in the Nordic countries it grew by 33.4 % during 2008-2015. The number of active enterprises grew the most in the financial and insurance activities sectors, arts, entertainment and recreation and administrative and support service activities

- On average, the BIN area's production value of private sector grew by 32 % in the last 10 years, compared to 42 % in the studied Nordic countries as a whole
- There are many positive examples of innovative cross-border cooperation in the BIN area. The future potential lies in the development of east-west transport corridors, industries utilizing steel, industrial services, innovative SME cooperation and international energy cooperation.

## Recommendations:

- Addressing demographic challenges by encouraging growth in the young population, creating attractive conditions for females to move to the BIN area, redefining the role of the elderly
- Planning of educational systems that satisfies the demand for life-long learning and address the shortage of new students due to declining youth in the BIN area, create incentives to increase student mobility within the BIN area
- Learning from the BIN counties that have more favorable employment development, e.g. learning from the Swedish counties Norrbotten and Västerbotten about how they succeeded in increasing youth employment for 16-24-year olds during 2008–2014
- Stimulating cross-border cooperation on innovation in the BIN area. Potential fields of cooperation on innovation in the BIN area include medical or veterinary science and hygiene, IT, vehicle engineering and mechanics, handling and processing, construction engineering, and solutions to deal with human necessities (for example health sector innovations)
- Promoting the BIN area as an attractive place for establishing power intensive industries and for businesses using renewable energy
- Identify underlying reasons as to what makes some BIN counties more successful than others in increasing the population of active enterprises and creating more production value in the private sector
- Cooperation in the BIN area requires strengthened transportation infrastructure in the East-West direction and a further extension of cross-border cooperation in the SME sector and between universities and industry

# Preface

This report focuses under what conditions business and people live and operate in the Arctic region of Norway, Sweden and Finland. Bodies, authorities and supranational organizations such as OECD, World Bank and the EU apply their policies to areas independently of their national borders. However, borders are not always defined by geography, but often motivated by the economy and social conditions. The advantage of the Arctic area definition, or here the BIN area is its comparative use. Focus on the BIN area, its industries and people in this report are understood based on its place dependence. This report provides one set of unified indexes and statistics to quantify various economic activities, population, values of natural resources and innovations in the BIN area. This report highlights qualitative attributes of the BIN area such as conditions to operate a company, social opportunities to live for a prospering future, natural resources, attractiveness, and future business opportunities. As such the report contributes to the development of knowledge within this domain and may subsequently provide more accurate discussion on nuances of these proposed borders.

Norway, Sweden and Finland have their own strategies for the Arctic. However, while most of the strategies reflect defense strategies or environmental issues due to global warming few reports recognize the issue of conditions for companies and people to operate and live in this type of area. The BIN area place on the world arena is becoming more important because of its wealth of natural resources such as fisheries, forest, minerals, oil and gas and wilderness. In new global competition, local

products from the North become recognizable brands and find a direct commercial exit from the north. For instance, Swedish Polar Bread, Lofoten seafood, and Polar Quality – an exporter of salmon and trout from Northern Norway, Finnish Aromtech (Arctic Omega Technology) directly reflect inherent values of the Arctic area. Space centers emerge in the BIN area because of its advantage to offer complete darkness. A new industry to test cars in cold conditions offers secrecy in a peripheral place of Arjeplog in Sweden and Muonio in Finland. The BIN area has attracted server plants, such as Facebook in Luleå, by offering the promise of cold cooling water, renewable energy, and allocation of land. Furthermore, as tourism in the BIN area is growing and becoming more mature. High North not only promises snow but also cold and darkness for its visitors.

New initiatives from universities enable them to push new questions and exert influence on the regional and urban communities surrounding them. Policy makers located in the capitals need knowledge of how to stimulate the economy and living in the Arctic area. The focus on Arctic, instead of the mixed constellation of countries with no similarities, enables better learning. This report draws attention to implications for policy-makers and business. A beginning of measuring various activities may also not only stress new questions but also results in a more harmonized system of measures. We hope that this report places the BIN area on the global map by illustrating its challenges and opportunities through its people, innovations, businesses and natural resources.

<sup>1</sup> The first BIN report includes eight northern counties of Norway (Finnmark, Troms, Nordland), Sweden (Norrbotten and Västerbotten) and Finland (Lapland, Northern Ostrobothnia and Kainuu). This report includes seven Chapters focusing on People in the North, Human Capital, Employment, Innovations, Renewable Energy, Businesses and Cooperation.

<sup>2</sup> Norway, Sweden and Finland in total

## What is index?

Index numbers are a statistician's way of expressing the difference between two measurements by designating one number as the base, giving it the value 100 and then expressing the second number as a percentage of the first.

Indexes allow us to compare trends across different metrics, such as population, employment, the population of active enterprises over a period of time. We select year as the base period and given the value 100, e.g. year 2011=100. The change in the index is used to demonstrate the change in the variable of interest over a period of time. For example, the population of the city increased from 500 in 2011 to 900 in 2014, the population in 2014 was 180% of the population in 2011. The population index was 180 in 2014. Each index number in a series reflects the percentage change from the base period.

We use two levels of data analysis to ensure that, the data and interpretations are linked to the context:

- the BIN area indexes are compared to the total of Norway, Sweden and Finland
- the BIN area indexes are analyzed at the county level and compared to each individual country indexes

The indexes are constructed using data gathered from National Statistical Bureaus and other publically available sources. At the end of each Chapter implications derived from our analysis are presented for policy makers and businesses.

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# Introduction

The BIN project's objective is to contribute to sustainable development and value creation through increased global awareness of business opportunities in the Arctic. The first BIN report starts this work by analyzing eight northern counties of Norway (Finnmark, Troms, Nordland), Sweden (Norrbotten and Västerbotten) and Finland (Lapland, Northern Ostrobothnia and Kainuu) that in the text are referred to collectively as the BIN area or the BIN counties.

During the recent decade, the Arctic regions with their extremely rich yet difficult to get natural resources have attracted a lot of attention by national states, global businesses and international policy makers. Challenges and opportunities for sustainable socio-economic development in the Arctic were addressed in many comprehensive reports supported by international cooperation institutions. The Arctic Council, The Arctic Economic Council, The Nordic Council of Ministers, OECD as well as governments and organizations in the Arctic States. The latest reports include but are not limited to topics of human development (Arctic Human Development Reports), northern sparsely populated areas (OECD Territorial Reviews), and recommendations for an interconnected Arctic (Arctic Economic Council Broadband Report). Furthermore, Arctic reports examined socio-economic drivers of change in the Arctic (Arctic Monitoring and Assessment Programme), the economy of the North (ECONOR reports), sustainable business development in the Nordic Arctic (Nordregio, Nordic Centre for Spatial Development) and European High North business and investments (Arctic Business Forum Yearbooks). The aforementioned studies make a sound contribution by filling the information gaps about the socio-economic issues in the Arctic regions and providing recommendations for policy makers.

The BIN report adds value to the extant studies by focusing on opportunities for business development and cooperation. We address the BIN area as a whole including its people, skills, innovation, business activities and natural resources, including wilderness. We show that this area deserves focused political support and has the potential for investments and international cooperation. The BIN report is positioned as an analytical tool for decision makers interested in value creation in the northern regions - each chapter has implications for pol-

icy makers, investors and businesses with suggestions for concrete actions.

In our report, we recognize that cooperation opportunities for the BIN counties stem not only from similar challenges but also from their unique features. The Finnish BIN counties depend on pulp and paper manufacturing, minerals, tourism and the ICT sector. Lapland, Northern Ostrobothnia and Kainuu were affected by lower demand for paper and shrinking exports to Russia and reduced tourism inflows as result of EU sanctions. The Norwegian counties' livelihood (Finnmark, Troms, and Nordland) is shaped by the energy sector, fisheries, aquaculture and growing tourism. Lower oil and gas prices have had an impact on the Norwegian BIN counties. In Sweden, Norrbotten and Västerbotten host wood and steel manufacturing, minerals extraction and hydroelectricity production. The Swedish BIN counties have capitalized on their renewable energy by attracting data centers. The BIN counties with their sparsely populated areas, rich wilderness assets, natural resources, and remoteness from metropolitan areas can benefit from learning from each other and joining their forces strategically to uncover their business and human capital potential.

The first BIN report comprises seven Chapters: Population in the North, Human Capital in the North, Employment in the North, Innovations, Renewable Energy in the North, Business in the North and Highlights of Cross-Border Cooperation in the North. The period of investigation is 2006-2015 for most of the chapters.

In the Population chapter, we investigate demographic trends in the BIN area during 2008-2015. The analysis includes population index, gender analysis, and population analysis by age groups. We conduct county and municipality level analysis that adds more value to the interpretation of the results.

In the chapter about Human Capital in the North, we operationalize human capital in the BIN area through tertiary educational attainment during 2008-2014. We measure the proportion of the population in the BIN area that has achieved short or long university degrees. Gender and county level analysis provides a lens through which to evaluate the concentration of human capital on a county level.

In the Employment chapter, we provide a historical overview of employment development in the BIN area during 2008-2014. We analyze the trends of employment across different industries in the BIN area in total as well as on a county level. A gender dimension analysis allows evaluating the employment situation for both males and females. Analysis by age groups (16-24, 25-54, 55+ year-olds) is used to identify vulnerable population groups in the BIN area.

The Innovations chapter uses patenting activity to measure the innovative capacity of companies operating in the BIN area. Patent applications submitted to the European Patent Office (EPO) and national industrial property offices (patent offices) in Norway, Sweden, and Finland are analyzed. We consider patent applications statistics over a long term from the early 1990's to 2014-15, look into the ownership structure of the patents, and trace their technical specifications.

The chapter about Renewable Energy in the North focuses on renewable power production in the BIN area. We analyze renewable power generation, transmission structure and market conditions for renewable energy.

The Business chapter addresses issues of doing business in the BIN area. The BIN area is placed within the World Bank's ranking on ease of doing business. An Active Enterprises Index measuring development in the total number of active enterprises (limited liability companies) is calculated for the BIN area and its counties. Additionally, we estimate production value of services and goods in the private sector for the period 2005-2015.

The chapter Highlights of Cross-Border Cooperation in the North provides some important examples of cross-border cooperation within Barents Euro-Arctic. We collect data from publicly available sources and through interviews with the experts. The examples of cooperation include business, international institutions, media, and the university sector in the BIN area.

In the end of each chapter, we present thoughts on future research, implications for policymakers and businesses. The BIN report provides clear, concise analysis integrated with the High North context. This report communicates the past and the potential of the BIN area. This report relies on comparable data, scientific approach and improved readability for every stakeholder in the North. We encourage stakeholders to contribute with suggestions and topics for future reports.



Concert at Keiservarden in Bodø by pianist Leif Ove Andsnes. August 2006.  
Photo: Bjørn Erik Olsen / nordnorge.com / Bodø



## Population in the North

This chapter focuses on the population development trends in the BIN area, including population distribution, gender and age group analysis at the county and municipal level. In 2015, the BIN area's population equaled 1 661 341 people that accounted for 10 % of the total population of Finland, Norway, and Sweden. The population in the BIN area has grown by 2.3 % from 2006-2015. This report provides only an analysis of the trends in population development, without accounting for trends in births, deaths and migration inflows and outflows that will be the topic of the next BIN report on population.

The results suggest a continuing trend of urbanization of the BIN area, with population growth concentrated in regional urban areas. These regional urban areas are located in coastal areas that benefit from good transport infrastructure, while transport infrastructure in rural areas remains underdeveloped. Gender analysis shows high male-to-female ratios in all BIN counties, while a municipality level analysis reveals that the proportion of females is higher in large cities. This follows an international trend in which primarily prime-aged females (25-54) abandon rural areas for opportunities in cities (De la Roca and Puga, 2017<sup>1</sup>). Age group analysis shows declining population in the age group 0-19, moderate growth in the age group 20-39 and a considerable increase in population for the age group 65+. This chapter provides insights into structural changes in age groups in the BIN area. The changes in population in the BIN area create challenges and opportunities. Policy implications include redefining the role of the elderly population, employment policies, conditions for establishing new businesses, public finances for social services and health care. The decline in the younger population in the BIN area has long-term implications for labor and education markets.

### Population development

The BIN area is experiencing an ageing of its population, where the proportions of adults and elderly increase, while the proportions of children and adolescents decrease. This process results in a rise in the median age of the population. The median age for Norway, Finland, and Sweden increased from 40.1 years in 2006 to 40.9 years in 2015. In the BIN area, the median age increased even more from 40.3 in 2006 to 41.8 years in 2015. This means that half of the BIN area's population was older than 41.8 years, while the other half was younger. The age dependency ratio demonstrates the economically dependent part (net consumers) of the population to the productive part (net producers). In 2015, the dependency ratio equaled 58.8 years in the BIN area, while the total of Norway, Finland, and Swe-

den equaled 57.1 years. The rise in the dependency ratio indicates growing pressures on social security and public health systems in the BIN area.

### County level development

The population distribution across counties in the BIN area is not uniform. The county of Northern Ostrobothnia (Finland) accounted for 24 % of all the population in the BIN area in 2015. The second largest counties analyzed in Sweden were Västerbotten and Norrbotten, where 16 % and 15 % of the population resided. In Norway, the county of Nordland represented 15% of total BIN population. The smaller counties of Lapland (Finland) and Troms (Norway) each accounted for 11% and 10% of total the BIN population respectively. The smallest counties analysis analyzed, Finnmark (Norway) and Kainuu (Finland), each served as home to 5% of the total BIN population. On a county level, the population development was lower in all the BIN counties compared with the corresponding country averages, with the exception of Northern Ostrobothnia (Finland), where population growth (5.9 %) was higher than the country average (4.0 %) during 2006-2016. The Finnish counties Lapland and Kainuu experienced a population decrease of 2.2 % and 6.7 %, while their Norwegian counterparts Finnmark (4.3 %) and Troms (6.6 %) saw continued population growth. Diverse population development trends in the BIN counties reflect the processes of urbanization and different government policies supporting the High North across Norway, Finland, and Sweden.

### Municipality level development

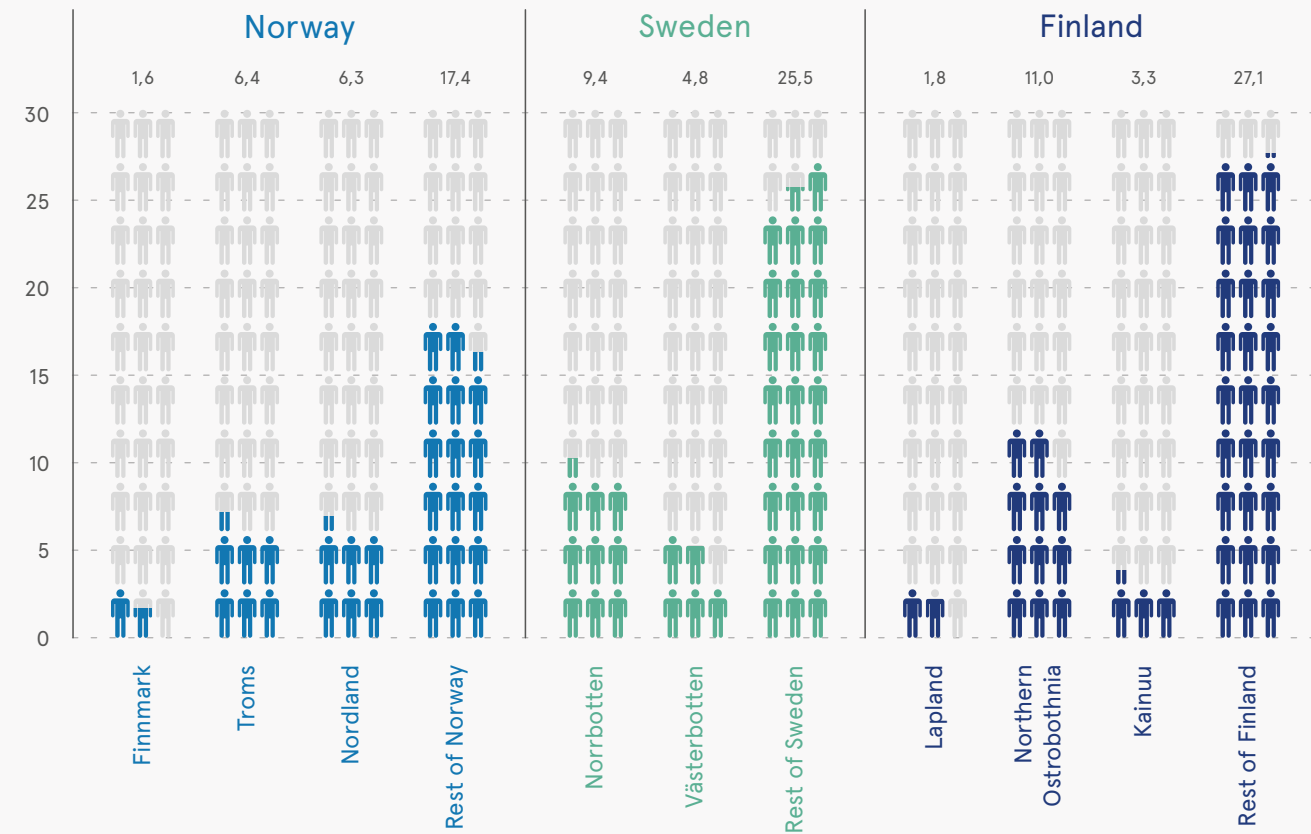
Municipality level analysis for the years 2006-2015 shows that only 32 % out of 175 municipalities saw population growth, whereas in the remaining 68 % there was a negative or zero growth in population. More remote municipalities had a low proportion of females in their population, while a higher number of females lived in municipalities with proximity to the regional urban centers.

<sup>1</sup> De la Roca, J., & Puga, D. (2017). Learning by Working in Big Cities. *The Review of Economic Studies*, 84(1), 106-142.

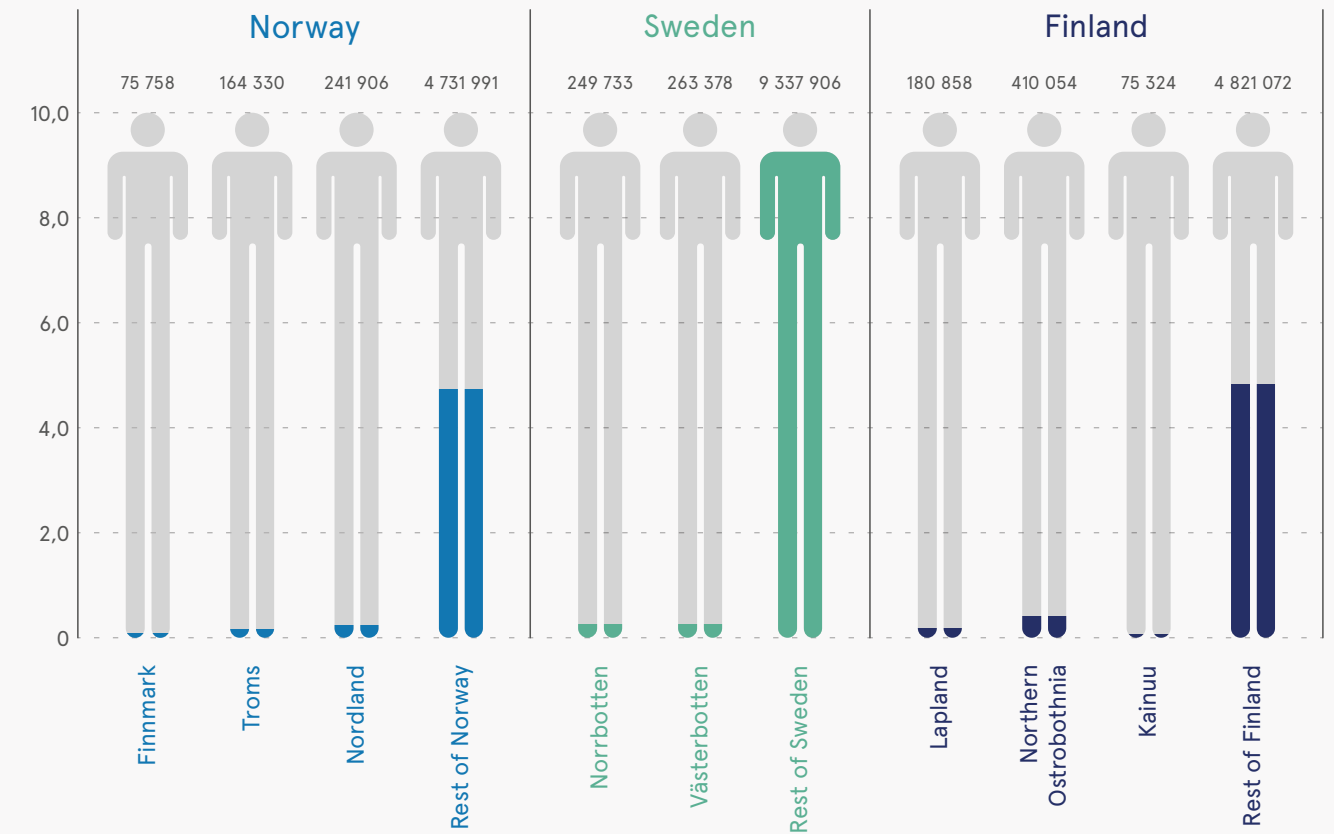


### Density of population in the BIN area, 2015

Number of citizens per 1 km<sup>2</sup>

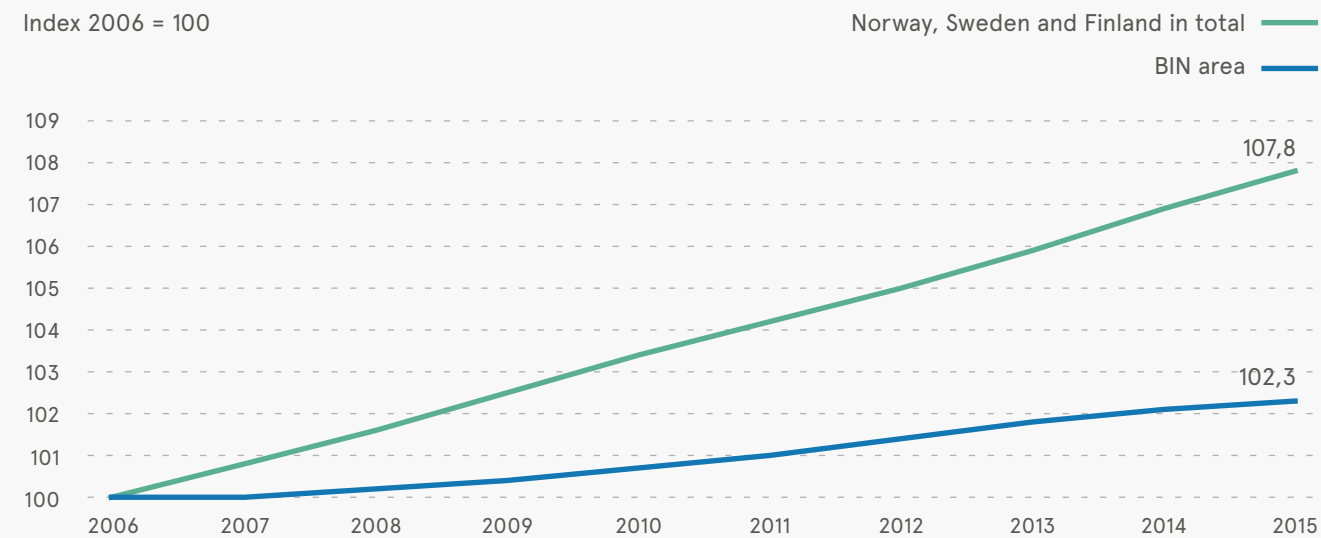


### Population in the north



### Population development from 2006 to 2015

Index 2006 = 100



### BIN area population development from 2006 to 2015 index=2006

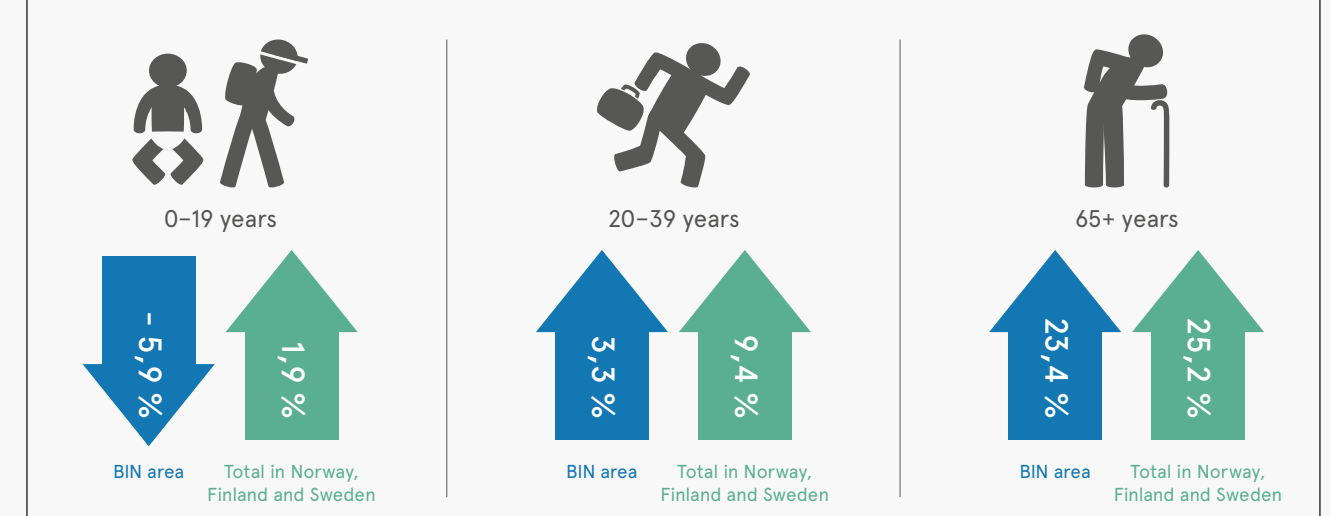


Figure 1 – Population development, 2006–2015, index 2006 = 100

Population in the BIN area grew with a surplus of 2.3 % from 2006 to 2015 (see Figure 1). The growth rate in the BIN area is, however, much lower than the average population growth of 7.8% in Finland, Norway, and Sweden over the years 2006–2015. The underlying reasons for that can be attributed to more attractive living conditions, employment and study opportunities in the southern metropolitan regions of Norway, Finland, and Sweden.

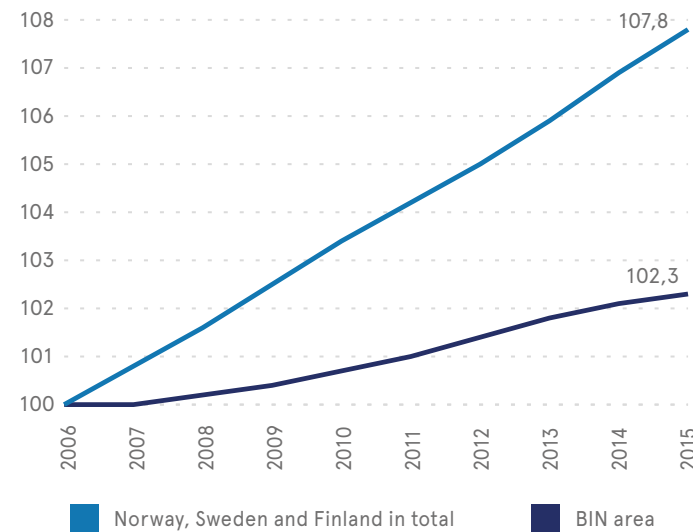


Figure 2 – Population development at the BIN county level, 2006–2015, %

The population development within BIN counties in Finland, Norway, and Sweden is not uniform (see Figure 2). In Finland, growth in the BIN area is maintained by the attractive Northern Ostrobothnia county, with its population growth reaching 5.9 % during 2006–2015. The counties with a diminishing population in Finland are Kainuu (-6.7 %) and Lapland (-2.2 %). The reasons for this are many, but the most obvious ones are the continuous processes of urbanization in Finland.

In Norway, the population of Troms county grew by 6.6 %, followed by Finnmark (4.3 %) and Nordland (2.7 %). The reasons for a surplus in population growth can be attributed to the migration flows and low unemployment rates in Norway. In Sweden, Västerbotten maintained a population growth of 2.3 %, in comparison to Norrbotten’s shrinking population (-0.9 %). Overall, the average growth of the Swedish counties in the BIN area is considerably lower than Sweden’s total population growth of 8.1 %.

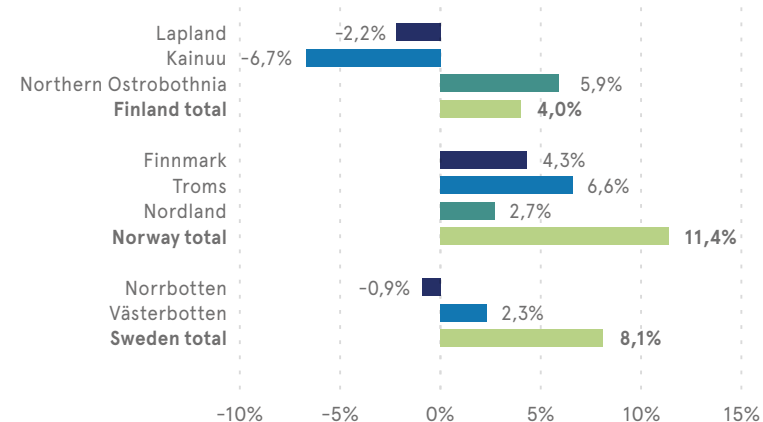


Table 1 – Municipality level development, 2006–2015

According to the OECD classification, regional urban areas of BIN area fall into the category of small urban areas with a population of between 50,000 and 200,000 inhabitants. The growth in BIN area is concentrated in the largest cities and their urban areas.

Table 1 demonstrates that 56 municipalities (32 %) experienced growth, whereas 68 % of municipalities had negative or zero growth in population during 2006–2015. Growth is concentrated in small urban areas and their surrounding municipalities.

Country	Number of municipalities	Number of growing municipalities
<b>Finland</b>	<b>59</b>	<b>12</b>
Kainuu	8	0
Lapland	21	3
Northern Ostrobothnia	30	9
<b>Norway</b>	<b>87</b>	<b>39</b>
Nordland	44	20
Finnmark	19	10
Troms	24	9
<b>Sweden</b>	<b>29</b>	<b>5</b>
Norrbotten	14	2
Västerbotten	15	3
<b>Grand total</b>	<b>175</b>	<b>56</b>

Table 2 – Positive and negative population growth in municipalities, 2006–2015, %

The population growth in municipalities varied greatly from 2006 to 2015; growth higher than 10 % or at a rate larger than 1 % annually is observed in university cities in Norway and Finland (see Table 2). Another explanation for the growth in large cities is the consolidation of municipalities around them and smaller municipalities joining bigger ones. Growth in the range of 5–10% or an annual growth rate higher than 0.5% is observed in a total of 14 Finnish and Norwegian municipalities, while in Sweden the municipality of Umeå was the only one that saw population growth in that range. Growth in the population in the range 0–5 % (annual growth rate larger than zero) is observed in 28 Norwegian municipalities, in two Finnish and in four Swedish ones. The population declined more than 10 % in 24 Finnish municipalities, in four Norwegian and five Swedish ones.

Country	Growth more than 10%	Growth 5–10%	Growth 0–5%	Negative growth more than 10%
<b>Finland</b>				
Kainuu				Hyrnsalmi, Kuhmo, Paltamo, Puolanka, Ristijärvi, Suomussalmi
Lapland		Kittilä, Rovaniemi	Kolari	Kemijärvi, Pelkosenniemi, Pello, Posio, Ranua, Salla, Savukoski, Tervola, Ylitornio
Northern Ostrobothnia	Kempele, Oulu, Tyrnävä, Ylivieska	Ii, Lumijoki, Muhos	Kalajoki	Kärsämäki, Merijärvi, Pudasjärvi, Pyhäjärvi, Pyhäntä, Siikalatva, Utajärvi, Vaala
<b>Norway</b>				
Finnmark	Hammerfest, Alta	Gamvik, Unjárga Nesseby, Sør-Varanger	Vadsø, Hasvik, Nordkapp, Båtsfjord	Loppa
Nordland	Bodø	Brønnøy, Træna, Sortland	Alstahaug, Fauske, Hamarøy, Herøy, Leirfjord, Narvik, Nesna, Rana, Saltdal, Vevelstad, Evenes, Værøy, Vestvågøy, Vågan, Hadsel, Øksnes	Bindal
Troms	Tromsø	Skånland, Lenvik	Harstad, Loabák Lavangen, Bardu, Målselv, Sørreisa, Balsfjord, Nordreisa	Ibestad, Lyngen
<b>Sweden</b>				
Norrbotten			Luleå, Piteå	Överkalix, Övertorneå
Västerbotten		Umeå	Skellefteå, Vännäs	Dorotea, Sorsele, Åsele



Figure 3 – Population development by gender, 2006-2015, index 2006=100

An analysis of population development by gender for the years 2006-2015 shows that the BIN area is male dominated, but gender distribution is consistent with the indices of countries averaging a total of 48 % female and 52 % male (see Figure 3). Historically, the high male-to-female ratio is driven by the labor market structure of the High North territories.

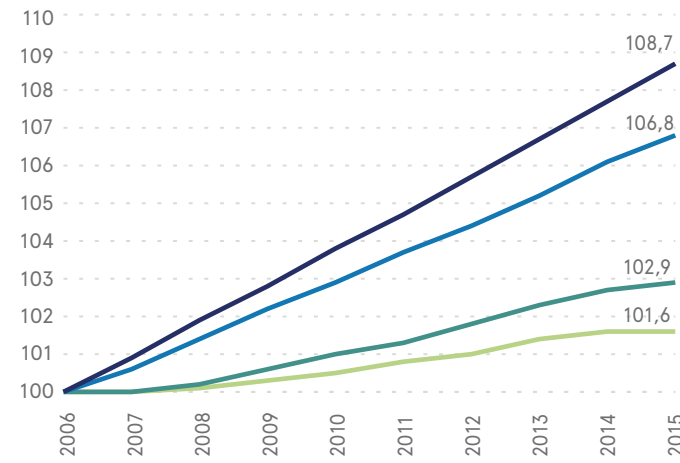
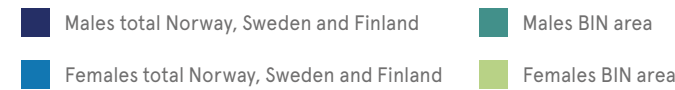


Figure 4 – Male population development at the BIN county level, 2006-2015, %

In Finland, the male population decreased in the Lapland (2.2 %) and Kainuu (6.5 %) counties, where the population is diminishing (see Figure 4). In Norway, the male population increased by 3.9 % in Nordland, 5.5 % in Finnmark and 7.6 % in Troms, but still remained below country's average of 12.9 %. Similarly, in Sweden, the male population development in the counties of Västerbotten, with an increase of 3.1 %, and in Norrbotten with a decrease of 0.2 %, were considerably lower than the country's corresponding number, with a total increase of 9.0 %.

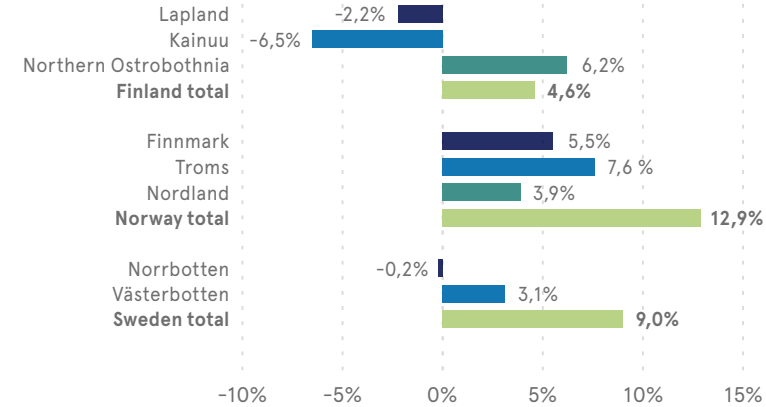


Figure 5 – Female population development at the BIN county level, 2006-2015, %

The analysis of female population development on a county level shows that Finnish counties of Lapland and Kainuu lost 2.2 % and 6.9 % of their female population respectively during 2006-2015. The county of Northern Ostrobothnia has a net gain in female population, with a growth of 5.5 % in Northern Ostrobothnia compared to 3.4 % in Finland as a whole. In Norway, all the BIN counties saw a growth in their female population; however, numbers were below the country average of 9.9 %. In the county of Troms, the female population increased by 5.6 %, followed by Finnmark and Nordland with an increase of 3.0 % and 1.6 % correspondingly. In Sweden, the county of Norrbotten lost 1.4 % of its female population and the county of Västerbotten had a small increase of 1 %, which is small compared with a total Swedish increase in the female population of 6.9 %. The increase in female population in Northern Ostrobothnia and Troms can be attributed to favorable living conditions, work and education opportunities offered by these BIN counties.

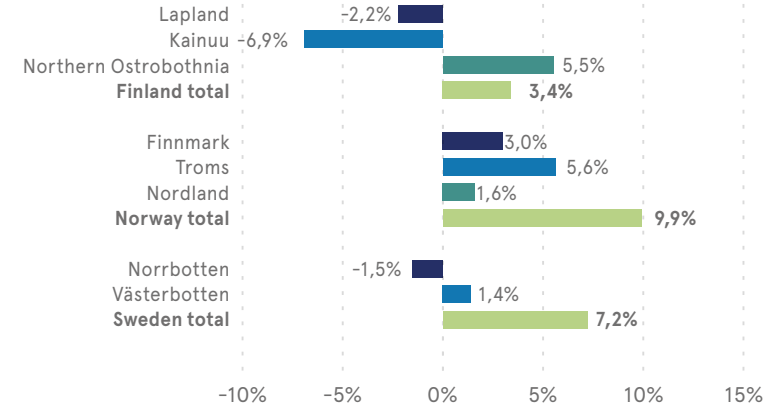


Table 3 – Proportion of female population at the BIN municipality level, 2015

At the municipal level of analysis, the proportion of females is calculated based on the male-to-female distribution of the BIN municipalities. The female population proportion is high in urban areas and low in rural areas. The proportion of females was less than 48 % in 27 municipalities out of 175 in 2006. By 2015, the number of municipalities with a female population lower than 48 % had increased to 53. The northernmost remote municipalities had a female proportion as low as 43.6 % in Gamvik and 44.6 % in Loppa (Norway), and 44.9 % in Savukoski and 44.8 % in Utsjoki (Finland) in 2015. The relatively high number of female-dominated municipalities in the county of Nordland can be attributed to attractive job opportunities for females in the tourism sector. In other cases, the proportion of females is higher than 50 % in urban centers with universities, e.g. Oulu, Rovaniemi.

Country	Female, % >50%	Female, % <48%	Female, % <45%
<b>Finland</b>			
Kainuu	2	3	-
Lapland	2	7	2
Northern Ostrobothnia	3	10	-
<b>Norway</b>			
Finnmark	-	9	2
Nordland	4	7	-
Troms	-	7	-
<b>Sweden</b>			
Norrbotten	-	4	-
Västerbotten	-	2	-
<b>Grand total</b>	<b>11</b>	<b>49</b>	<b>4</b>

Figure 6 – Median age, years

The median age provides means for analyzing the population structure. The median age is the age that divides a population into two numerically equal groups; that is, half the people are younger than this age and half are older. Figure 6. shows that the median age increased in Norway, Sweden, and Finland as a whole, from 40.1 years in 2006 to 40.9 years in 2015. In the BIN area, the increase is steeper from 40.3 years in 2006 to 41.8 years in 2015. Therefore, the ageing of the population is more pronounced in the BIN area, comparing 0.8 years increase in Norway, Sweden, and Finland to 1.5 years in the BIN area.

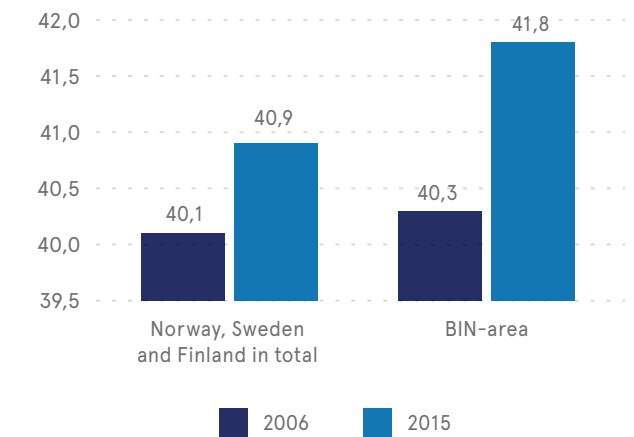
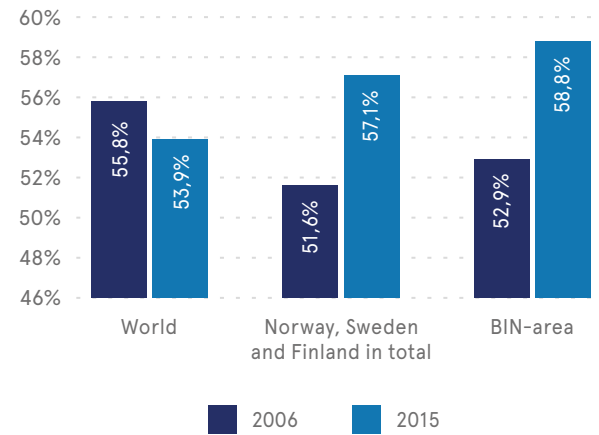


Figure 7 – Total age dependency, %

Total age dependency is used for comparing the economically dependent part (net consumers) of the population to the productive part (net producers). The total age dependency ratio relates the number of children (0-14 years old) and older persons (65 years or over) to the working-age population (15-64 years old). Data are shown as the proportion of dependents per 100 working-age population. Figure 7 demonstrates the trend in total age dependency for the years 2006 to 2015. The world dependency ratio decreased from 55.8 % in 2006 to 53.9 % in 2015. The total age dependency ratio in Norway, Sweden, and Finland as a whole increased from 51.6 % to 57.1 %. In the BIN area, the increase from 52.9 % to 58.8 % resulted in a higher total dependency ratio, 1.8 % higher than the ratio in Norway, Sweden, and Finland as a whole. In the BIN area, the high total dependency ratio indicates pressure on the economy and the active population in order to sustain the level of public services to young and elderly people.



Source of world statistics: World Bank

Figure 8 – Population development in age group 0-19 years, 2006-2015, index 2006=100

Measured as index, population in the age class 0-19 in the BIN area decreased by 5.9 % (see Figure 8), while for Norway, Sweden and Finland as a whole it grew by 1.9 % in the 2006-2015 period. The reasons for decline in age class 0-19 are, amongst others, low fertility rates in the reproductive age group 15-45, increased age of first-time mothers and out-migration of the 15-45 age group in order to obtain education and work.

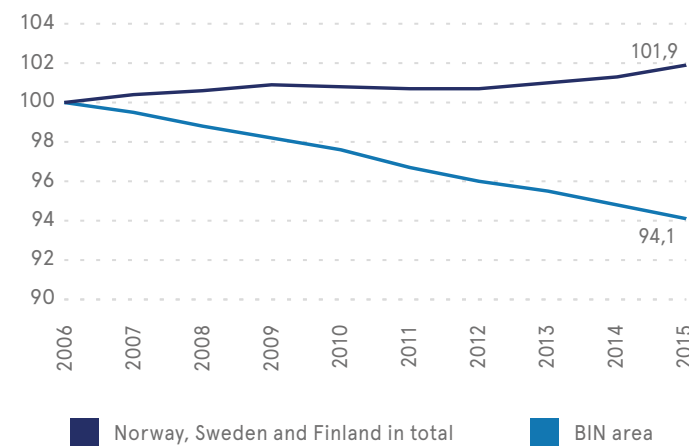


Figure 9 – Population development in age group 20-39 years, 2006-2015, index 2006=100

Measured as index, population in the age class 20-39 in the BIN area increased by 3.3 % (see Figure 9), while for Norway, Sweden and Finland as a whole it grew by 9.4 %. Slow growth in the active working population in the BIN area is due to out-migration of this class to southern areas that hold higher employability opportunities.

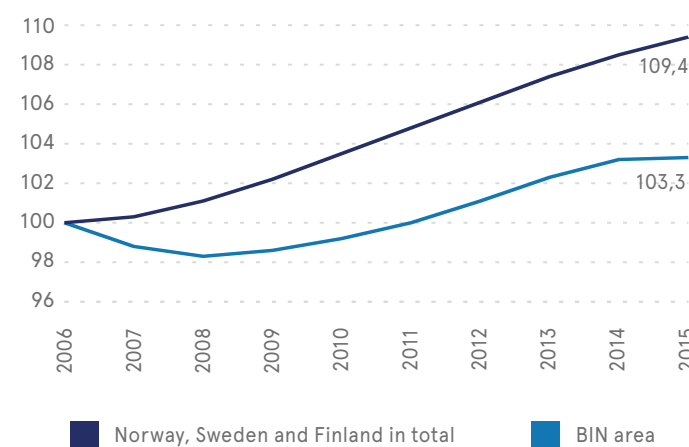


Figure 10 – Population development in age group 65+ years, 2006-2015, index 2006=100

Population in the age class 65+ in the BIN area grew by 23.4 % (see Figure 10), while for Norway, Sweden and Finland as a whole it grew by 25.2 %. This reflects a long-term pattern of greying population in Europe and longer life expectancy for this age class.

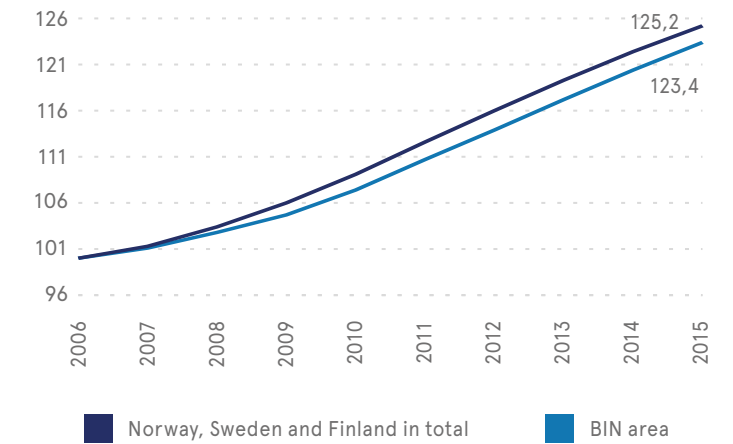
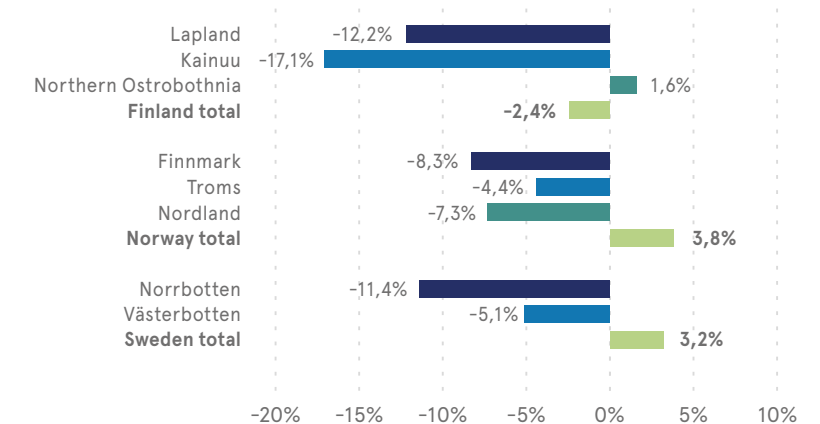


Figure 11 – Population development in age group 0-19 years at BIN county level, 2006-2015, %

On a county level, the trend in the age class 0-19 is negative in all counties of the BIN area (see Figure 11), e.g. Kainuu -17.1 %, Norrbotten -11.4 %. In Finnmark, Troms, and Nordland the number of young people in the age group 0-19 decreased considerably (8.3 %, 4.4 % and 7.3 % respectively). In Sweden, the counties of Norrbotten and Västerbotten observed the same trend, declining by 11.4 % and 5.1 % respectively. Out of all the BIN counties, it was only in Northern Ostrobothnia that the age group 0-19 increased, by 1.6 % during 2006-2015. The increase in the young population in Northern Ostrobothnia could be attributed to better education and work opportunities as well as a higher fertility rate, which is 2.05 children per woman in Northern Ostrobothnia<sup>2</sup>.



<sup>2</sup> Fertility rates in 2014 Finland (1.71), Norway (1.75), and Sweden (1.88). Source: Eurostat.



Figure 12 — Population development in age group 20-39 years at the BIN county level, 2006-2015, %

The increase of the age group 20-39 population in the BIN counties is much lower than the general average in Finland, Norway, and Sweden. An analysis of the population development in the 20-39 age group on a county level reveals (see Figure 12) that in Finland, the Lapland (2.3 %) and Northern Ostrobothnia (4.4 %) counties are the net gainers in that age group, while Kainuu represents a net loser with its 5.9 % decline in the age group 20-39. In Norway, Troms (6.3 %) proves to be a net gainer in the age group 20-39 population, while Finnmark (0.9 %) and Nordland (2.0 %) saw a very moderate increase in the age group 20-39 population. In Sweden, both Norrbotten and Västerbotten counties remain in the positive dynamics of the population development for the age group 20-39, but their increase of 3.2 % and 4.6 % respectively are much lower than the country's total average (10.5 %).

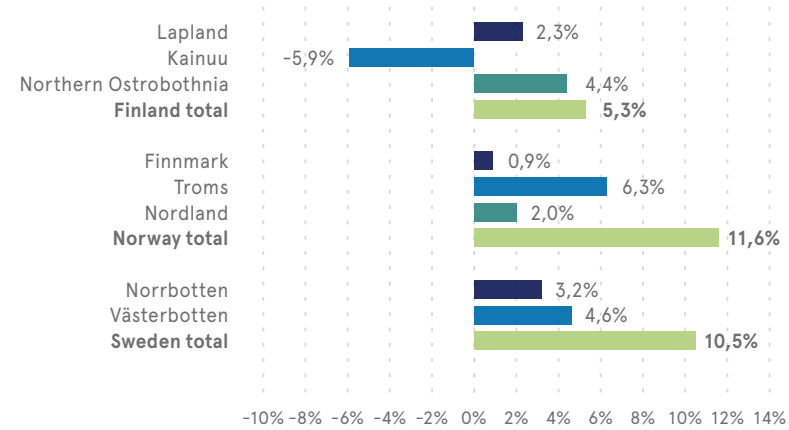
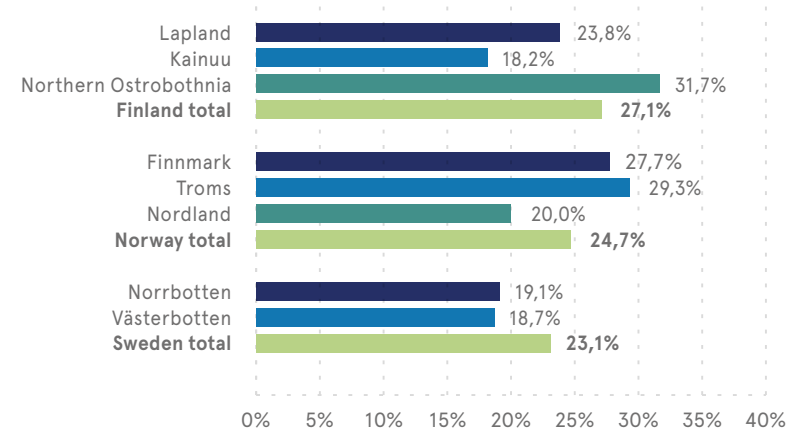


Figure 13 — Population development in age group 65+ years at BIN county level, 2006-2015, %

Figure 13 shows the development in the older population group 65+. Positive development in the group 65+ indicates a population growing older. In Finland, Lapland (23.8 %) and Kainuu (18.2 %) demonstrated smaller growth than Finland's national total of 27.1 %. In Northern Ostrobothnia, the growth of 31.7 % for age group 65+ was above the country's 27.1 % total.

In Norway, the counties of Finnmark and Troms saw a growth in the age group 65+ of 27.7 % and 29.3 % respectively, which is above the country's total average of 24.7 %, while Nordland had lower growth with its 20.0 %. In Sweden, both Norrbotten (19.1 %) and Västerbotten (18.7 %) counties had growth for the age group 65+ below the country's total average of 23.1 %. The differences in growth for the population group 65+ reflect the differences in attractiveness of BIN counties for elderly people in terms of services provided



## Implications

The analysis of trends in population in the BIN area has several implications for both policymakers and the business sector. Therefore, two sets of recommendations are developed based on the Chapter "Population in the North" findings.

For policy-makers:

- Redefining the role of the rapidly growing elderly population as active consumers and participants in the economic growth in the BIN area
- High dependency ratios in the BIN area affect financial planning of health care services and pension systems
- Designing social and health care services to accommodate the demands of the BIN area with a larger proportion of elderly population than the national average of Norway, Sweden, and Finland
- Reviving rural areas with a low proportion of females by community planning that offers an attractive combination of leisure, education and work opportunities<sup>3</sup>
- Assessing the impact of a declining young population aged 0-19 on the educational systems and education budgets
- Addressing the decline in young population aged 0-19 in the BIN area by developing policies and community planning for attracting young families to the BIN area
- Creating platforms for stakeholder engagement in order to develop the BIN area as a whole

For business:

- Business opportunities for companies supplying goods and services to the elderly population aged 65+
- Business opportunities in the arts, entertainment and recreation sector<sup>4</sup> to accommodate the needs of the elderly population
- Development of health technology in senior care and preventive health care for elderly
- Development of digital health technology, e.g. wearable health monitors, digital hospitals
- Business opportunities for companies specializing in urban and community planning in order to develop a socially and environmentally sustainable BIN area

<sup>3</sup> see report by Norden (2016). Gender, Education and Population Flows Summary report on knowledge, cross-Nordic experiences and examples from practice

<sup>4</sup> The Arts, Entertainment, and Recreation sector includes a wide range of establishments that operate facilities or provide services to meet varied cultural, entertainment, and recreational interests of their patrons (definition by US Department of Labor)

# Human Capital in the North

This chapter focuses on human capital measured as educational attainment in the BIN area. Human capital is productive wealth embodied in labor, skills and knowledge<sup>1</sup>. Human capital theory<sup>2</sup> views education as an “investment” which yields returns in due course to the individual in terms of pay and to the state in terms of employment and economic growth. More importantly, investments in human capital are not only limited by economic returns, as the true goal of education is the activation and realization of the creative potential of a person. We use the attainment of tertiary education to measure the stock of human capital, i.e. the skills available in the population and the labor force.

Educational attainment refers to the highest level of education completed by a person, shown as a percentage of all persons in that age group. In this report, we study the educational attainment of tertiary education. Universities and other higher education institutions provide tertiary education. For comparability reasons of education systems across countries, educational attainment in tertiary education is analysed combining both short and long tertiary education. It includes short (less than three years) degrees and long (four years or more) degrees, including Bachelor’s, Master’s and Doctoral level programmes. Collectively short and long tertiary education represents both theoretically and practically oriented degrees. Incentives to earn a tertiary degree include higher salaries and better employment prospects.<sup>3</sup> Knowledge production and transfer have direct impacts on the livelihood and prosperity of the BIN area. An analysis of tertiary education attainment provides estimates of the human capital and knowledge base in the BIN area. The analysis is conducted in the age group 20-59 and within its sub-age groups.

Tertiary education has pronounced impacts on the individual level by improving career opportunities and quality of life, while on the societal level tertiary education fosters innovation, increases economic activities and growth, and contributes to the wellbeing of citizens (Eurostat<sup>4</sup>). Tertiary education defines adolescents in transition reaching adulthood that traditionally involves leaving parents, forming a long-term relationship, becoming a parent and finding a long term job<sup>5</sup>.

Tertiary education, short and long, in age group 20-59 is compared from 2008 to 2014 in all countries across the BIN area and their respective counties. The indicator is defined as the percentage of the population aged 20-59 who have successfully completed tertiary studies (e.g. university, higher technical institution, etc.). Finland, Norway, and Sweden have comparably high expenditures on

education as a percentage of GDP<sup>6</sup>, however, analysis at the BIN level reveals cross-country and cross-county differences. On an individual level, investing in tertiary education pays off as higher net financial gains during one’s career. On the public level, countries benefit from having a higher percentage of individuals with tertiary education by collecting higher tax revenues once tertiary education graduates join the labor market. In this report, the proportion of employees with university degrees in different educational fields is analyzed in the BIN area.

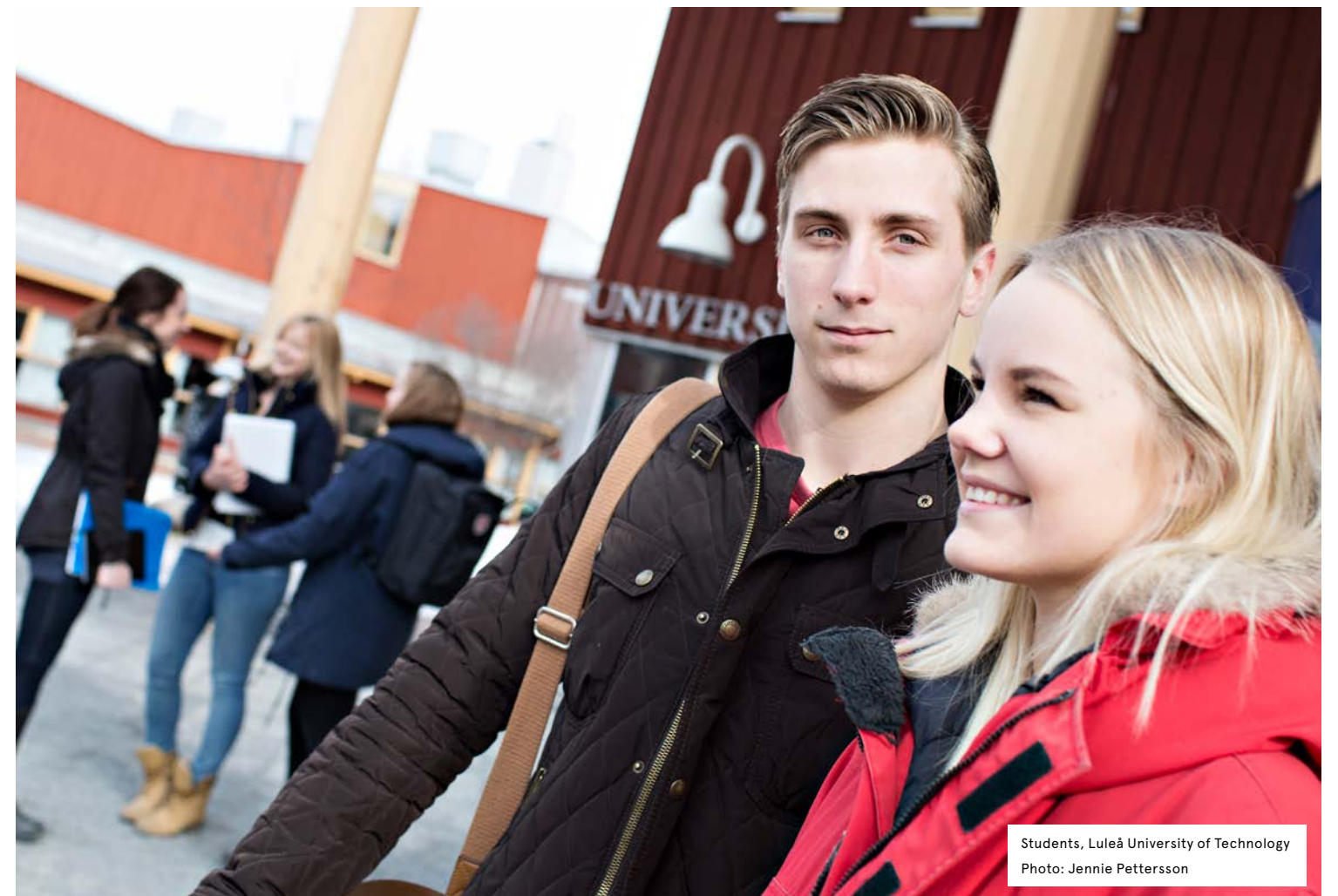
The results of this chapter suggest:

- A growth in human capital measured as tertiary education attainment of population is observed in the BIN counties reaching the respective country averages
- A high concentration of population with tertiary education attainment in age group 20-59 is observed in the counties of Troms and Northern Ostrobothnia
- Out of all the population that attained tertiary education degrees, 59 % are females, and 41 % are males in the BIN area, compared to 56 % females and 44 % males in total for Norway, Sweden and Finland
- In the Swedish and Finnish BIN counties, human capital in the age group 25-29 is decreasing, which may potentially reflect employability challenges of recent higher education graduates
- The highest gains in tertiary education attainment occurred in the age groups 40-49 and 50-59
- Out of the employed persons with tertiary degrees in the BIN area, 25 % have their degree in the field of health and welfare, compared to 20% in total for Norway, Sweden and Finland as of 2014

The results show that the highest concentration of human capital in the BIN area is observed in the county of Troms (Norway) and in the county of Northern Ostrobothnia (Finland) where 38% and 35% of all population aged 20-59 have attained tertiary education. Other BIN counties lagged behind their respective country averages in the percentage of population aged 20-59 that has attained tertiary education. This creates opportunities for higher education institutions in the area to offer tertiary education to the population living in the BIN area. Taking population development with diminishing young population in age group 0-19 into consideration, tertiary education offerings could be tailored to accommodate a life-long learning concept with flexible education opportunities. Holders of tertiary education degrees in the BIN area are predominantly females, e.g. 60 % of all tertiary education holders in Finnmark and Lapland. Sub-group analysis of tertiary education attainment in the BIN area during 2008-2014 shows that a high percentage of tertiary education holders in all age groups in the BIN area correspond or lie below the respective country averages. However, in Swedish and Finnish BIN counties, human capital in age group 25-29 is decreasing. That may

potentially reflect employment challenges for recent higher education graduates. The highest growth in tertiary education attainment is observed in age group 40-49 across all BIN counties.

The analysis of employed people holding tertiary education degrees in five major fields is conducted in order to detect tendencies in the employment market in relation to tertiary education, i.e. what skills and competencies were growing or declining in demand during 2008-2014. The analysis of employed people holding tertiary education degrees in five major fields revealed that the highest growth in employed people with tertiary education was in the field of natural and social sciences in the Norwegian and Swedish BIN counties. The percentage of employed people with tertiary education in the field of agriculture, fisheries and forestry grew in the Norwegian BIN counties. Moreover, there was a growth of people employed with tertiary education degrees in health and welfare (e.g. Norwegian BIN counties), while the percentage of employed people in the field of humanities and art has remained nearly the same. This analysis can be further extended in order to account for the industry of employment, gender and salary differences.



Students, Luleå University of Technology  
Photo: Jennie Pettersson

<sup>1</sup> OECD definition

<sup>2</sup> Gillies, D.Peters, M. (Ed.) Human Capital Theory in Education. Encyclopedia of Educational Philosophy and Theory, Springer Singapore, 2017, 1-5

<sup>3</sup> OECD (2016), Education at a Glance 2016: OECD Indicators, OECD Publishing, Paris.

<sup>4</sup> Eurostat definition

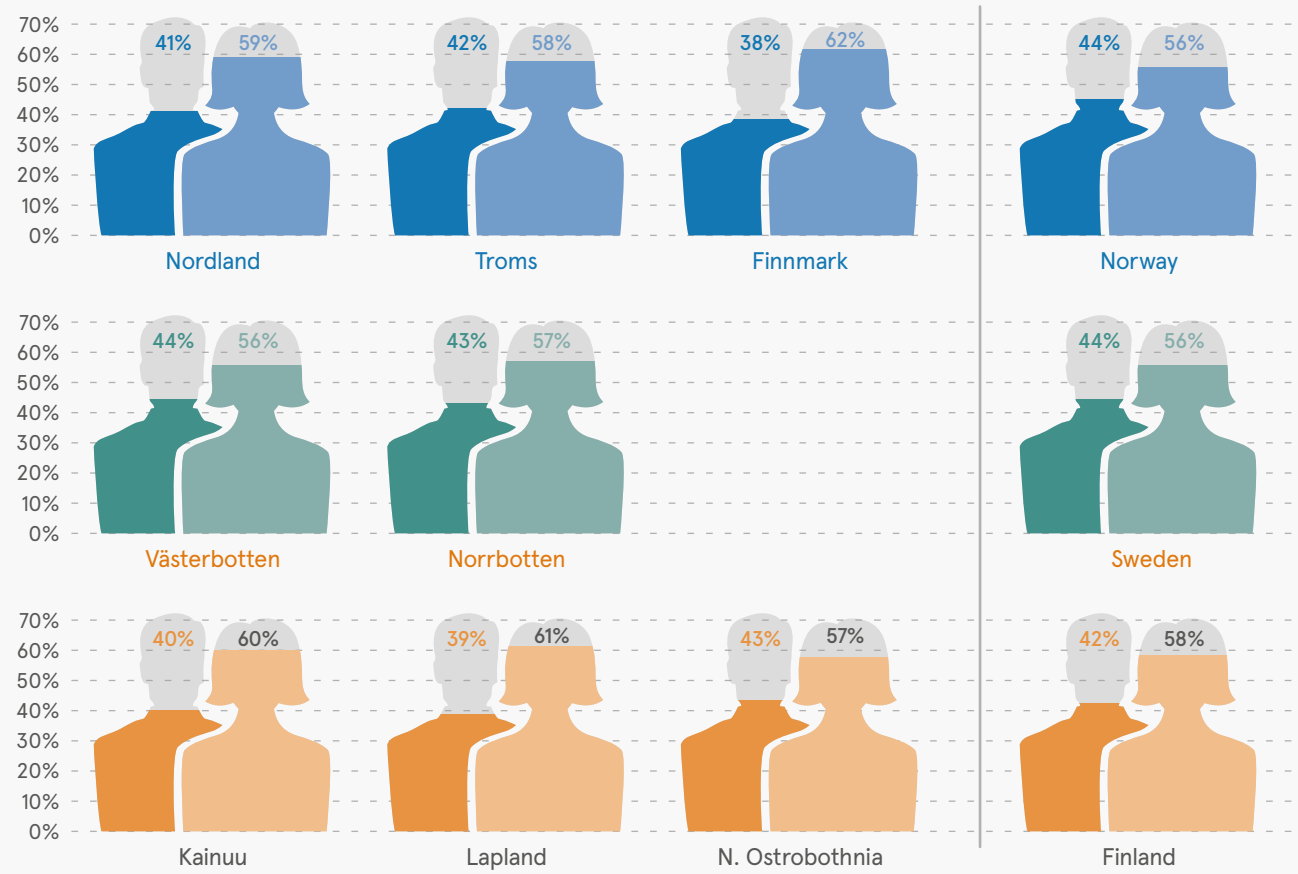
<sup>5</sup> Arnett, J. J. (2007). Emerging adulthood: What is it, and what is it good for?. Child development perspectives, 1(2), 68-73.

<sup>6</sup> Expenditure on education, % of GDP /% of GDP on tertiary education in 2013, Finland (5.7%/1.8%), Norway (6.3%/1.6%), Sweden (5.4%/1.7%). Source: OECD

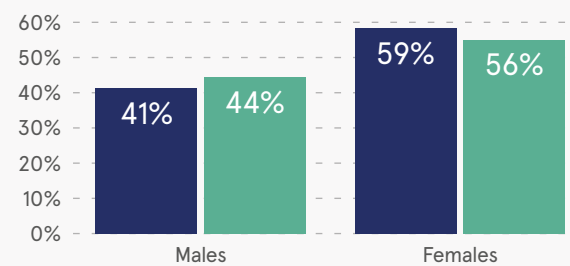


### Gender differences in tertiary education attainment

2014

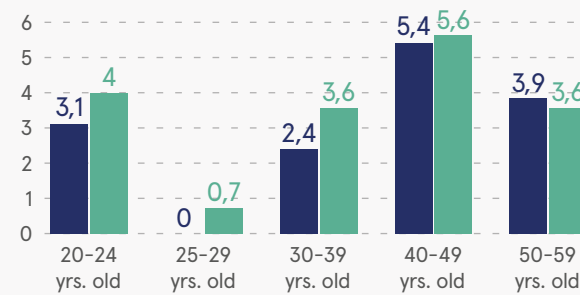


Gender differences in tertiary education attainment, 2014



■ BIN average ■ Average total, Norway, Sweden and Finland

Gains and losses in tertiary education attainment by age groups, average %, 2008–2004



■ BIN average ■ Average total, Norway, Sweden and Finland

### Tertiary education attainment in age group 20–59 year olds

2014

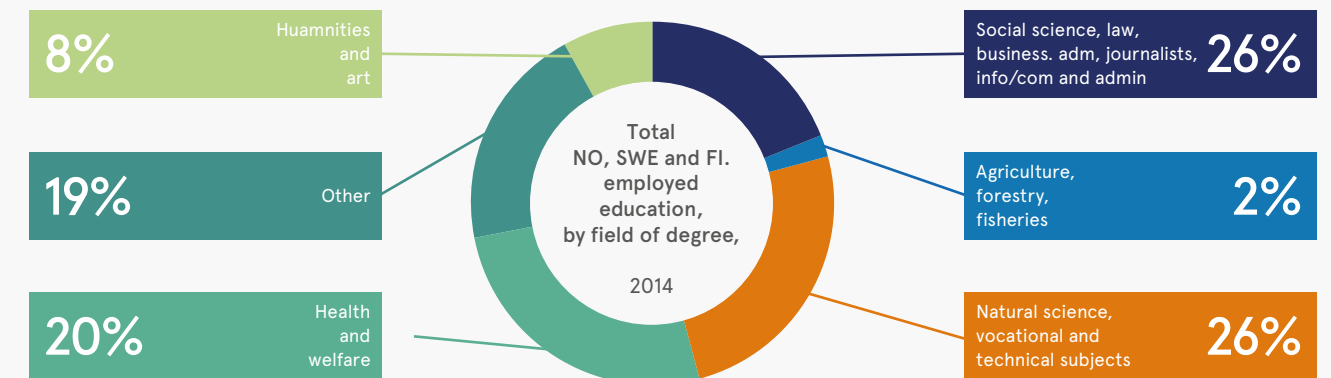
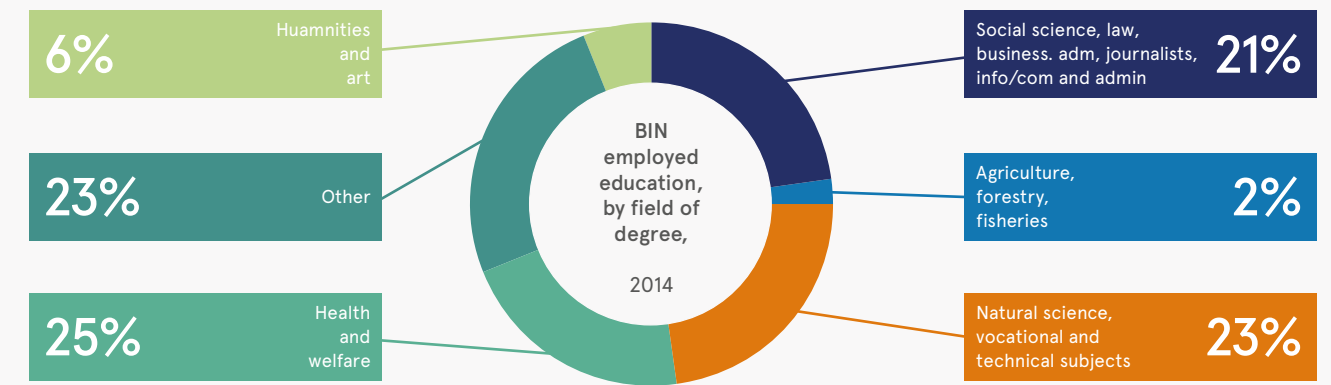
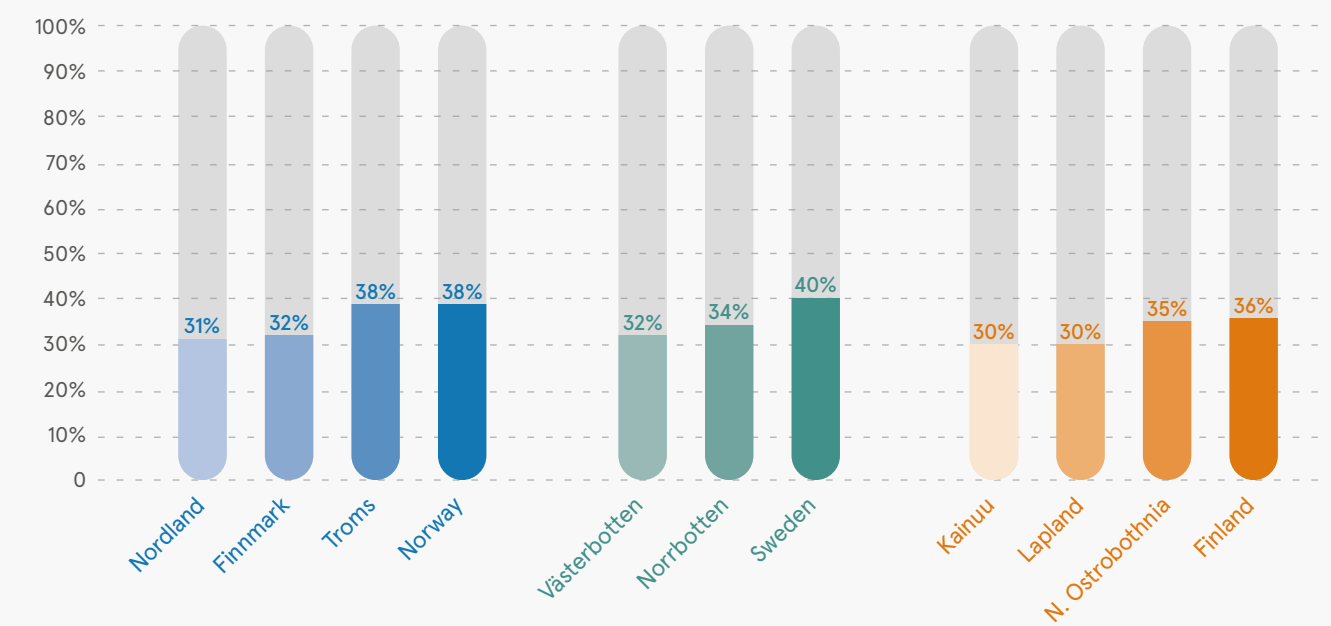


Figure 1 – Tertiary education combined in age group 20–59, total for Finland and its BIN counties

Figure 1 shows a pattern in tertiary education attainment in Finland, where the country's average in tertiary education attainment has increased by 3 % from 2008, reaching 36 % of the total population. Northern Ostrobothnia's statistics demonstrate that the level of tertiary education attainment is the same as the country's average, while the counties of Kainuu and Lapland lagged 6 % behind the country's average, both reaching the 30 % mark in 2014.

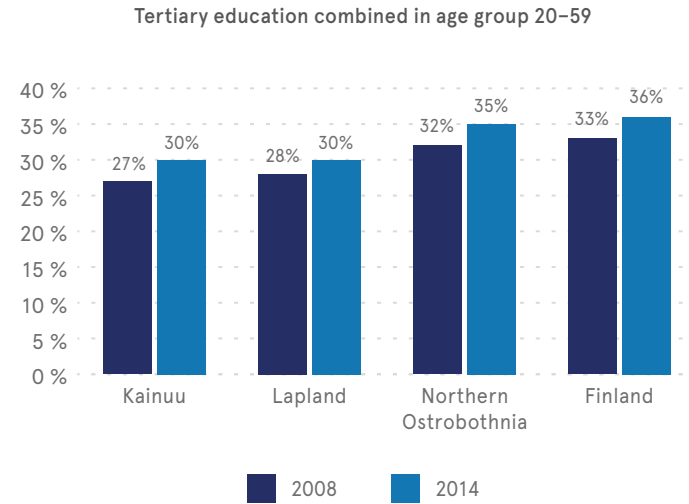


Figure 4 – Female to male ratio in tertiary education attainment as of 2014

Figure 4 demonstrates the breakdown of tertiary education attainment as a female-to-male ratio in 2014. A ratio higher than one means that there are more females than males with tertiary education attainment. High female-to-male ratio in all BIN counties demonstrates the prevalence of highly skilled females; the ratio is higher than the respective country average in all counties, except in Northern Ostrobothnia. In the counties of Finnmark and Lapland, nearly 60 % of all tertiary education holders are females. An analysis of population in the BIN area demonstrated that women tend to move to cities with higher employment opportunities.

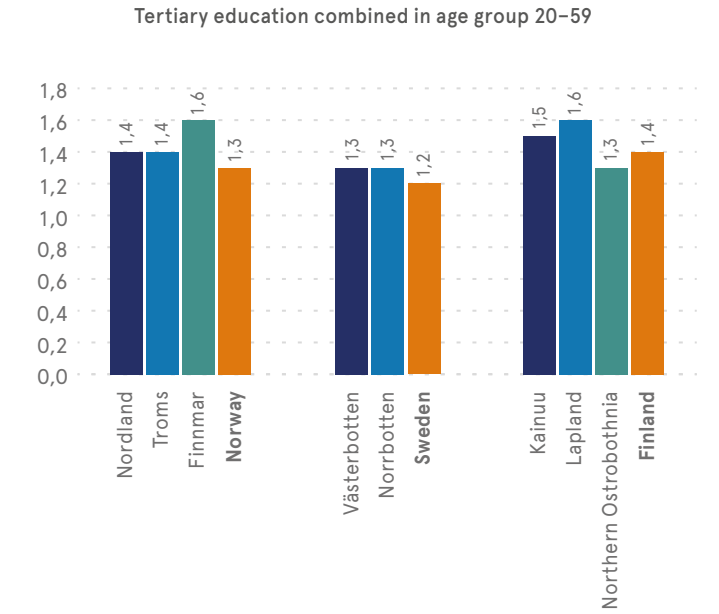


Figure 2 – Tertiary education combined in age group 20–59, total for Norway and its BIN counties

Figure 2 demonstrates development in tertiary education attainment in Norway and its BIN counties. Norway's average for tertiary education attainment in the total population had risen from 32 % in 2008 to 38 % in 2014. The county of Troms followed the national pattern, while in Nordland and Finnmark counties, the percentage of the population aged 20–59 who had successfully completed tertiary studies, was registered at 6–7 % below the country average in 2014.

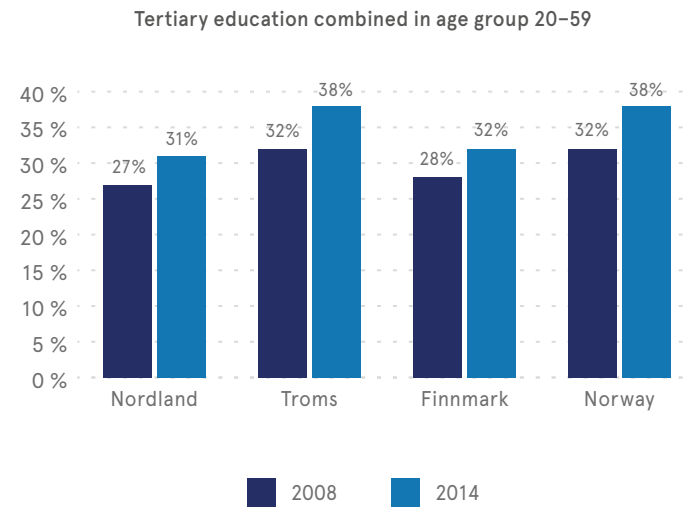


Figure 5 – Change in tertiary education attainment in age group 20–24 from 2008 to 2014, BIN counties

A further analysis involves the development of tertiary education attainment in age subgroups: 20–24, 25–29, 30–39, 40–49 and 50–59. Between 2008 and 2014, tertiary educational attainment among 20–24 year-olds increased in all countries of the BIN area (see Figure 5), ranging from 2 % to 5 % increase. This age group is dominated by short-cycle tertiary education attainment. According to Eurostat, 45 % of young people (aged 15–29) are still in education. In Troms county, 38 % of all 20–24 year-olds had attained tertiary education, which corresponded to the national average, while the Nordland and Finnmark counties had 31 % and 32 % of the population in the age group 20–24 with tertiary education degrees as of 2014. In Sweden, Västerbotten county had the highest percentage (42 %) of 20–24 year-olds with tertiary education degrees in 2014, while the average in Sweden equaled 40 %. In Finland, the Kainuu and Lapland counties had on average 6 % fewer 20–24-year-olds with tertiary education attainment compared to Finland's national average of 36 %.

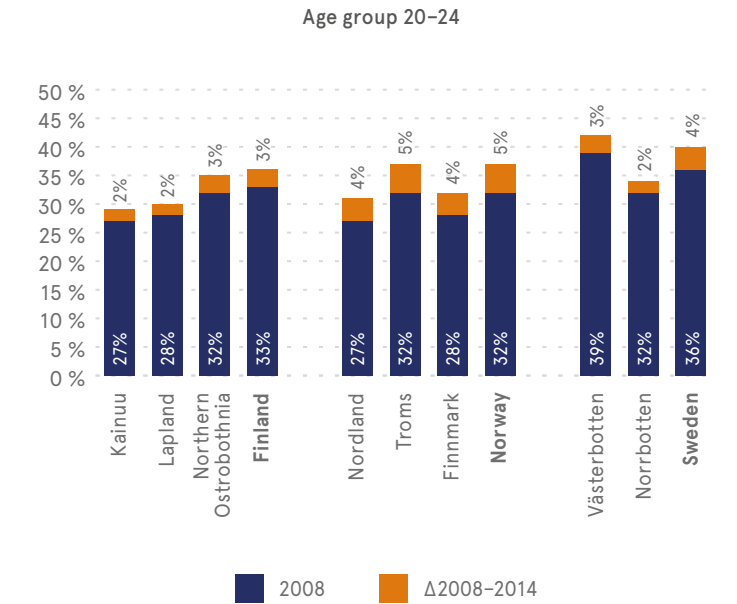


Figure 3 – Tertiary education combined in age group 20–59, total for Sweden and its BIN counties

Figure 3 demonstrates the development in tertiary education attainment among the population in Sweden and in its BIN counties. Norrbotten (32%) and Västerbotten (32%) both had a lower percentage of population with tertiary education attainment compared to Sweden's average of 40 % in 2014.

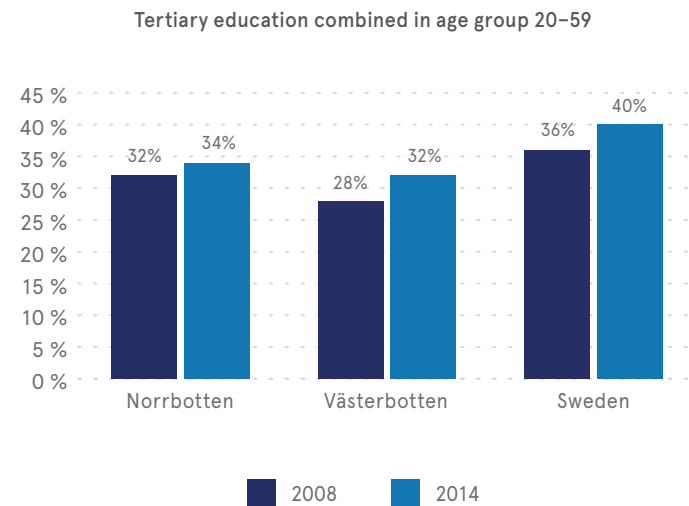




Figure 6 – Change in tertiary education attainment in age group 25–29 from 2008 to 2014, BIN counties

People aged 25–29 represent a category of people who mostly likely have completed their tertiary education, and for them, access the labor market is essential. Between 2008 and 2014, the tertiary educational attainment among 24–29 year-olds increased only in the Norwegian countries of the BIN area (see Figure 6), ranging from 2 % to 6 % increase. In Sweden, in Västerbotten and Norrbotten counties, the percentage of 25–29-year-olds with tertiary education has decreased by 3 %. In Västerbotten, the pool of highly skilled 25–29-year-olds in 2008 has reached saturation (50 % of that age group) and was higher than the national average of 43 %. Decreases in tertiary education attainment in age category 25–29 are observed in Lapland and Kainuu in Finland. This can be interpreted as an indirect proxy for employability opportunities of young people with tertiary education degrees. Therefore, the results potentially indicate weakened employment opportunities for young adults who attained tertiary education in the age group 25–29 in the Swedish and Finnish BIN counties, while Norway maintained growth in tertiary education attainment in that population group during 2008–2014.

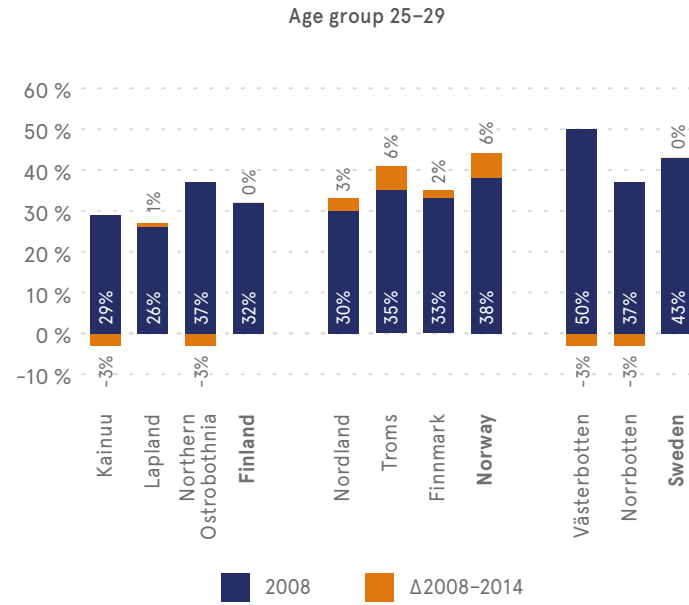


Figure 8 – Change in tertiary education attainment in age group 40–49 from 2008 to 2014, BIN counties

Figure 8 demonstrates tertiary education attainment in age group 40–49 from 2008 to 2014. This age group maintained the highest growth, ranging from 4 % to 8 % in all BIN area counties. This can be interpreted as an outcome of lifelong learning education, where 40–49-year-olds are most likely to receive a tertiary education degree either in their field of specialization or in a new field with favorable employability opportunities.

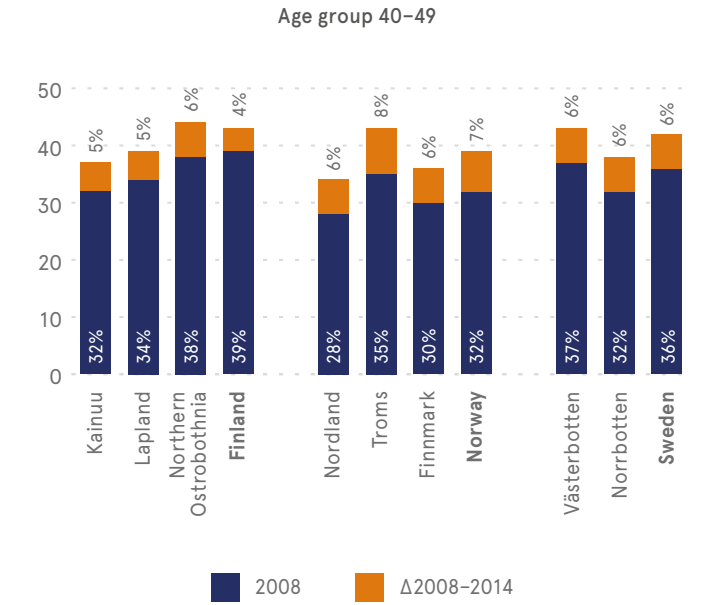


Figure 7 – Change in tertiary education attainment in age group 30–39 from 2008 to 2014, BIN counties

Figure 7 shows the trend of tertiary education attainment in age group 30–39. In Norway and Sweden, population in age group 30–39 demonstrated growth in tertiary education attainment, with Troms county (47 %) and Västerbotten country (51 %) leading to the number of highly skilled 30–39-year-olds. The decline in population who has attained tertiary education in the age group 30–39 was observed in Finland in Lapland and Northern Ostrobothnia counties. This potentially indicates weakening employment opportunities the Finnish BIN counties for people aged 30–39 during 2008–2014.

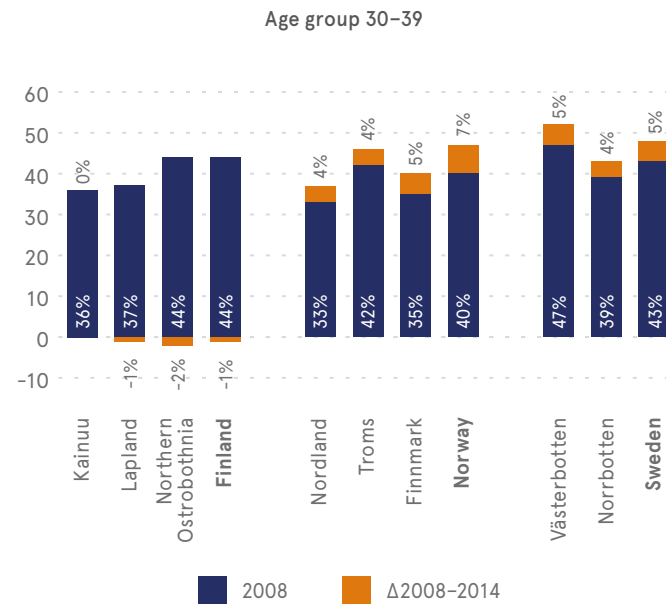


Figure 9 – Change in tertiary education attainment in age group 50–59 from 2008 to 2014, BIN counties

Figure 9 demonstrates tertiary education attainment in age group 50–59 from 2008 to 2014. Tertiary education attainment in this age group showed a positive trend ranging from 2 % to 6 %. Troms (33 %) and Västerbotten (36 %) counties had the largest proportion of 50–59 year-olds with tertiary education degrees in 2014. The rest of the BIN counties maintained a level of 50–59 year-olds with tertiary education degrees in 2014 that was below the national average. Collectively, results for 40–49 and 50–59 year-olds are in line with the OECD report<sup>7</sup>. The reasons for older adults to obtain a tertiary education is to secure higher earnings at an older age, and also to improve their prospects of being employed at an older age.

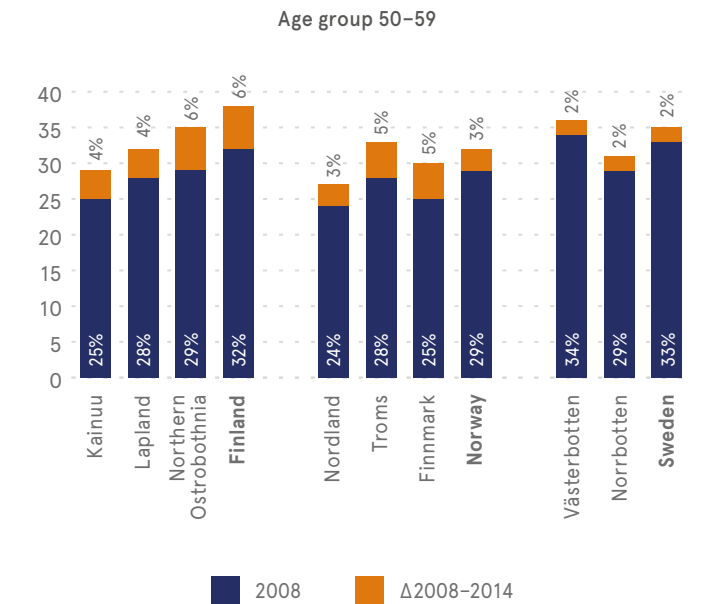
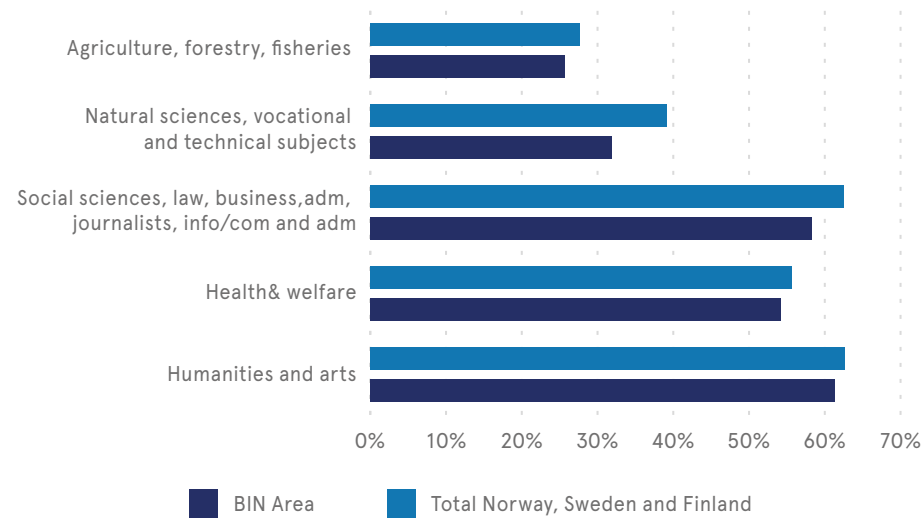


Figure 10 – Proportion of employed people with tertiary education, by field of degree<sup>8</sup>, 2014.

Figure 10 shows the proportion of employees with tertiary education in five major fields. Statistics for employed people with tertiary education does not account for the industry in which these people are employed. University degree is indicative of a level of knowledge and intellectual ability. Supply of university graduates has been expanding, and the degree per se does not guarantee a job or a career. Graduates' attributes are more important in the recruitment process than the graduates' degree subject<sup>9</sup>. Therefore, a person with a degree in arts can be employed in the IT sector. Statistics of employees with tertiary (university) education by study field is only in-



dicative of the demand side of employment and its need for people with corresponding degrees. The results suggest that in the BIN area, the proportion of employees with university degrees lagged behind of the national average in Norway, Finland, and Sweden as of 2014. This can be interpreted as there not being enough jobs available for highly skilled workers or the supply highly skilled professional has not yet reached its saturation point. The differences are particularly pronounced in natural sciences, vocational and technical subjects; compare 31.9 % in the BIN area to 39.3 % in total for Norway, Finland, and Sweden. This indicates only that skills required, as we do not know whether these people work in the field in which they are educated. Statistics are on the field their degree is from.

Figure 11 – Breakdown by field of degree of all employed people with tertiary degrees (all tertiary degrees=100%), 2014

Figure 11 shows breakdown by field of degree of all employed people with a tertiary degree. Considering all employed people with a tertiary degree as 100%. The main differences between the BIN area and Norway, Sweden and Finland is employed people with tertiary degree in health and welfare. The BIN area accounts for 25% all employed people with a tertiary degree in health and welfare, while in Norway, Sweden and Finland in total this proportion is 20%. At the same time, lower proportion of employed people with a tertiary degree in social sciences 21% is observed in BIN in 2014, as compared to 26% in Norway, Sweden and Finland in total. This indicates higher demands in of employees with skills in health and welfare in the BIN area that corresponds to our finding of the ageing population in the BIN area that puts increased demands on health care and social services.

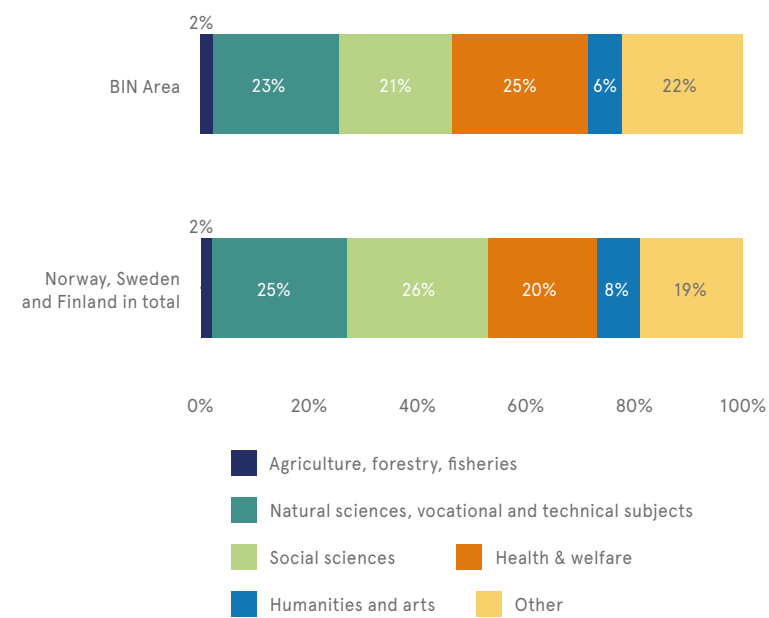


Figure 12 – Employed people with tertiary education degree in the fields of agriculture, forestry, and fisheries, 2008–2014, % change

Figure 12 illustrates the percentage change of employed people with a tertiary education degree in the agriculture, forestry and fisheries field from 2008 to 2014 in total for Norway, Sweden and Finland as well as the BIN area. Out of all persons employed with degrees in the field of agriculture, forestry, and fisheries, only 27.6 % had a university or equivalent degree in total for Norway, Sweden and Finland, and 25.7 % in the BIN area. This means that the demand side of employment does not require highly skilled workers in the agriculture, forestry, and fisheries field, while an increase of 2.1 % is observed in the BIN area.

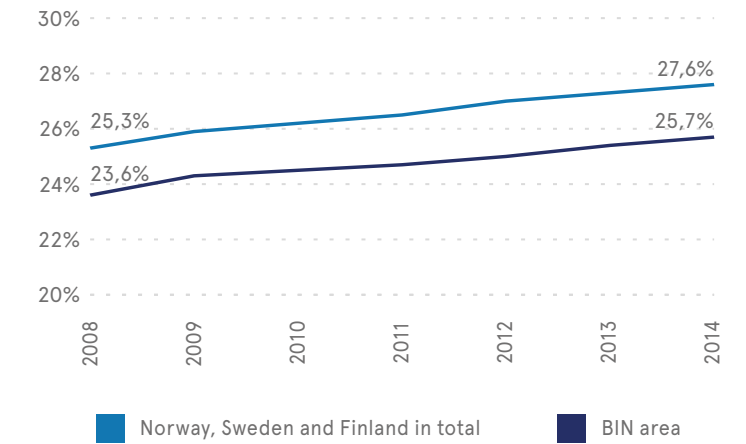
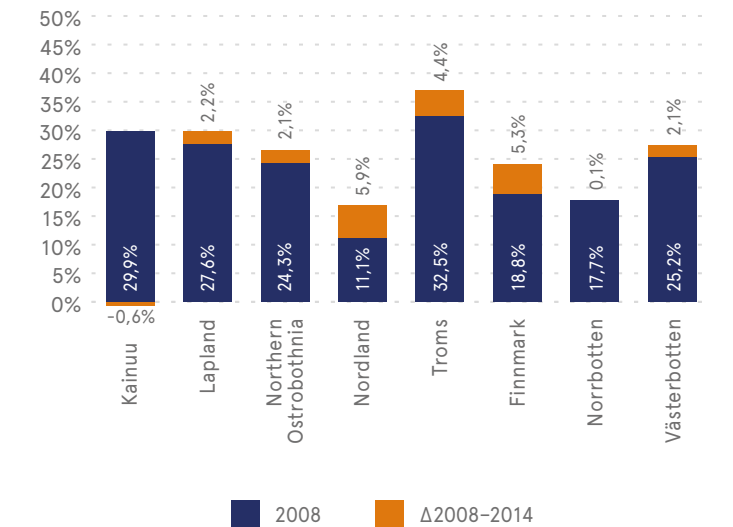


Figure 13 – Employed people with tertiary education degrees in the field of agriculture, forestry and fisheries at the BIN county level, 2008–2014, % change

Figure 13 shows the percentage change of employees with tertiary education degrees in the agriculture, forestry, and fisheries field at the BIN county level, from 2008 to 2014. The demand for highly skilled people with a degree in the field of agriculture, forestry and fisheries varied greatly amongst BIN counties, compare 37 % in Troms to 17 % in Nordland and 17.8% in Norrbotten. The change was high in the counties with an initial low percentage of highly skilled employed people, e.g. in Nordland, the increase during 2008–2014 was 5.9 % from 2008 level of 11.1 %.

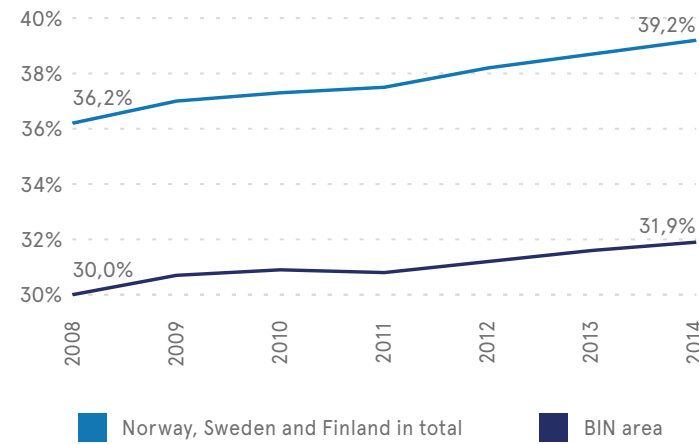


<sup>8</sup> Social sciences include: Social sciences, journalism and information, business, administration and law

<sup>9</sup> Harvey, L. (2000). New realities: The relationship between higher education and employment. Tertiary Education & Management, 6(1), 3–17.

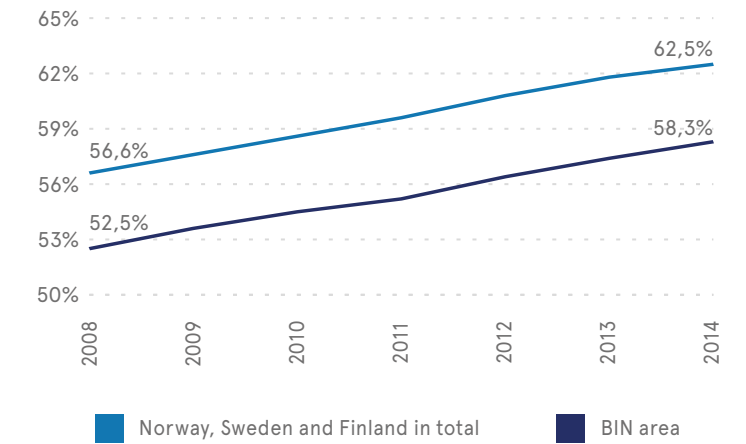
**Figure 14 – Employed people with tertiary education degrees in the field of natural sciences, vocational and technical subject, 2008-2014, % change**

Figure 14 demonstrates that the demand for highly skilled workers with tertiary education degrees in the field of natural sciences, vocational and technical subject was much lower in the BIN area (31.9 %) compared to the total for Norway, Finland and Sweden (39.2 %) in 2014. Moreover, the change during 2008-2014 was below 2% in the BIN compared to 3% in the total for Norway, Finland and Sweden.



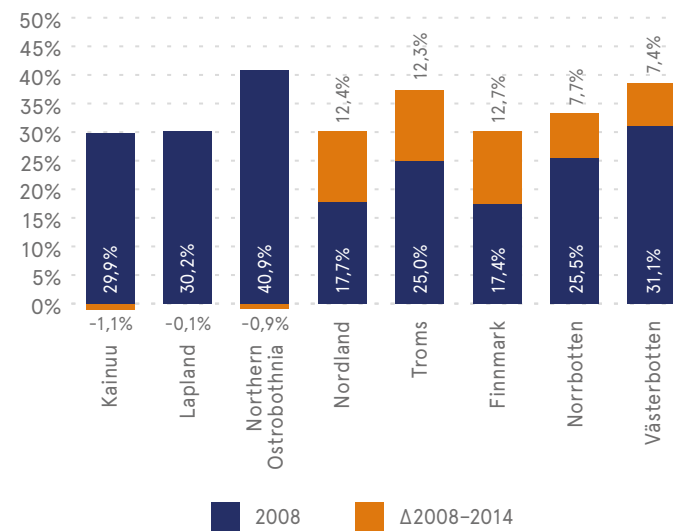
**Figure 16 – Employed people with tertiary education degrees in the field of social sciences, 2008-2014, % change**

Figure 16 demonstrates an increase of 5.9 % in the group of employed people holding a tertiary education degree in the field of social sciences in total for Norway, Sweden and Finland during 2008-2014. In the BIN area, the same indicator grew by 5.8 % but still remained at 58.3 %, compared to a 62.5 % total for Norway, Sweden and Finland in 2014.



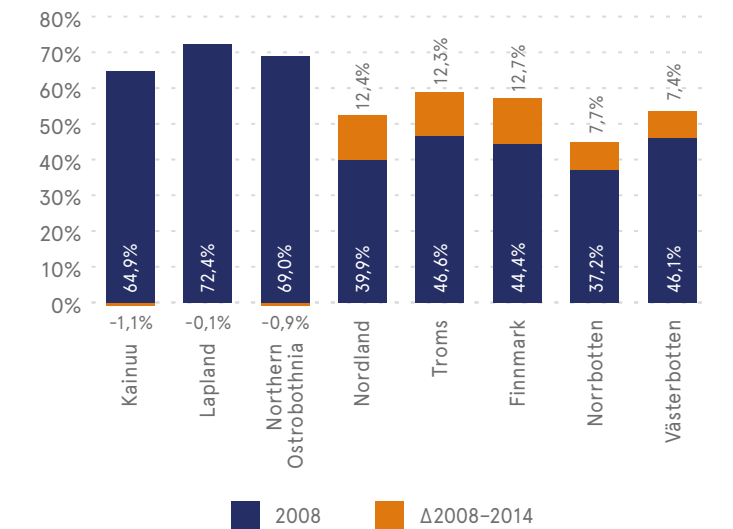
**Figure 15 – Employed people with tertiary education degrees in the field of natural sciences, vocational and technical subject at the BIN county level, 2008-2014, % change**

Figure 15 shows the trend of percentage change of employed people with tertiary education degrees in the field of natural sciences, vocational and technical subject at the BIN county level from 2008 to 2014. Norwegian and Swedish counties appear to be the net gainers of highly skilled employees in that category. The county of Northern Ostrobothnia had a slight decrease of 0.9 % in employed people with tertiary education degree in the field of natural sciences, vocational and technical subject, yet it remained the leader in the BIN area, with 40 % of employed people having a degree in the field of natural sciences, vocational and technical subject on a tertiary level.



**Figure 17 – Employed people with tertiary education degree in the field of social sciences at the BIN county level, 2008-2014, % change**

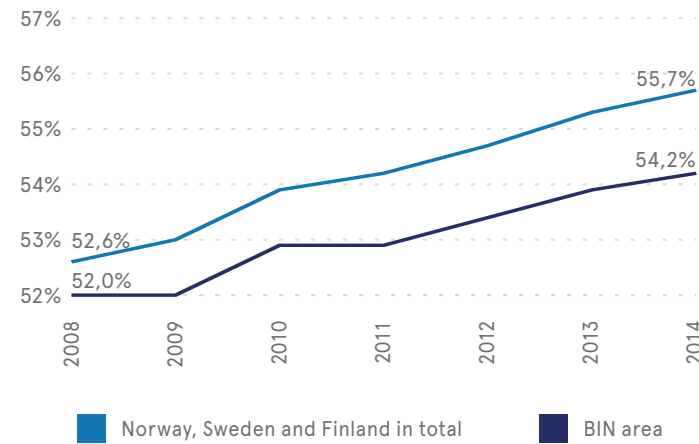
Figure 17 demonstrates trends in employed people holding tertiary education degree in the field of social sciences at the BIN county level. The Norwegian counties of Nordland, Troms and Finnmark had an average growth of 12 % in employees holding tertiary education degrees in the field of social sciences, meaning an increase in the demand side of the employment market for people with skills in social sciences. The Swedish counties Norrbotten and Västerbotten saw an average growth of 7.5 % in the same category. The Finnish counties had a slight decrease in employed people holding tertiary education degree in the field of social sciences, which is explained by a high average percentage (69 %) of people holding tertiary education degree in the field of social sciences in 2008.





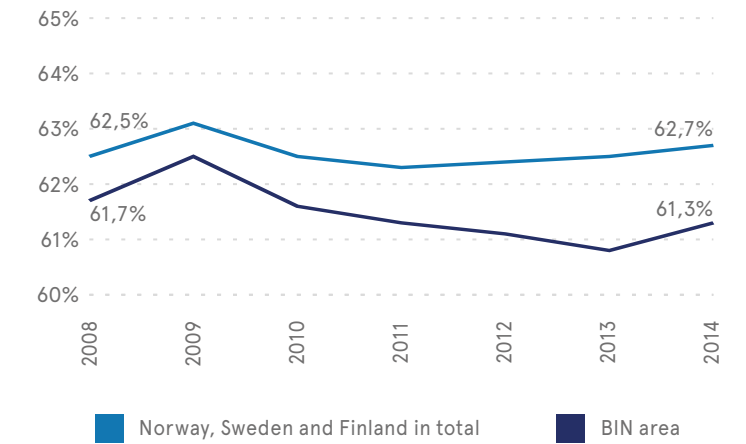
**Figure 18 – Employed people with tertiary education degree in the field of health and welfare, 2008-2014, % change**

Figure 18 demonstrates the percentage change of employed people with tertiary education degrees in the field of health and welfare from 2008 to 2014. A 3.1% increase is observed in the total for Norway, Sweden, and Finland in 2014, compared to 2.2 % in the BIN area.



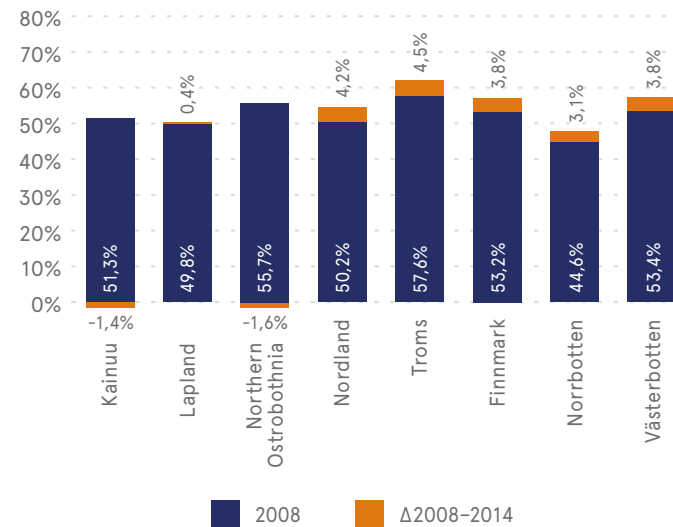
**Figure 20 – Employed people with tertiary education degrees in the field of humanities and arts, 2008-2014, % change**

Figure 20 demonstrates that the percentage of employed people with tertiary education degrees in the field of humanities and arts plateaued during 2008-2014, which can be explained by a high starting point; 61.7% for the BIN area and 62.5 % in total for Norway, Sweden and Finland in 2008.



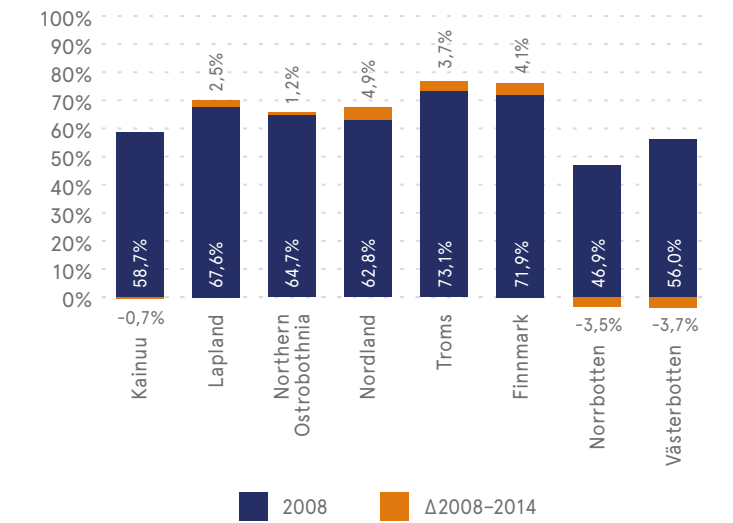
**Figure 19 – Employed people with tertiary education degree in the field of health and welfare at the BIN county level, 2008-2014, % change**

Figure 19 demonstrates that in the Norwegian counties Nordland, Troms and Finnmark, employed people with a tertiary education degree in the field of health and welfare increased the most. For example, Nordland had 62.1 % of the employed people with tertiary education degree in the health and welfare field in 2014, which is much higher than the total of 55.7 % across Norway, Sweden, and Finland. Norrbotten and Västerbotten saw an average growth of 3.5 %, while the Finnish BIN counties had a slight decrease. This indicates that the population growing older creates job demands for the holders of tertiary education degrees in the health and welfare field.



**Figure 21 – Percentage change of employed people with tertiary education degree in the field of humanities and arts at the BIN county level from 2008 to 2014**

Figure 21 demonstrates a continuous growth of employed people with tertiary education degrees in the field of humanities and arts in the Norwegian BIN counties as well as in Lapland and Northern Ostrobothnia. The Swedish BIN counties saw an average decrease of 3.6 % of employed people with tertiary education degrees in the field of humanities and arts.



# Implications

“Human Capital in the North” chapter provides an analysis of trends in human capital measured as tertiary education attainment in the BIN area and for Norway, Sweden and Finland as a whole. The Human Capital Index<sup>10</sup> measures how well countries are at leveraging their human capital and establishing workforces that are prepared for the demands of competitive economies. The Countries of the BIN area have ranked at the very top of the world, Finland (1), Norway (2) and Sweden (5). The value of this chapter is the investigation of educational attainment in-depth on a county level and within age groups. Prior results on high levels of tertiary educational attainment<sup>11</sup> suggest that highly educated people generally have better health, are more socially engaged, have higher employment rates and have higher relative earnings. We suggest the following implications for policy makers and business in general.

For policy makers:

- The findings from population development and educational attainment in the BIN area should be used for planning an education system of the future. The BIN area may experience shortage of new local entrants to its educational system caused by the decline in the population group aged 0-19
- Shrinking population in rural parts of the BIN area creates challenges to maintaining the accessibility of education services

- Assessment of distance learning in the future for the BIN area education systems
- Facilitate cooperation in the tertiary education sector (universities in the BIN area) in order to work together and strategically address demographic challenges of the BIN area

For business:

- County profiles help to gauge which human capital and what skills (employed people by the field of degree) are available in each of the BIN counties. This information is useful for recruitment and capital investment purposes
- Business opportunities for companies offering life-long learning solutions and education for the mature and elderly population
- Business opportunities for companies offering digital learning platforms
- Export opportunities of educational expertise and solutions based on Finnish, Swedish and Norwegian education systems

<sup>10</sup> Source: World Economic Forum, \*2016 rank out of 130 economies

<sup>11</sup> OECD (2016), Education at a Glance 2016: OECD Indicators, OECD Publishing, Paris.

## Employment in the North

This chapter provides a historical overview of the employment development in the BIN area and serves the decision maker's needs with regards to labor politics in the BIN area. In this chapter, analysis focuses on trends in employment rates, unemployment rates and job creations for the time-period 2008-2014. According to OECD definition, the employment rate is a measure of the extent to which available labor resources (people available to work aged 15-65) are being used. It is calculated as the ratio of the employed to the working age population. The unemployment rate is the number of unemployed people as a percentage of the labor force, where the latter consists of the unemployed plus those in paid or self-employment. This chapter analyses the trends in the employment growth, taking into consideration industry breakdown and gender factors. Moreover, a detailed analysis of the employment trends on the county level of the BIN area is conducted. Age-group analysis provides a tool to analyze labor market dynamics for the different groups of the population ranging from youth 16-24 to people aged 55+.

For methodological reasons, the analysis of employment is conducted on the industry level as a total, and on all industries except agriculture, forestry and fishing<sup>1</sup>. The Labour market in the BIN area is affected by the challenge of an ageing population, and the period under investigation (2008–2014) is affected by the consequences of the global crisis of 2008. Economic trends worldwide indicate a decline in long-term capital investment, population ageing, rising inequality and weakening productivity gains<sup>2</sup>. Moreover, growing automation in production, job outsourcing and price competition from emerging countries have had visible impacts on manufacturing jobs that saw a significant decline over the past decade in all EU countries<sup>3</sup>. Trends in developed markets reflect a decline in the employment share in middle-skilled and middle-waged occupations and a rise in the employment in high-skilled occupations. These factors have affected the development of the employment market in the BIN area.

The results demonstrate that:

- The lowest unemployment rate was observed in the BIN counties in Norway, the highest in Finland, during 2008-2014
- The growth in employment has been moderate in the BIN area. The growth in employment was negatively affected by the agriculture, forestry and manufacturing sectors, which are losing their importance for employment in the BIN area
- The biggest job losses occurred in mining, quarrying and manufacturing, followed by agriculture, forestry and fishing. The biggest job creation occurred in the of real estate sector, professional, scientific and technical sector and other services reflecting increased demand in highly skilled jobs during 2008-2014
- Great discrepancies can be observed in youth employment in the age group 16-24 on the BIN county level, with drastic decline in Finland and big increase in Sweden.
- Increase in employment for the age group 55+ in the BIN area



Worker  
Photo: Fennovoima

<sup>1</sup> Sweden changed its classification of agriculture, forestry and fisheries industry in 2011.

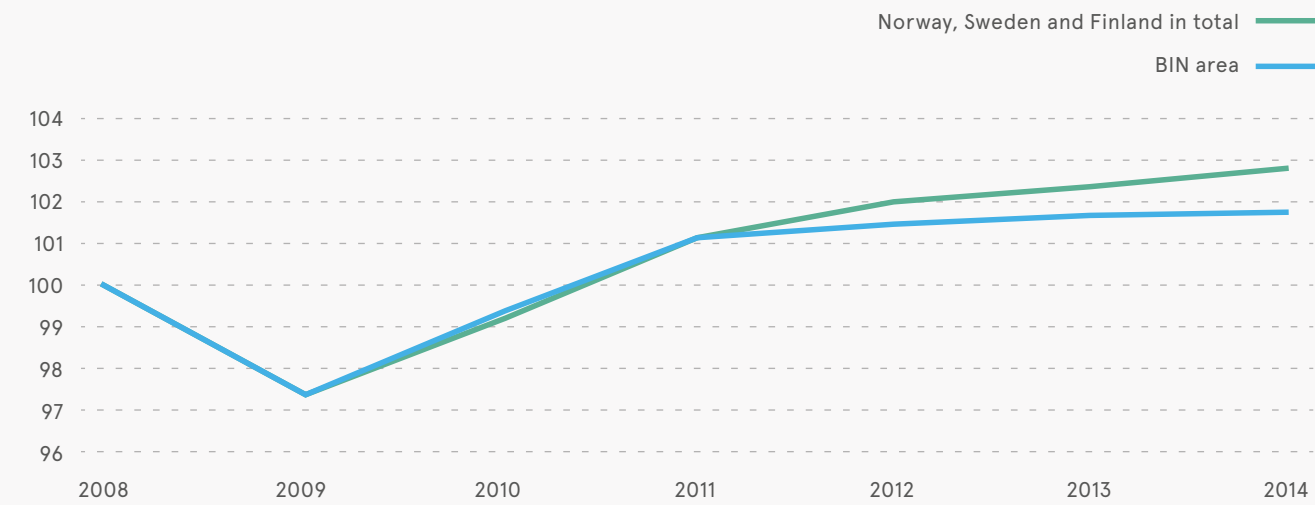
<sup>2</sup> World Employment and Social Outlook: Trends 2016, International Labour Office – Geneva: ILO, 2016

<sup>3</sup> World Employment and Social Outlook: Trends 2015, International Labour Office – Geneva: ILO, 2015



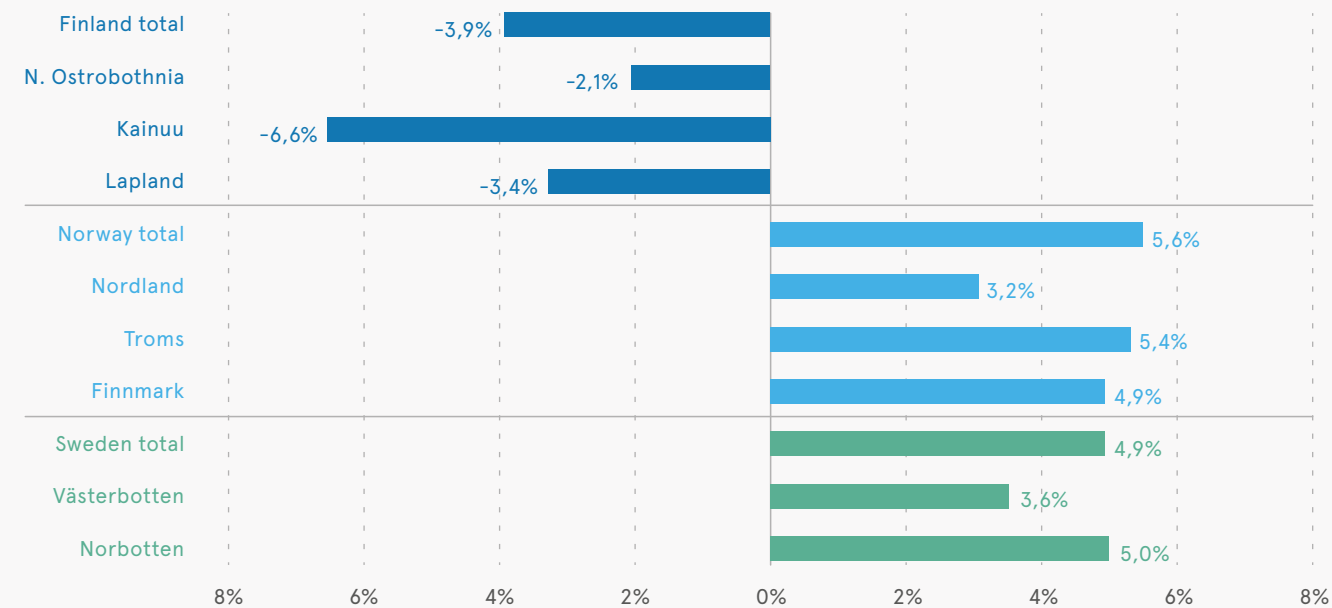
### Employment development

All industries except agriculture, forestry and fishing  
2008-2014, index 2008 = 100



### Employment growth at the BIN county level

All industries except agriculture, forestry and fishing  
2008-2014, %



### Biggest job creation and losses in the BIN area 2011-2014

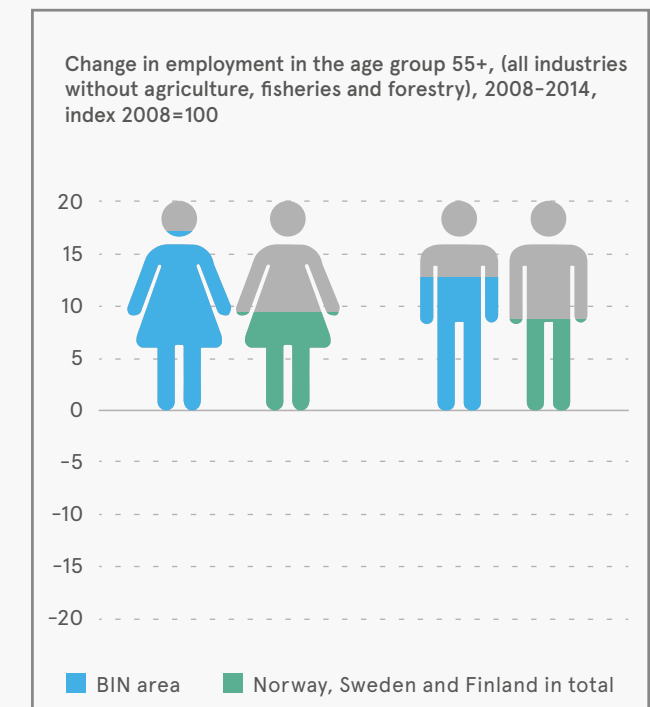
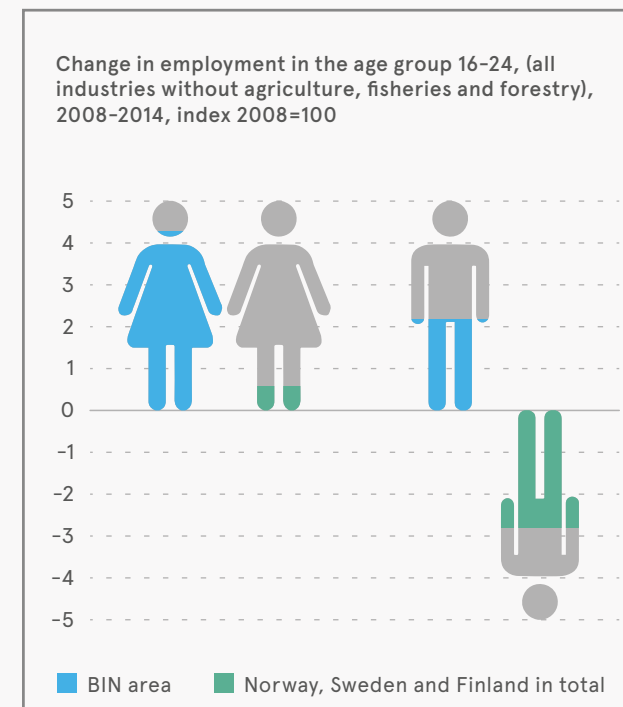
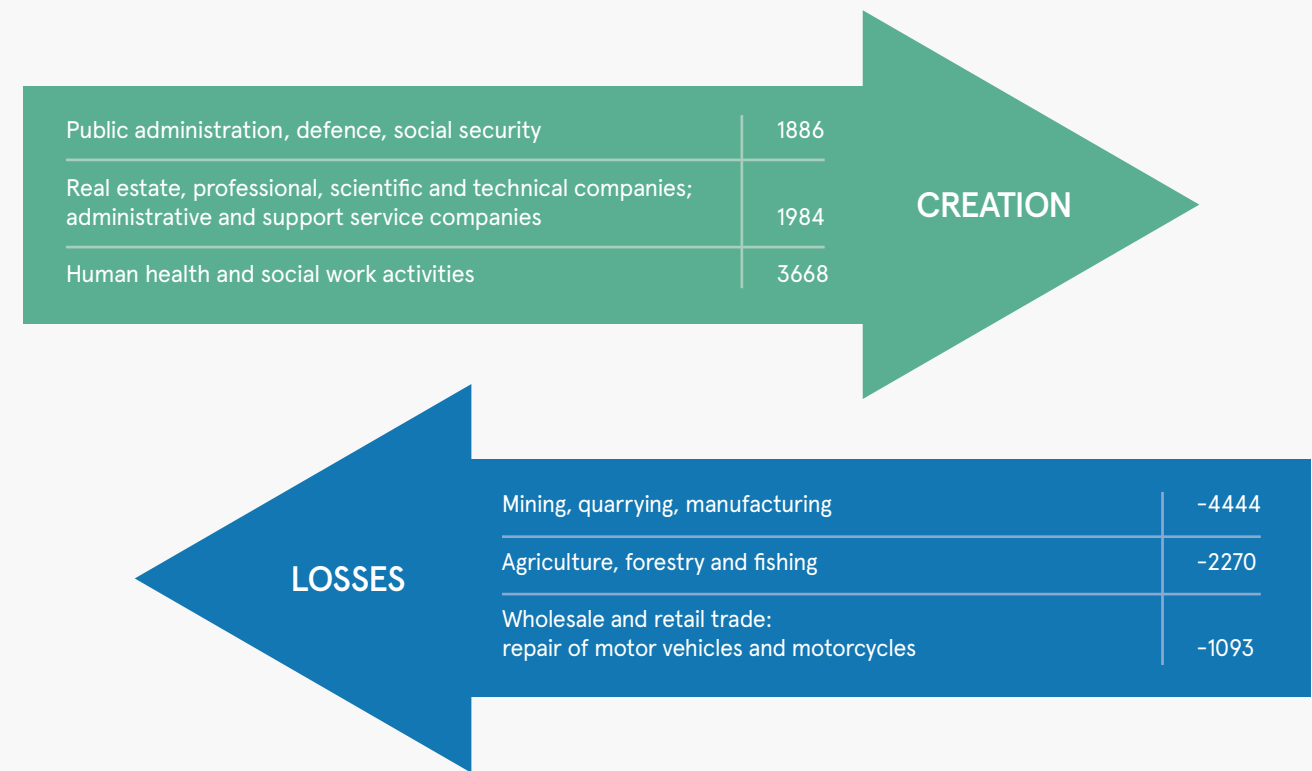


Figure 1 – Total employed persons in the BIN area, 2014

The BIN area was home to a total number of 739,272 employees as of 2014. Employees are people aged 16+ who are currently employed in the labour market. Figure 1 shows a breakdown of employees on a county level, with the largest pool of employees in Northern Ostrobothnia county, and the smallest in Kainuu county, which is proportionate to the population figures of their respective counties.

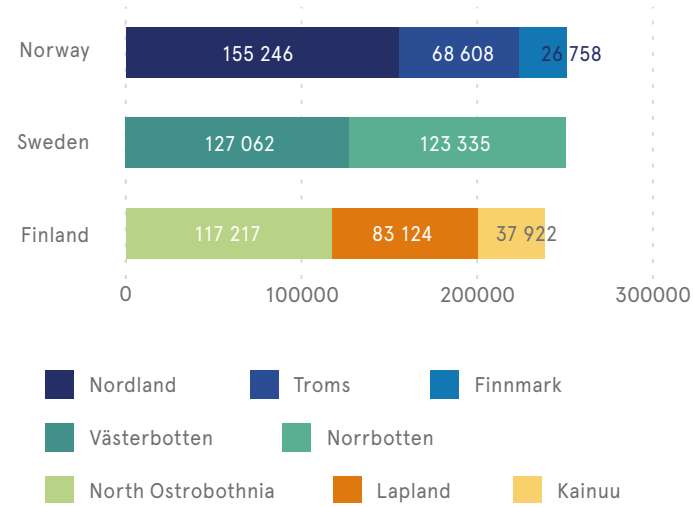


Figure 2 – Median employment rate, 2008-2014

Figure 2 shows the median employment rate in the BIN area on a county level and compares it to the total of Finland, Norway and Sweden. The median is used as a mid-point of a distribution curve, with half of the values falling above it and half below it during 2008-2014. All the BIN counties had an employment rate lower than the corresponding country's median value, which ranged from 66-69%.

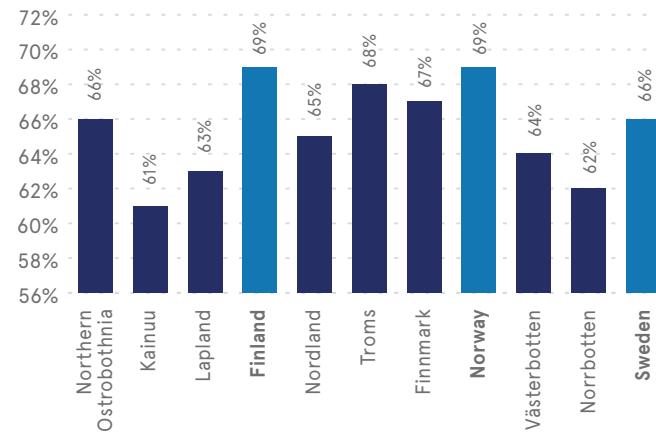


Figure 3 – Median unemployment rate, 2008-2014

Figure 3 reports differences in the unemployment rate<sup>4</sup>. Finland has had the highest median unemployment rate, reaching 10% during 2008-2014, with the BIN counties' unemployment rate as high as 16% (Kainuu). Norway had the lowest median unemployment rate during 2008-2014, as low as 3% and the BIN area counties of Nordland (3%), Finnmark (3%) and Troms (2%) followed the same pattern. In Sweden, there were no differences in unemployment rates between the country's median of 8% and its BIN counties.

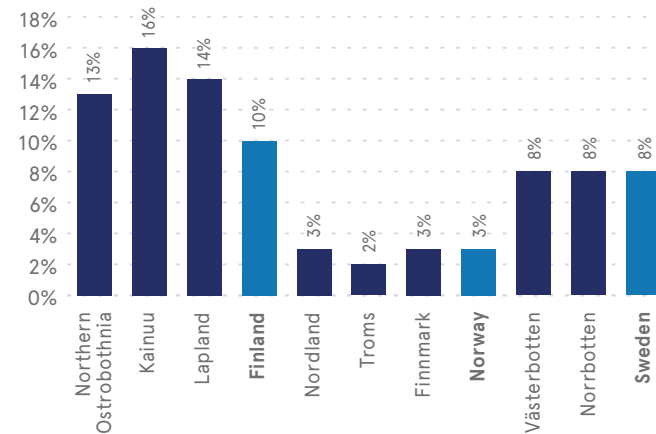


Figure 4 – Employment development (all industries), 2011-2014, index 2011 = 100

Figure 4 demonstrates employment development expressed as index (all industries). The BIN area experienced near-zero growth of 0.2% in 2011-2014, compared to 1.6% for Norway, Sweden and Finland in total.

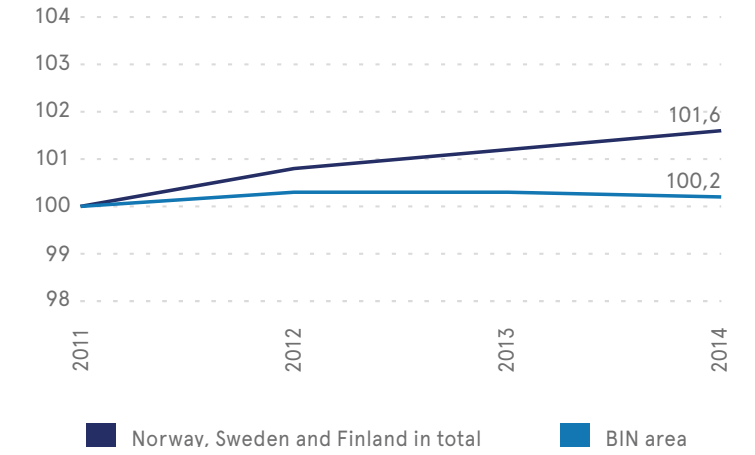


Figure 5 – Employment development (all industries except agriculture, forestry and fishing), 2008 - 2014, index 2008 = 100

An index of employment development excluding agriculture, forestry and fishing, is shown in Figure 5. From 2008 to 2014, the BIN area saw a growth of 1.7%, and Norway, Sweden and Finland in total saw a growth of 2.9%. Therefore, when controlling for agriculture, forestry and fishing, a growth in employment development is observed. This indicates a diminishing role for agriculture, forestry and fishing in the BIN area employment market. The modernization of agriculture and the rise of industry and services within economy have resulted in agriculture becoming a much less important source of jobs.<sup>5</sup>

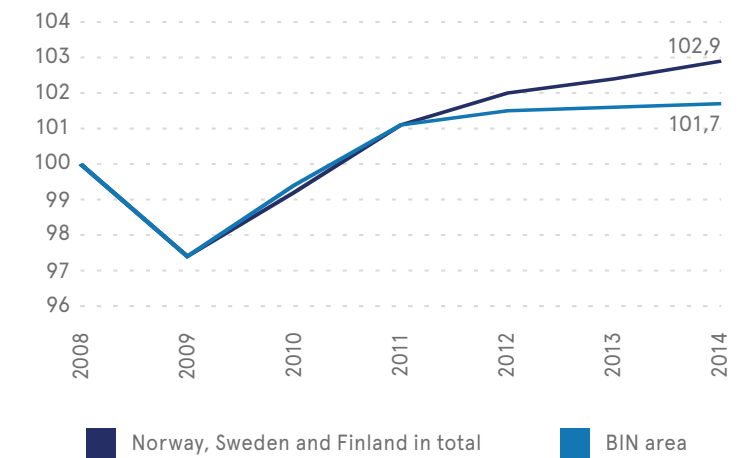
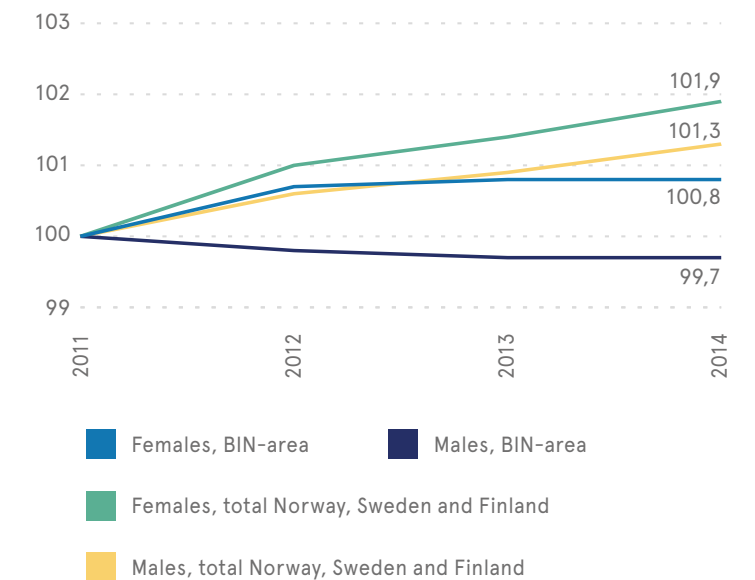


Figure 6 – Employment development by gender (all industries), 2011-2014, index 2011 = 100

Figure 6 demonstrates that employment development expressed as an index (all industries) during 2011-2014 for males in the BIN area has worsened (-0.3%) more than in Norway, Sweden and Finland as a whole, where there was an increase of 1.3%. For females, employment development has remained positive in the BIN area, but underperformed for Norway, Sweden and Finland as a whole by 1.1%.



<sup>4</sup> The methodology of unemployment rate calculation differs across countries, therefore the comparison in Figure 2 is not direct (Finland uses age group 18 - 64 years, while in Sweden and Norway age group is 15-74).

<sup>5</sup> Agricultural census in Finland, Norway and Sweden in 2013. (Source: Eurostat)

Figure 7 – Employment development by gender (all industries except agriculture, forestry and fishing), 2008–2014, index 2008 = 100

Figure 7 shows employment development expressed as index while controlling for the effect of agriculture, forestry and fishing. The employment development in the BIN area for both males (1.1%) and females (2.4%) was positive during 2008–2014, but below of the total for Norway, Sweden and Finland for males (2.5%) and for females (3.3%) respectively.

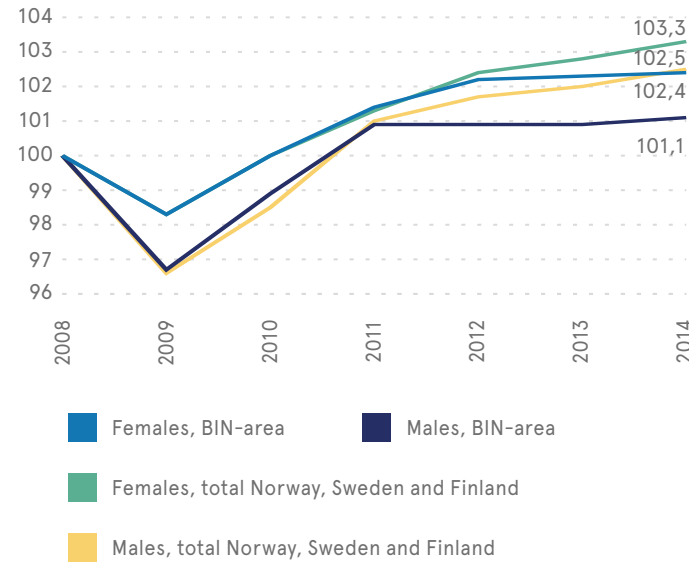


Table 1 – Employment rate per industry (by place of work) in 2014, BIN area compared with the total for Norway, Sweden and Finland

Table 1 provides a breakdown of employment rate per industry in the BIN area (by place of work) as of 2014, compared with the total rate for Norway, Sweden and Finland. The BIN area had higher employment rates in human health and social work activities (20.7% vs 17.5%), education (9.8% vs 9%), construction (7.6% vs 7.1%), public administration, defense and social security (6.9% vs 5.7%) and agriculture, forestry and fishing (4.6% vs 2.5%), when compared to the total for Norway, Sweden and Finland. The public sector accounts for a significant share of employment. The industries providing less employment opportunities in the BIN area include mining, quarrying and manufacturing, wholesale and retail trade, repair of motor vehicles and motorcycles, real estate, professional, scientific and technical companies; administrative and support service companies, information, communication, financial and insurance activities.

Industry	BIN Area	Norway, Sweden and Finland in total
Human health and social work activities	20,7 %	17,5 %
Mining, quarrying, manufacturing	11,2 %	12,1 %
Wholesale and retail trade: repair of motor vehicles and motorcycles	10,5 %	12,5 %
Real estate, professional, scientific and technical companies; administrative and support service companies	10,1 %	12,6 %
Education	9,8 %	9,0 %
Construction	7,6 %	7,1 %
Public adm., defence, soc. security	6,9 %	5,7 %
Transportation and storage	5,5 %	5,2 %
Agriculture, forestry and fishing	4,6 %	2,5 %
Other services	4,1 %	4,5 %
Accommodation and food service activities	3,4 %	3,5 %
Information and communication	2,1 %	3,7 %
Electricity, water supply, sewerage, waste management	1,3 %	1,1 %
Financial and insurance activities	1,1 %	1,9 %
Unspecified	1,0 %	1,0 %
<b>Total sum</b>	<b>100,0 %</b>	<b>100,0 %</b>

Figure 8 – Employment growth by industry groups, 2008–2014

Figure 8 demonstrates that the BIN area underperformed in employment growth across all industry groups compared to the total for Norway, Sweden and Finland. Employment growth in education was 1.3% in the BIN area compared to an average for Norway, Sweden and Finland of 6.4%. Human health and social work saw an increase of 6.2% in the BIN area, as opposed to 8.4% in total for Norway, Sweden and Finland. Industrial activities decreased by 5.0% in the BIN area and by 6.8% in total for Norway, Sweden and Finland. The growth in other service activities was the largest out of all industry groups, compare 11.2% in the BIN area to 12.3% in total for Norway, Sweden and Finland. Public administration, defense and social security grew by 7.5% in the BIN area and by 8.2% in total for Norway, Sweden and Finland. Trade, transport, communication, real estate and business activities grew by 0.5% in the BIN area as opposed to a 3.3% in total for Norway, Sweden and Finland. Results from Figure 8 indicate a growing role for the service economy in the BIN area as well as in the Norway, Sweden and Finland, and a decreasing role of industrial activities.

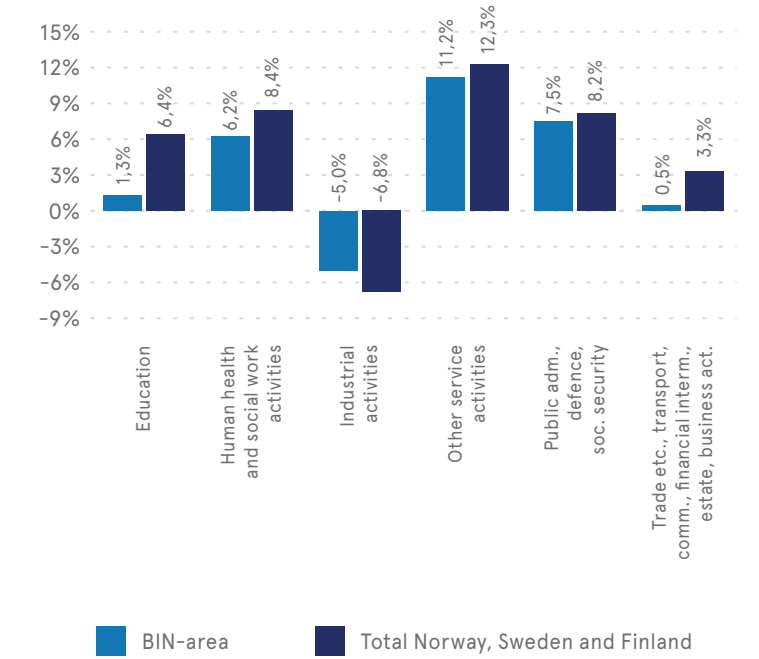


Figure 9 – Job creation and losses in the BIN area, 2011–2014

Figure 9 provides an industry breakdown analysis of the total job creation in the BIN area during 2011–2014. The biggest job loss is observed in mining, quarrying and manufacturing (4,444 jobs), followed by agriculture, forestry and fishing (2,270 jobs). Job losses in agriculture, forestry and fishing reflect the process of urbanization in the BIN area, combined with the modernization of the industry. The biggest contributors to job creation have been the real estate, professional, scientific and technical sector (1,984 jobs), followed by public administration, defense and social security (1,886). This indicates an increased demand for high-skilled labor in the BIN area, as well as public sector domination in job creation on the labor market.

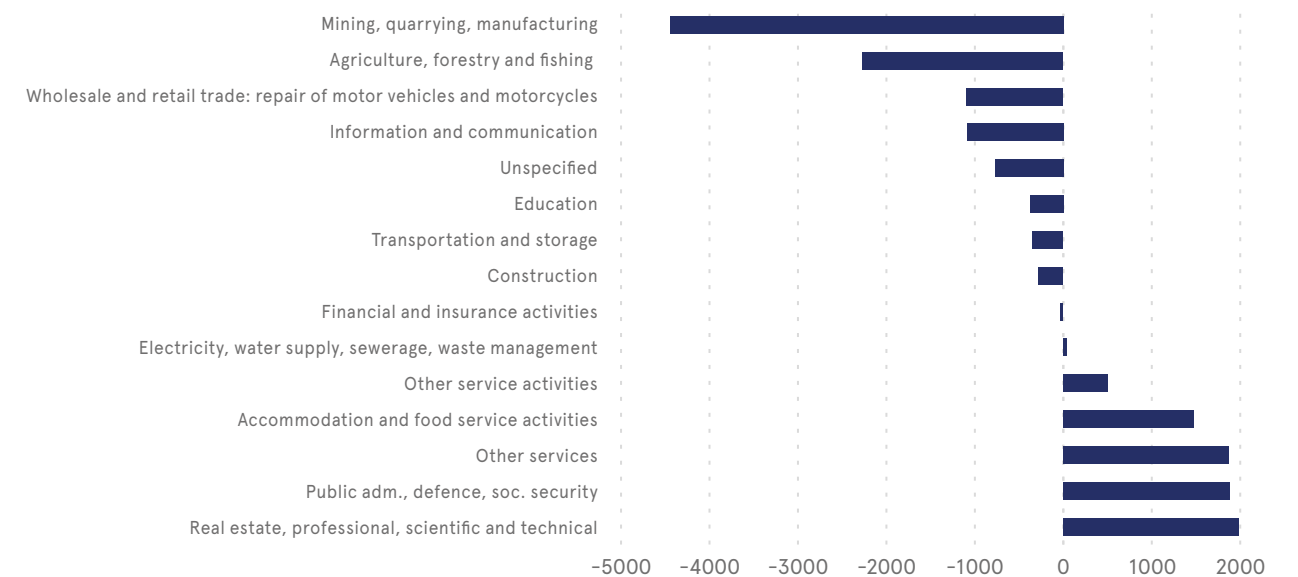




Figure 10 – Job creation and losses for males in the BIN area, 2011–2014

Figure 10 provides an overview of job creation for males in the BIN area during 2011–2014. For males, the biggest job loss occurred in the mining, quarrying and manufacturing sector (3,556 jobs) accounting for 50% of all jobs lost. The highest job creation has been observed in the highly –skilled real estate, professional, scientific and technical sector (1,300 jobs).

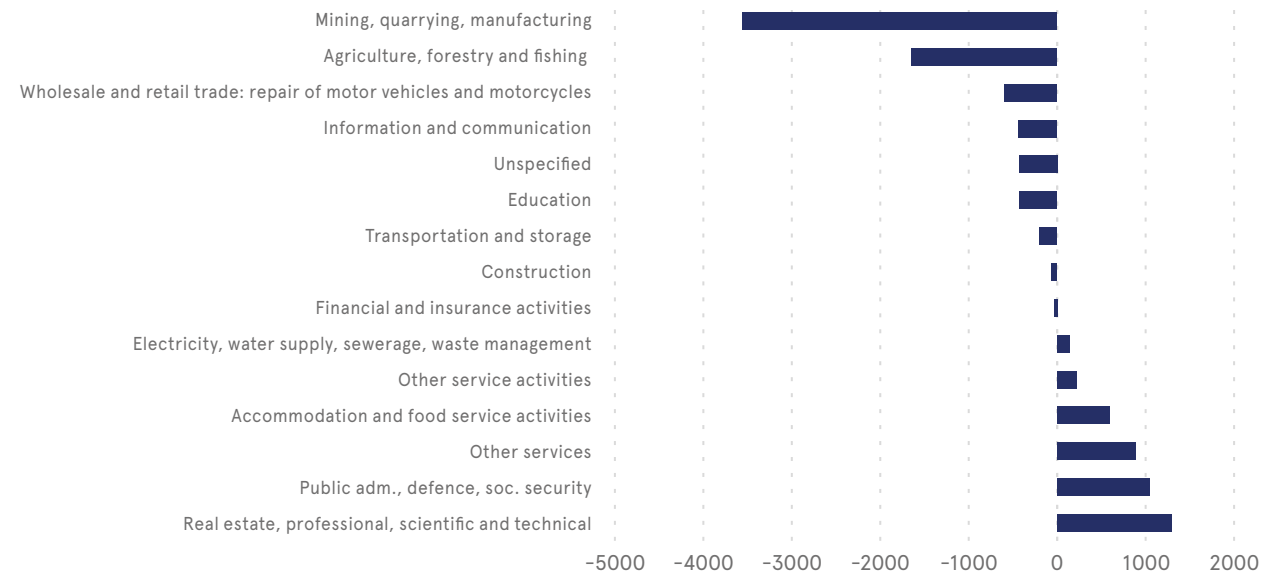


Figure 11 – Job creation and losses for females in the BIN area, 2011–2014

Similarly, Figure 11 provides an overview of job creation for females in the BIN area during 2011–2014. For females, the biggest job loss occurred in the mining, quarrying and manufacturing sector (888 jobs), followed by wholesale and retail trade (658). Job losses for females were distributed more evenly across all the industries. The highest job creation has been observed in the tertiary sector of the economy, corresponding to 1,281 jobs in other services.

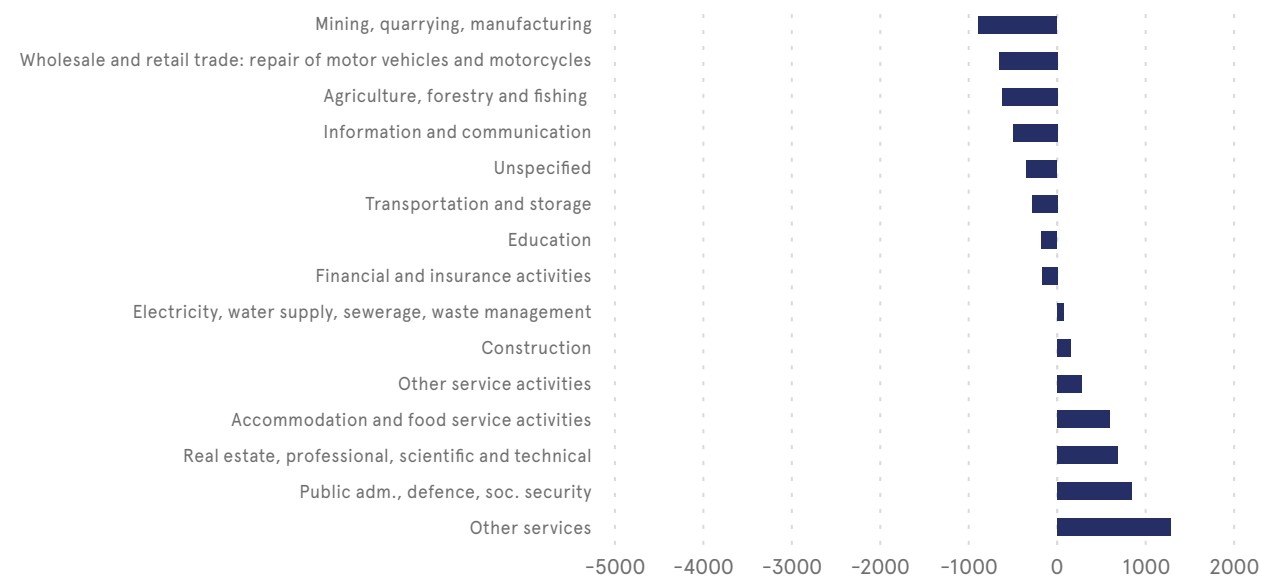


Figure 12 – Employment development (all industries), 2011–2014, %

Differences in employment development (all industries) in the BIN area are depicted in Figure 12. Employment decreased in Finland in total (-3.4%) and in all the BIN area counties, especially in Kainuu (-8.7%). This reflects job losses in the forestry sector in Kainuu county. In Norway and Sweden, employment grew by around 3%. Troms county in Norway showed growth in employment of 3.1%, while Nordland (0.8%) and Finnmark (1.2%) experienced growth well below the national average of 3.4%. In Sweden, Västerbotten county had a growth 2.8%, while Norrbotten county with its growth of 3.7% outperformed the national average of 3.1%.

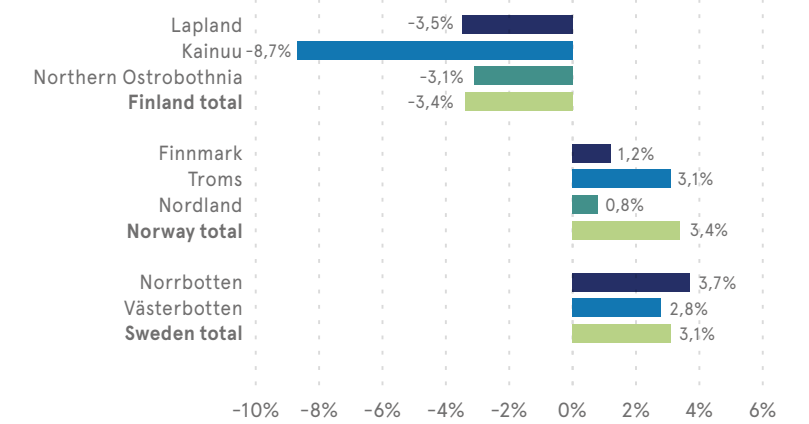


Figure 13 – Employment development (all industries except agriculture, forestry and fishing), 2008–2014, %

Figure 13 demonstrates a trend in employment development when controlled for agriculture, forestry and fishing. In Finland, all counties had a negative trend during 2008–2014, while Northern Ostrobothnia county performed better (-2.1%) than the national average of (-3.9%). In Norway, positive employment development across all BIN counties is observed in the industries excluding agriculture, forestry and fishery, supporting the view of a diminishing role of this sector in employment. In Sweden, there was no significant impact of agriculture, forestry and fishery on the employment development, with growth rates ranging from 3.6% to 5% in the BIN counties of Norrbotten and Västerbotten.

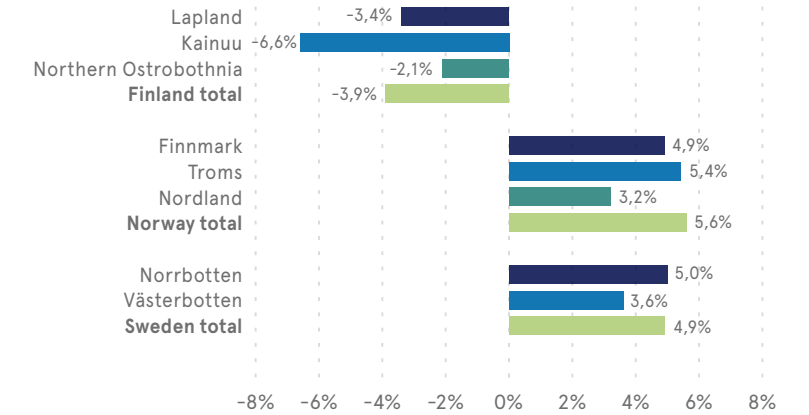


Figure 14 – Employment development (all industries) by gender at the BIN county level, 2011–2014, %

Figure 14 shows employment development by gender during 2011–2014 for all industries. In Finland, employment for males worsened dramatically, especially in the Kainuu county (-12.1%), reflecting job losses in a traditionally male-dominated industry sector within agriculture, forestry and fishery. In Norway, employment in the BIN counties of Troms, Nordland and Finnmark was more favorable for males, ranging from 2.2% to 4.2% growth during 2011–2014, signaling better employment opportunities for males when agriculture, forestry and fishery are included in the analysis. The country-specific profile should be considered when interpreting these results, e.g. fishery is particularly important for Norway, while forestry is important for Finland. In Sweden, on the other hand, employment was more favorable for females, e.g. Västerbotten (3.2%), Norrbotten (4.3%). This result can be interpreted as more equality-based employment opportunities in the Swedish BIN counties than in its Finnish and Norwegian counterparts, even in the male-dominated industries.

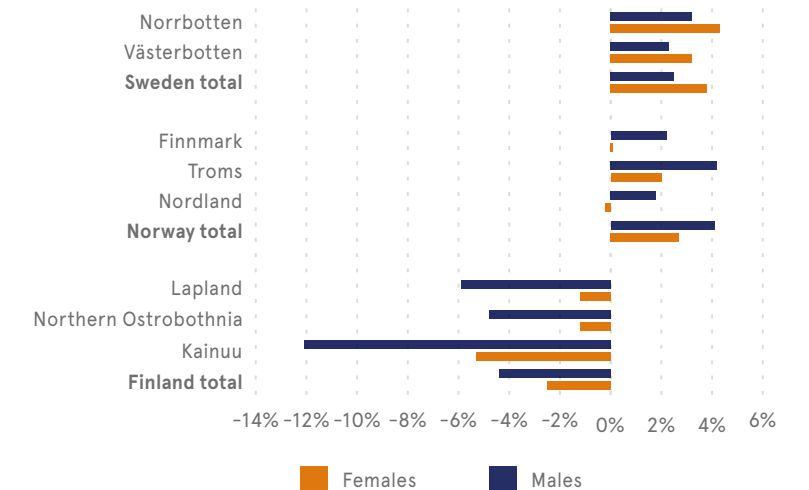


Figure 15 – Employment development (all industries except agriculture, forestry and fishing) by gender at the BIN county level, 2008–2014, %

Figure 15 provides a view on employment development by gender during 2008–2014, when the effect of agriculture, forestry and fishing is removed. In Finland, negative employment development is observed for both genders during 2008–2014, with the only exception being Northern Ostrobothnia county, where employment for females was favorable, with 0.6% compared to the national average of -2.1%. In the Norwegian BIN counties, employment for males was comparable to the national average of 6.4%, while for females it was weaker in Nordland (2.4%) and Finnmark (2.1%) counties when compared to the national average of 4.9%. In Sweden, employment development for males was more favorable in Norrbotten (5.8%) and less favorable in Västerbotten (2.5%), compared to a Swedish national average of 4.4%. For females, employment in the Swedish BIN counties was positive (4.2% and 4.7%), but still below that of the national average (5.5%).

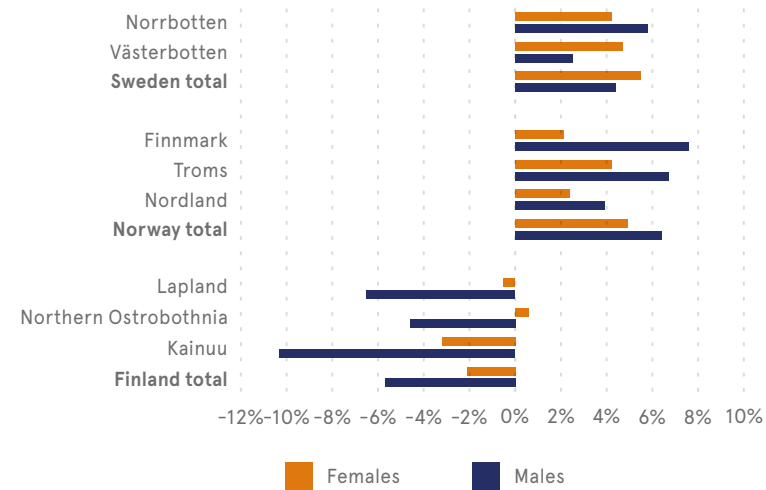


Figure 17 – Employment development by gender in age group 25- 54 years, (all industries except agriculture, forestry and fishing), 2008–2014, index 2008 = 100

Figure 17 provides an overview of employment development (all industries except agriculture, forestry and fishing) for the age group 25–54 for males and females separately. Employment for age group 25–54 in the BIN area has worsened by 2.3% for females and 2.8% for males, while in Norway, Sweden and Finland as a whole it continued to grow during 2008–2014.

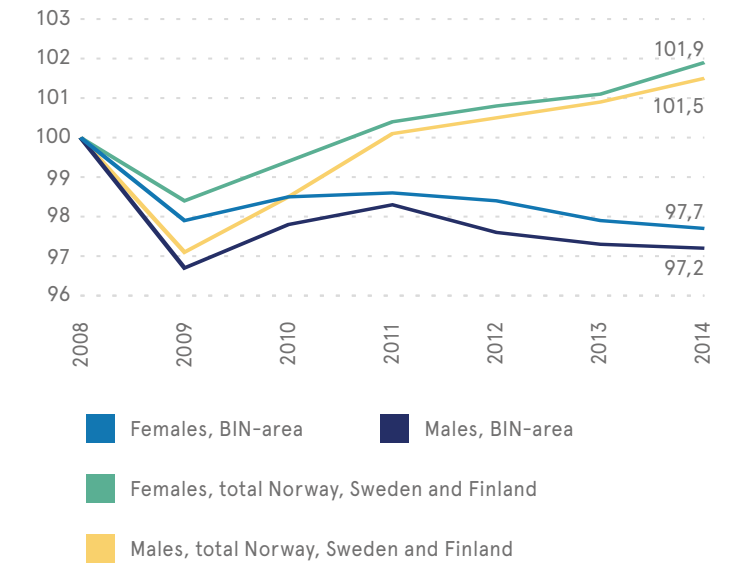


Figure 16 – Employment development by gender in age group 16 – 24 years, (all industries except agriculture, forestry and fishing), 2008–2014, index 2008 = 100

Figure 16 provides an overview of employment development (all industries except agriculture, forestry and fishing) for the age group 16–24 for males and females separately. On average, youth employment in the BIN area has been better for both females (4.3%) and males (2.2%), while the total for Norway, Sweden and Finland has averaged around 0.5% for females and (-2.7%) for males during 2008–2014.

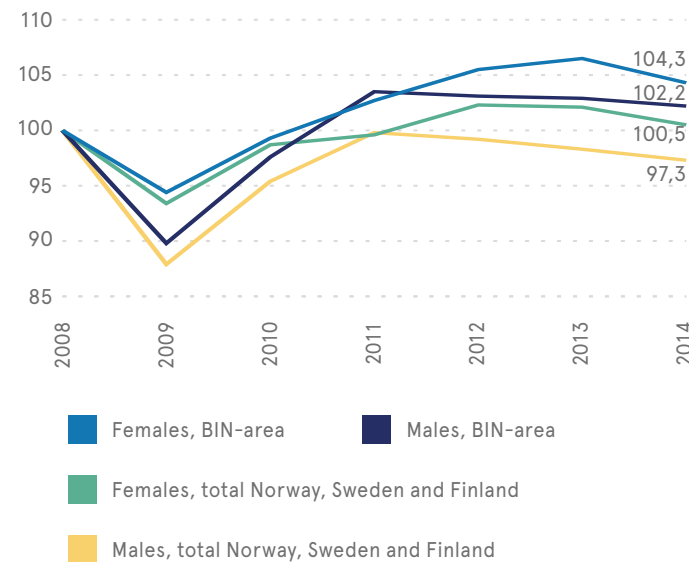


Figure 18 – employment development by gender in age group 55+ years, (all industries except agriculture, forestry and fishing), 2008–2014, index 2008 = 100

Figure 18 provides an overview of employment development (all industries except agriculture, forestry and fishing) for the age group 55+ for males and females separately. The BIN area outperformed Norway, Sweden and Finland as a whole during 2008–2014, with female employment growth as high as 16.5% and male employment growth as high as 13.4%, while the total for Norway, Sweden and Finland was 9.8% for females and 8.5% for males. These dynamics corresponds to the rapidly ageing population in the BIN area.

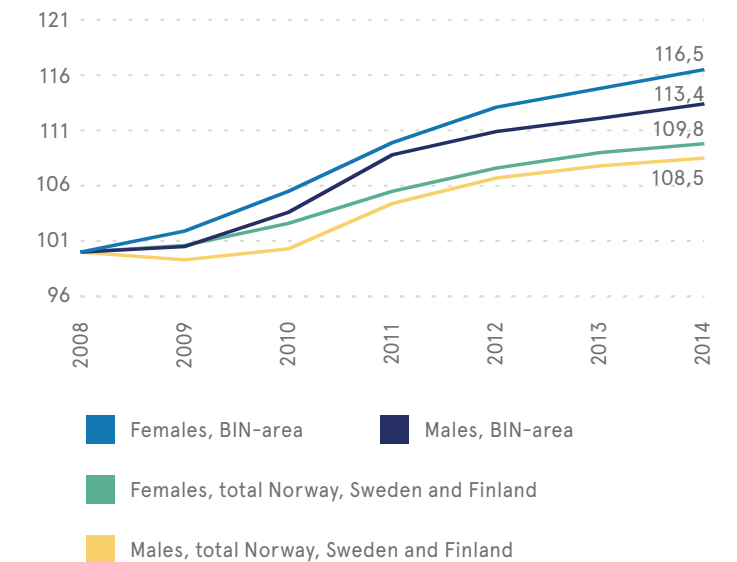


Figure 19 – Employment development by gender in age group 16–24 years at the BIN county level, (all industries except agriculture, forestry and fishing), 2008–2014, index 2008 = 100

Figure 19 provides an analysis of youth employment (all industries except agriculture, forestry and fishing) in the BIN area on a county level during 2008–2014. While the index in Figure 16 demonstrated positive dynamics in employment for the age group 16–24 on average, the county level analysis revealed high discrepancies on the county level. Finland and its BIN area counties had a large deficit in youth employment development, especially for males (e.g. -13% for males in Lapland) that also reflects the trends in unemployment. At the same time, Norwegian and Swedish BIN area counties have performed in creating employment for youth much better than their respective national averages. For example, Troms had 11% increase in male employment and Norrbotten county had 22.8% increase in female employment. This phenomenon deserves a deeper analysis in order to compare governmental actions and other initiatives (e.g. training opportunities, start-up grants, government subsidies for hiring recent graduates) that might have influenced favorable employment development for youth in the Norwegian and Swedish BIN counties.

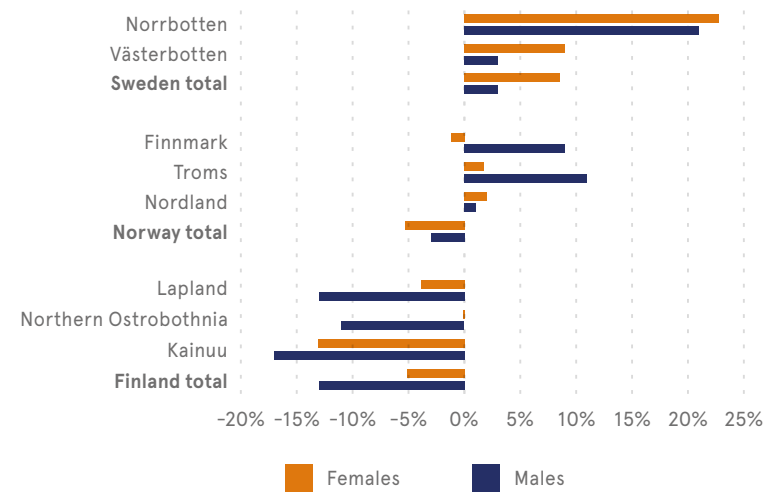


Figure 21 – Employment development by gender in age group 55+ years at the BIN county level, (all industries except agriculture, forestry and fishing), 2008 – 2014, index 2008 = 100

Figure 21 illustrates employment in age group 55+ (all industries except agriculture, forestry and fishing) in the BIN area on a county level during 2008–2014. All BIN counties had a positive growth in employment development for the age group 55+, while Finnish counties succeeded in increasing employment for females in the range of 23–25%. Norwegian counties in the BIN area followed the national averages in employment, 15–16% for females and males aged 55+, with Finnmark slightly underperforming with its 11–13%. In Sweden, employment for females and males aged 55+ was more favorable in the counties of Västerbotten and Norrbotten than in the whole country on average

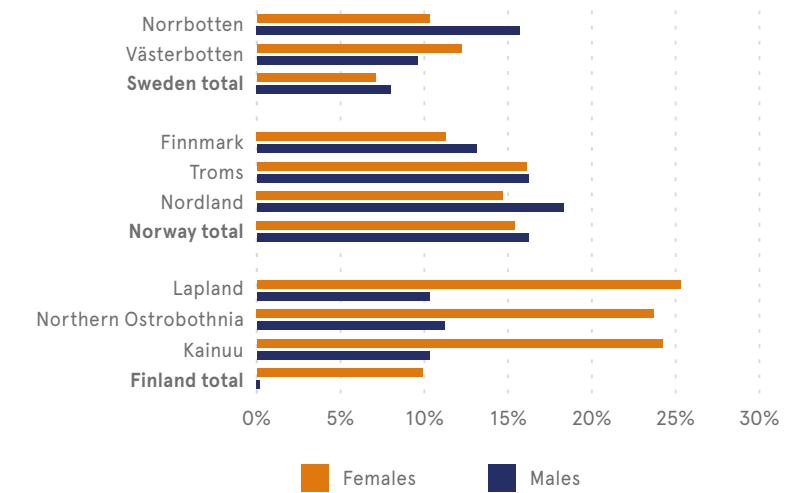
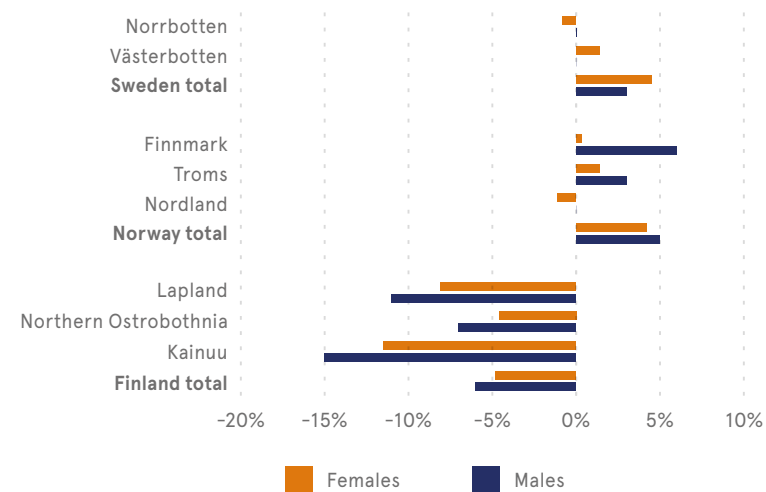


Figure 20 – Employment development by gender in age group 25–54 years at the BIN county level, (all industries except agriculture, forestry and fishing), 2008–2014, index 2008 = 100

Figure 20 demonstrates employment in age group 25–54 (all industries except agriculture, forestry and fishing) in the BIN area on a county level during 2008–2014. In Finland, employment in the BIN area counties weakened in comparison with the national average, e.g. Northern Ostrobothnia county's labor market suffered from redundancies in the ICT field. In Norway, only Finnmark county performed better in male employment (6%) for 25–54-year olds, while other BIN area counties underperformed. The same pattern is observed in Sweden, where Norrbotten and Västerbotten had near to zero or as low as 1% growth in employment, compared to a growth of 3–4.5% on average in Sweden.



## Implications

The chapter on Employment provides a statistical analysis that can be used to evaluate trends in unemployment rates, employment rates and employment development within industries and age groups. County-level analysis brings additional value when counties in the BIN area can be benchmarked against each other. One of the limiting factors of this analysis is industry groupings that do not allow identifying the effects of individual industries, such as, for instance, forestry and agriculture. Learning from neighboring countries and their country and regional policies can shed light on how to create a functioning future labour market in the BIN area. Therefore, we introduce the following recommendations for policy makers and businesses. Job creation requires assessment of changing work and consumption patterns. The BIN area requires new thinking, tools and policies to exploit the potentials for job creation. The BIN area should work jointly towards the goals of developing its labor market.

### For policy makers:

- Job creation in the BIN area should be addressed within the potential of the BIN area that has great skilled-labor supply
- Simulate positive experiences from other counties, e.g. finding out how the Swedish BIN counties succeeded in youth employment for the age group 16–24

- Education systems should address how to generate competences that will match the job demands of the future
- A non-standard form of employment (such as job-sharing, crowd or on-demand work) creates challenges for traditional work patterns. The emergence of these forms of employments should be addressed on a regulatory level in order to ensure protection of workers in these areas

### For business:

- Business opportunities for companies that require highly-skilled workers
- Expansion of service economy in the North creates investment opportunities and stimulates start-ups in related industries
- The European Commission announced an Investment Plan (2014) that addressed stimulating employment through private sector investment. The aim of the plan is to ensure that small enterprises benefit from the projects and indirectly through credit guarantee schemes and improved access to credit in general. This plan provides conditions for larger private-sector involvement in the development of the economy





Photo: iStock

## Innovations

“The Stone Age did not end because humans ran out of stones. It ended because it was time for a re-think about how we live.”

William MacDonough, American designer

Innovation has crucial importance for the industry competitiveness and it is recognized as the most important driver of economic growth. Nordic Innovation – an international institution promoting business sector innovations - defines innovation as new products, services, markets, processes or organizational models that create financial benefits or otherwise are of value to society. This chapter assesses innovative capacity of businesses within the BIN area. According to the Institute for Strategy and Competitiveness at Harvard Business School, the innovative capacity of a nation or region is heavily rooted in its microeconomic environment, in areas such as the intensity of scientists and engineers in the workforce, the degree of protection of intellectual property, and the depth of clusters. Patenting activity, associated with protection of intellectual property, is one of the key indicators of companies' innovative capacity for development of new competitive products. We use this indicator to measure the innovative capacity of companies operating in the BIN area. In our analysis, we utilize patent applications submitted to the European Patent Office (EPO) and national industrial property offices (patent offices) in Norway, Sweden, and Finland. We consider patent applications statistics over a long term from the early 1990's to 2014–15, look into the ownership structure of the patents, and trace their technical specifications. Our key findings are as follows:

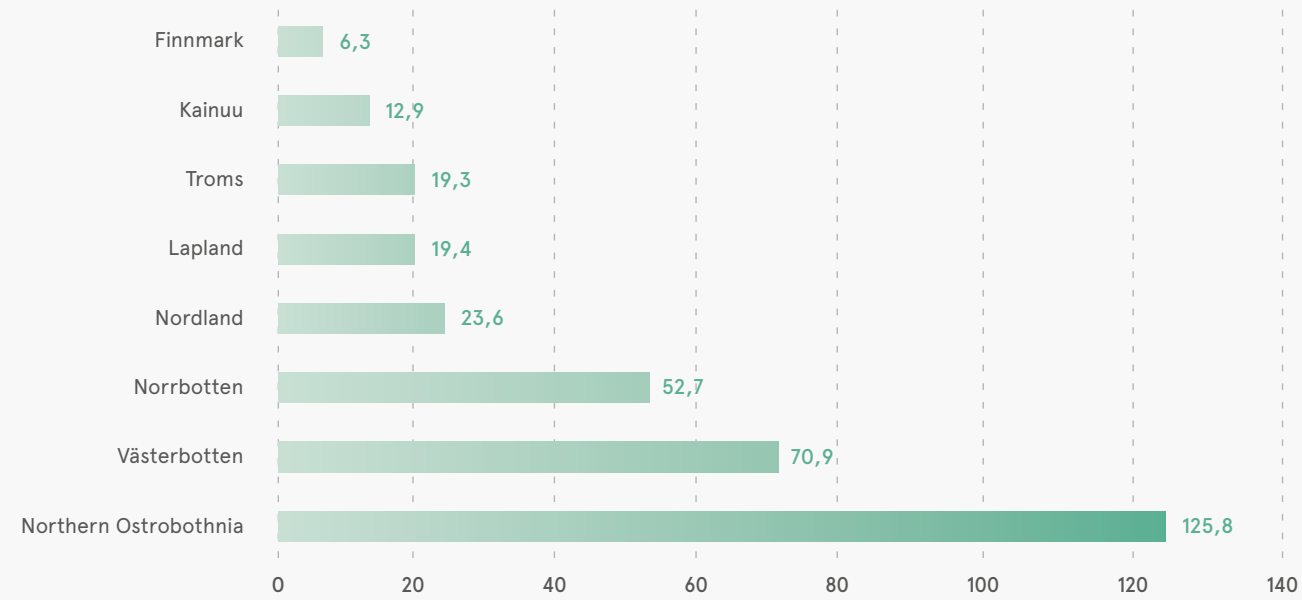
- Three of eight BIN counties - Northern Ostrobothnia, Norrbotten and Västerbotten have a relatively high level of patenting activity. The level of patenting activity in the five other counties (Nordland, Troms, Finnmark, Lapland, and Kainuu) is rather low.

- EPO patents made in Northern Ostrobothnia and Norrbotten have a low degree of local ownership. For each region, proprietors of around 80 % of patents applied for are companies headquartered outside. The degree of local ownership in Västerbotten is about 58%.
- Besides externally owned innovations, there is still a substantial number of local innovative companies and entrepreneurs in the BIN counties. These companies may benefit from cross-border cooperation and focused political support with a suitable degree of coordination by a third party.
- Potential areas for cooperation between the local BIN innovative companies are: electric communication, computing and calculating, measuring, electric elements, medical or veterinary science and hygiene, vehicle engineering and mechanics, handling and processing, construction engineering, and solutions to deal with human necessities.

The remainder of this chapter is structured as follows: We start with patenting trends overview and then move on to the analysis of the industrial property ownership in the BIN area. Further, we present our findings regarding common front-edge competence areas for the BIN companies. The chapter ends with an outline of possible practical implications of our analysis, as well as a note on its limitations and opportunities for further studies.

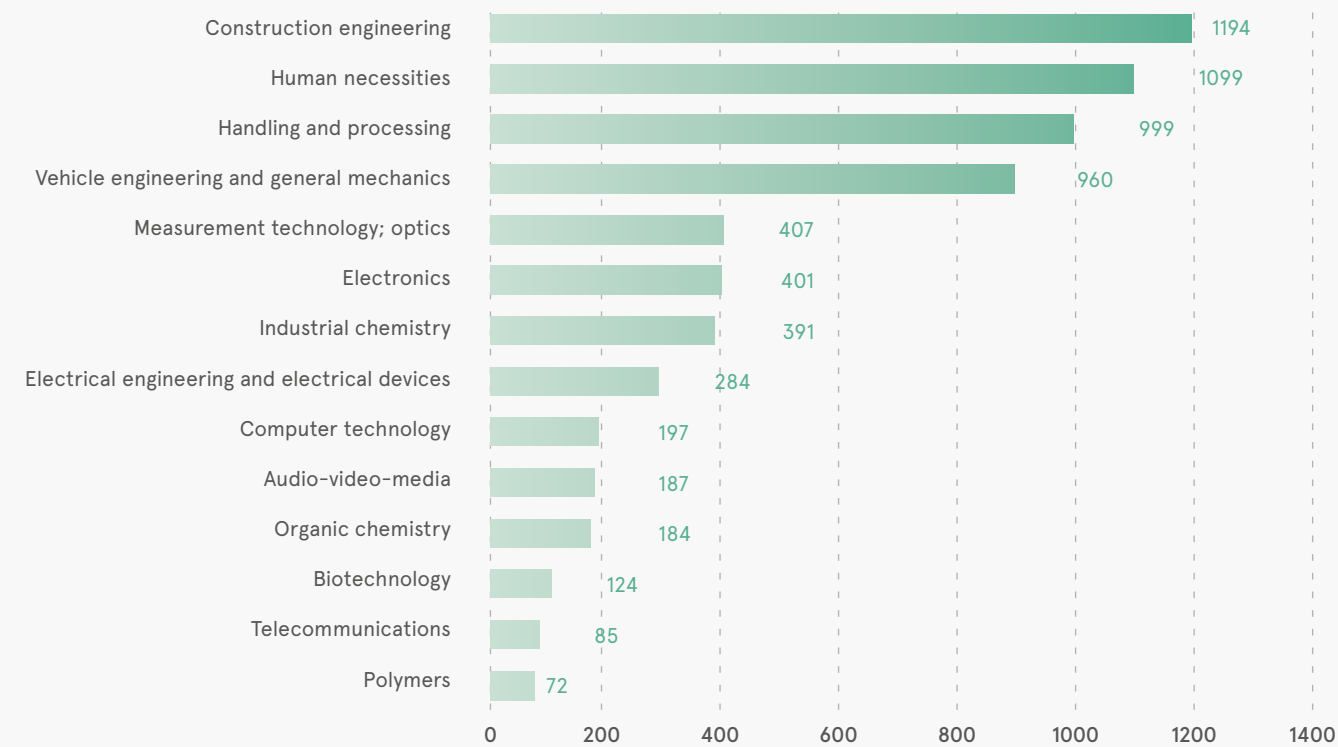
### Ranking – patenting activity in the BIN area

Average number of European and national patent applications per year



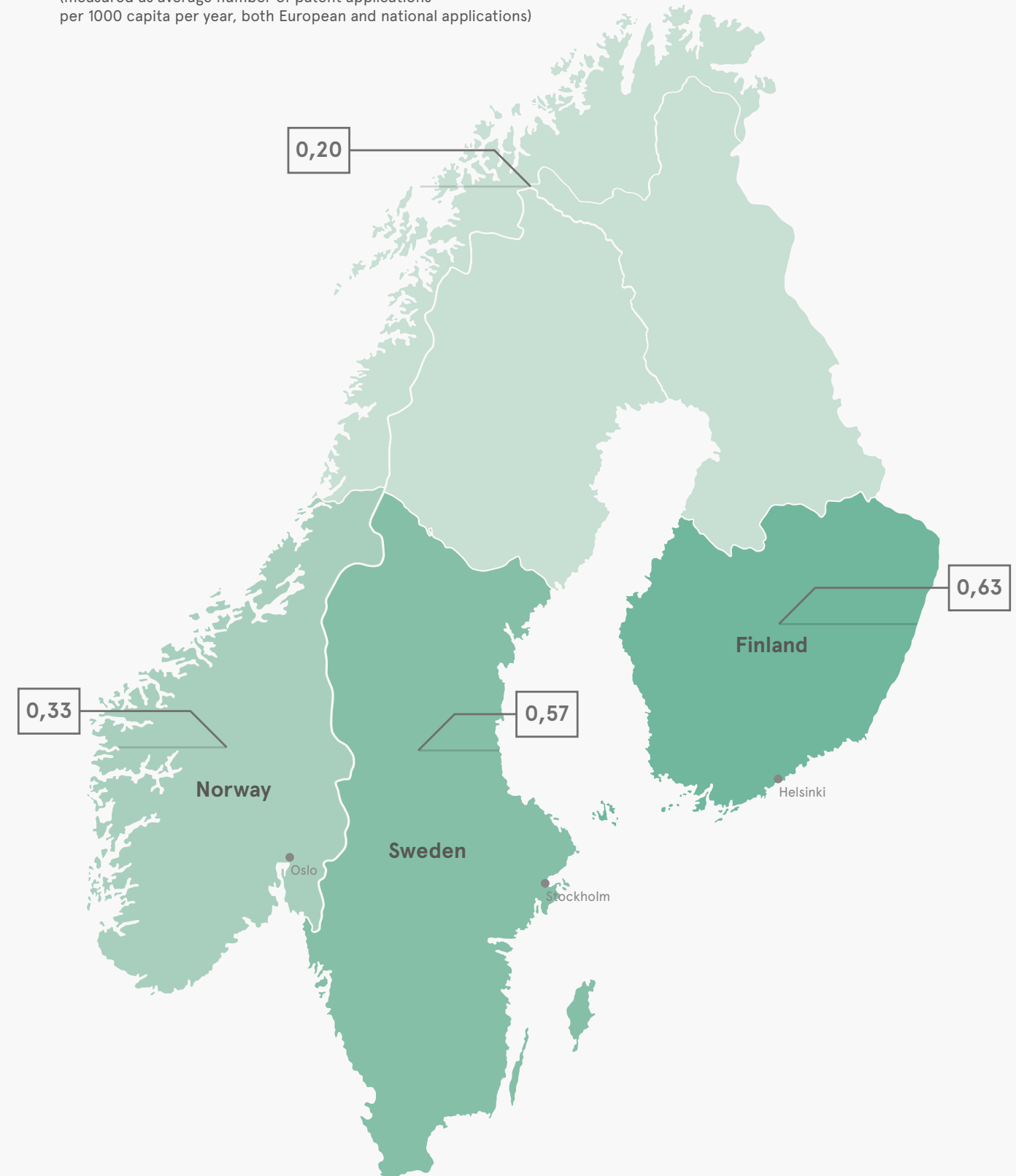
### Types of technology developed and patented – BIN area

Number of applications to national patent offices the last 25 years



### Intensity of patenting activity in the BIN area compared to countries averages.

(measured as average number of patent applications per 1000 capita per year, both European and national applications)

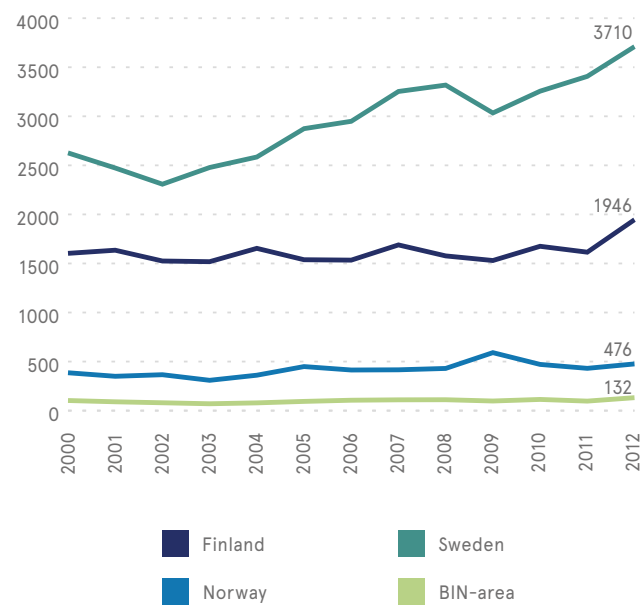


# Trends overview

Patenting can be done through either international, regional or national offices. The protection of property rights in the European region (through EPO patenting) is a characteristic way for local businesses to develop front-edge products and technologies demanded in markets far beyond their physical geographic location<sup>1</sup>. The protection of intellectual property rights in the European market by Nordic countries has gained importance since joining the EU Patent Convention in 1996. The annual number of European patent applications submitted to EPO after 2010 has increased nearly 4 times in Sweden and Finland and doubled in Norway compared to the early 1990s. In addition to this, Nordic applicants tend to use their national patent offices both as a point of destination for acquiring a national patent and as an entry to the filing rout towards international patent authorities in Europe and beyond. The number of applications to the national patent offices has declined during the recent decade in Finland and Sweden, but remained rather stable in Norway. Historically, the total number of patent applications (both European and national ones) has been highest in Sweden and lowest in Norway, with Finland placed in between.

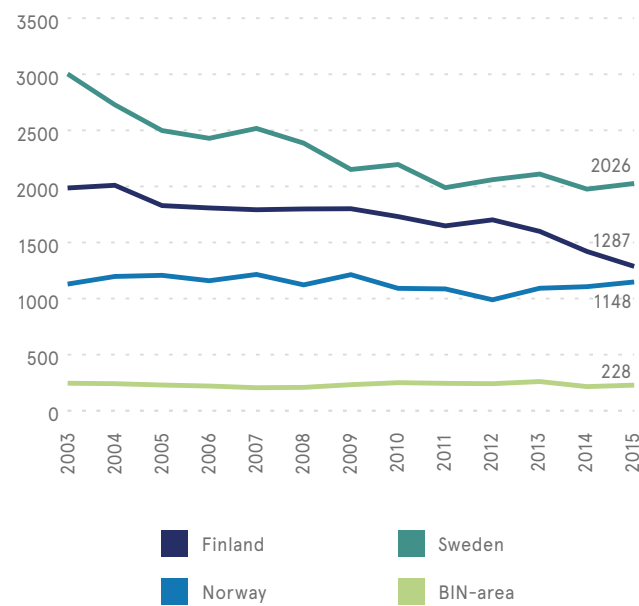
The total number of both EPO and national patent applications from the BIN area is significantly lower than the total for any Nordic country to which BIN counties belong (figures 1 and 2).

Figure 1 – Patent applications to the EPO (2000–2012)



The figure shows the sum of direct applications to EPO and international applications submitted to EPO (regional phase), based on priority date timescale (date of “conceiving” the actual invention). Background data source: OECD patent statistics.

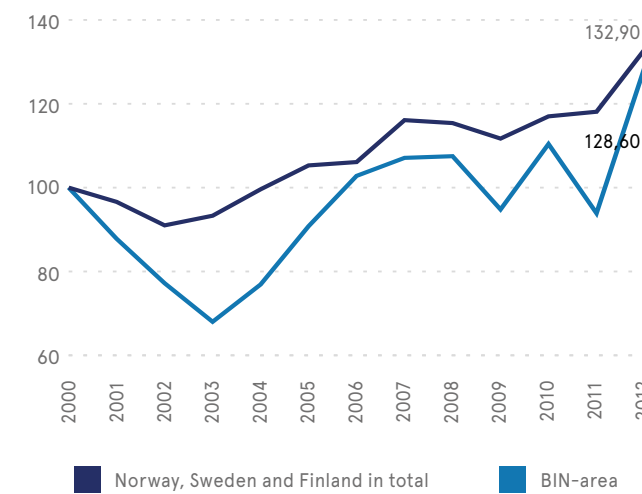
Figure 2 – Patent applications to national offices



The figure shows the sum of direct and PCT national phase applications by country residents, based on the year of filing. Background data sources: National industrial property offices in Finland, Norway, and Sweden.

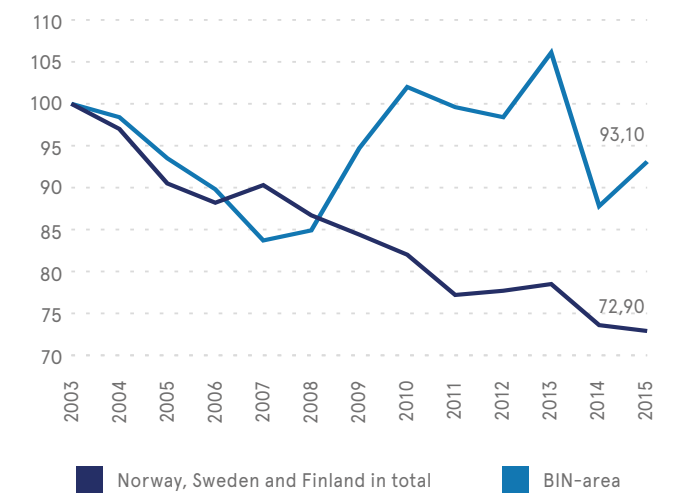
Figure 3 compares development in the number of applications to EPO in the BIN-area as well as the total for Norway, Sweden and Finland. The international orientation of the BIN area innovators is generally progressing along with the general trend for Sweden, Finland and Norway. Although the growth for the BIN area is not as steady<sup>2</sup> as for the three countries’ totals. Figure 4 shows that in 2003–2008, the number of national patent applications from the BIN area was declining along with the general trend for Norway, Sweden, Finland, while in 2009–2015 the BIN innovators were more oriented towards protecting property rights on the national markets than the three countries in general. A possible hypothesis for future research based on this last observation is whether the BIN innovators are companies with niche products seeing opportunities in the domestic markets.

Figure 3 – Development in number of applications to EPO: BIN-area and total for Norway, Sweden and Finland (2000–2012). Index 2000 = 100%



The figure shows the sum of direct applications to EPO and international applications submitted to EPO (regional phase), based on priority date timescale (date of “conceiving” the actual invention). Background data source: OECD patent statistics.

Figure 4 – Development in number of applications to national patent offices: BIN-area and total for Norway, Sweden and Finland (2003–2015). Index 2003 = 100%



The figure shows the sum of direct and PCT national phase applications by country residents, based on the year of filing. Background data sources: national industrial property offices in Finland, Norway, and Sweden.

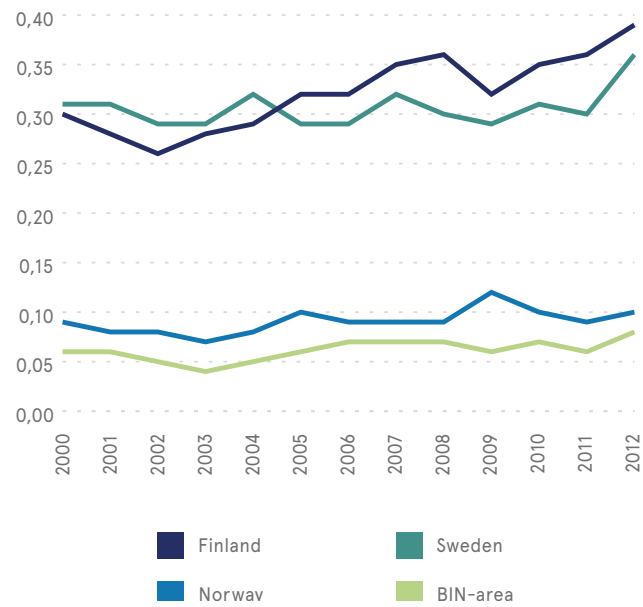
<sup>1</sup> The number of EPO applications is used here as an indicator of international orientation of companies. However, only the national validation figures would give a precise measure of in which countries patents are actually entering into force.

<sup>2</sup> Consider “drops” for the BIN area in 2003, 2009, 2011 shown on the figure 3. Relatively low volume of total patenting activity may be a reason for less smooth shape of the development line.



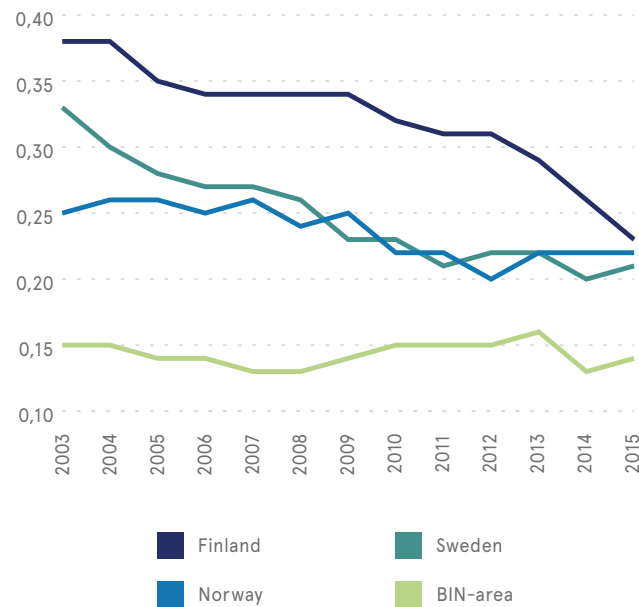
Intensity of patent applications is measured as patent applications to EPO or national offices per thousand capita. Figure 5 shows that patent intensity in the BIN area is below any Nordic country represented, compare 0.08 in the BIN area in 2012 with Finland close to 0.4. Patent intensity to EPO for Sweden and Finland is at least three times higher than in Norway. Low patent intensity in the BIN area is observed for both EPO and national patent applications (figures 5–6). Lower intensity of patent application can be attributed to a lower population in the BIN area compared to Norway, Finland, and Sweden in general. For inventions patented at the national offices, intensity in Finland has generally been higher than in Norway and Sweden (those two have been at approximately the same level) but seems to have dropped since 2012 (figure 6).

Figure 5 – Patent applications to EPO per 1000 capita



Data sources: OECD, national patent offices and statistics offices in Finland, Norway, Sweden

Figure 6 – Patent applications to national offices per 1000 capita



Analysis at the county level demonstrates that Northern Ostrobothnia, Norrbotten and Västerbotten are leaders within the BIN area in terms of patent applications (Figure 7). The intensity of patent applications from these three counties put together is still lower than total for Norway, Sweden, and Finland, but higher than for Norway (Compare these three regions presented in figure 7 with the same indicator for Norway shown on the figures 5 and 6). The intensity of EPO applications grew in these three BIN regions along with the trend for Norway, Sweden, and Finland. The intensity of national patent applications for the three countries is clearly declining (perhaps due to increased internationalization of businesses).

Data sources: OECD, national patent offices and statistics offices in Finland, Norway, Sweden

Figure 7 – Patent applications to national offices and to EPO per thousand capita, 2000–2012, total for Norway, Sweden, Finland and total for Northern Ostrobothnia, Norrbotten and Västerbotten

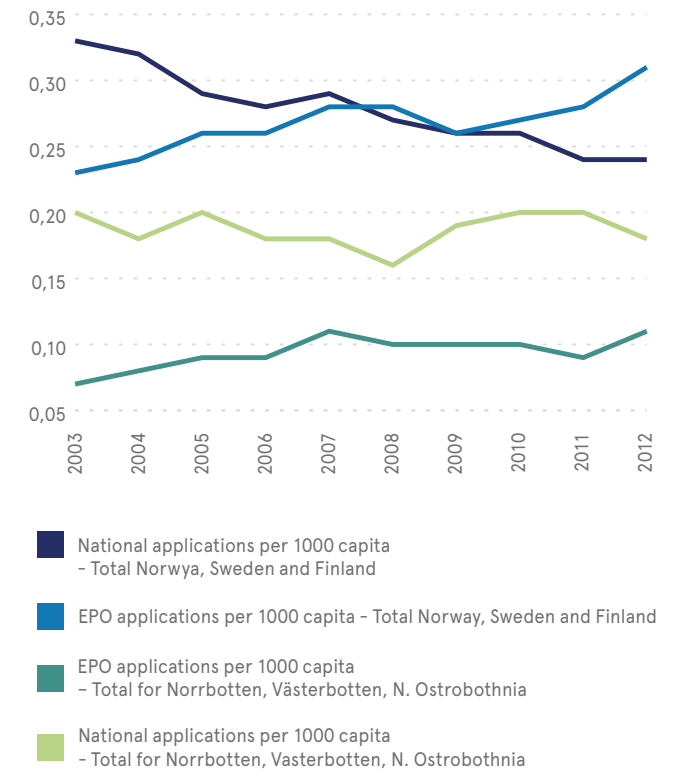
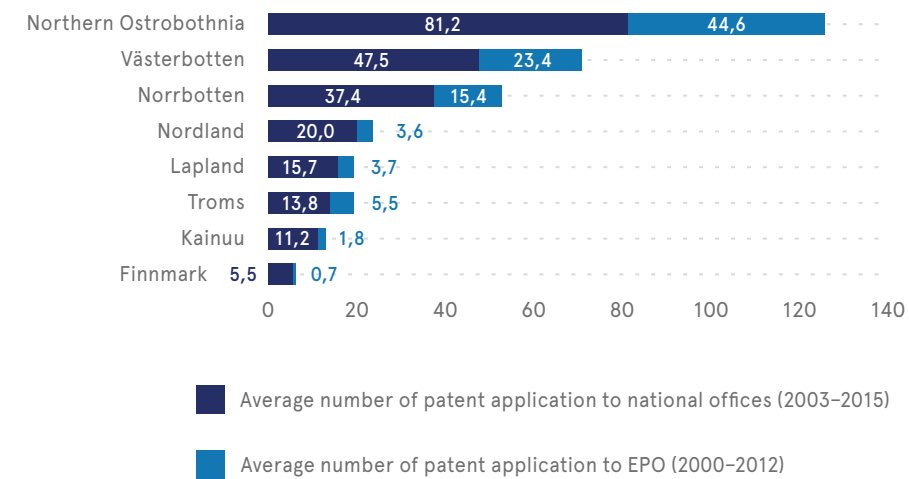


Figure 8 – Average number of patent applications per year – BIN-regions



Northern Ostrobothnia has the highest average number of applications per year in the BIN area, followed by Norrbotten and Västerbotten; the level of patenting activity in the rest of the BIN area (Nordland, Troms, Finnmark, Lapland, and Kainuu) is rather low.

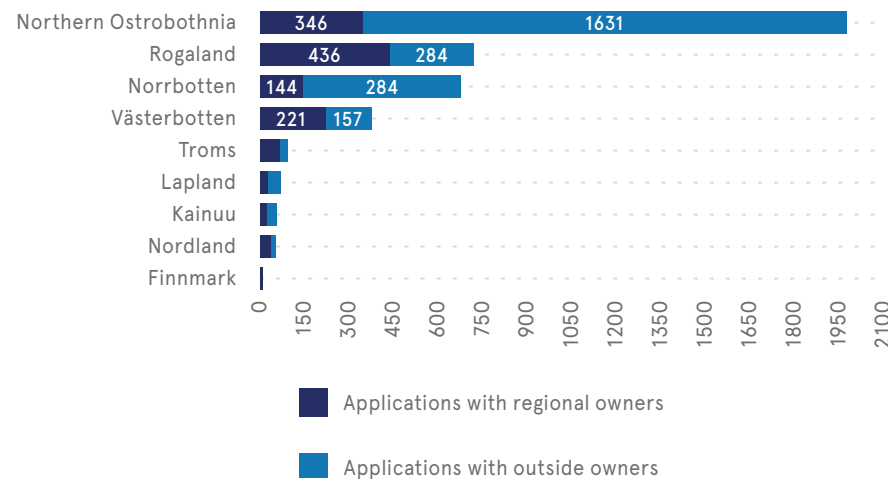
About 75 % of BIN patent applications (total for EPO and national offices) come from Northern Ostrobothnia, Norrbotten and Västerbotten. In these regions, the share of EPO applications in total number of applications (sum of EPO and national ones) is at least 30% (in the rest of the BIN area it is less than 20%).

The figure shows averages for both EPO and national patent applications. Data sources: OECD, national industrial property offices in Finland, Norway, Sweden. Average numbers of applications per year are calculated for a 13 years period (2003–15 for national applications, and 2000–2012 for EPO applications).

# Intellectual property ownership in the BIN-area

According to the EPO classification, the applicant is proprietor - owner of the invention. The owner can be either a company(/ies) or an individual(s). The inventor is an individual(s) who conceived the invention. In our analysis, we focused on the EPO applications during 1996–2014 assigned to the BIN counties, and traced those with inventor and owner (applicant) from the same county and those with regional inventor but an outside owner.

Figure 9 – EPO patent applications (1996–2014) with inventors from BIN counties and owners – residents and non-residents to BIN counties



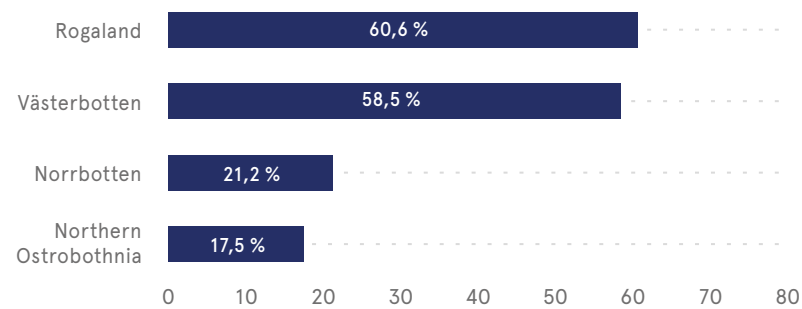
The figure shows the total number of applications to EPO from each BIN region in 1996–2014. The inventors assigned to the applications are residents of the BIN counties. The applications are classified into having regional and outside owners respectively (residents and non-residents). Data source: EPO database EPAB with statistics.

The figure illustrates the ownership structure of the patented inventions from the BIN counties. For comparison, we also include Rogaland from South Norway, which is a key region in the Norwegian oil and gas cluster, a good example of a county with rapid economic growth.

Compared to Rogaland (720 applications in total), there is a very high level of invention activity among local entrepreneurs or company employees residing in Northern Ostrobothnia (1,997 applications in total) and a rather good level in Norrbotten (678 applications). Total number of EPO applications with a local inventor in Västerbotten was 378.

The relatively low level of patenting activity in 5 out of 8 BIN regions (Troms, Lapland, Kainuu, Nordland and Finnmark) may put local businesses in danger in the course of global production systems extending to the north.

Figure 10 – Degree of local ownership (%) in Northern Ostrobothnia, Norrbotten, Västerbotten compared to Rogaland



Degree of local ownership is defined as number of patented inventions with proprietors - regional residents divided by total number of inventions made in the county.

Degree of local ownership for the inventions made in Northern Ostrobothnia and Norrbotten is low: 17,5 % and 21,2 % respectively; while it is relatively high in Västerbotten - 58,5% (close to the reference county Rogaland - 60,6%).

The low degree of local ownership signals that commercial results of the inventions (materialized as innovations) are not retained locally.

The other five BIN regions are not included due to rather low total volume and the sparse character of the patenting activity. Although the degree of regional ownership there would be close to 100%, which means lack of R&D investments by larger companies from the outside.

Table 1 – Top owners of the EPO patented inventions and location of their headquarters (HQ)

Norrbotten			Västerbotten		
Top Owners, 72,4% Of Total Applications	HQ	Applications	Top Owners, 31% Of Total Applications	HQ	Applications
Telefonaktiebolaget Lm Ericsson Publ	Non-Resident	398	Swetree Technologies AB	Resident	15
Gestamp Hardtech AB	Subsidiary	30	Telefonaktiebolaget L M Ericsson Publ	Non-resident	13
Telia AB	Non-Resident	25	Sqs Security Qube System AB	Resident	8
Operax AB	Resident	14	Sekab E Technology AB	Non-resident	7
Accra Teknik AB	Non-Resident	13	Stock Of Sweden AB	Non-resident	7
Telia AB Publ	Non-Resident	11	Bioendev AB	Resident	6
Northern Ostrobothnia			Abbott Laboratories		
Top Owners, 72% Of Total Applications	HQ	Applications	Non-resident	5	
Nokia Corporation	Non-resident	730	Bae Systems Haggblunds Aktiebolag	Non-resident	5
Nokia Siemens Networks Oy	Non-resident	186	Betagenon AB	Non-resident	5
Nokia Solutions And Networks Oy	Non-resident	152	Fumex AB	Resident	5
Nokia Networks Oy	Non-resident	144	Komatsu Forest AB	Resident	5
Nokia Telecommunications Oy	Non-resident	104	Bergteamet AB	Non-resident	4
Nokia Mobile Phones Ltd	Non-resident	37	Airgrinder AB	Resident	3
Kemira Oyj	Non-resident	23	Alimak Hek AB	Resident	3
Nokia Technologies Oy	Non-resident	22	Alo AB	Resident	3
Polar Electro Oy	Resident	21	Ascom Network Testing AB	Resident	3
Pulse Finland Oy	Resident	20	Ascom Network Testing Inc	Non-resident	3
			Element Six Pty Ltd	Non-resident	3
			Konftel AB	Resident	3
			Li Haibo	Resident	3
			Omnio Healer AB	Resident	3
			Outotec Oyj	Non-resident	3
			Umecrine AB	Resident	3

Data source: EPO database EPAB & Statistics

The top owners (close to 70 % of total applications) in Norrbotten and Northern Ostrobothnia are multi-national telecommunication companies headquartered in Stockholm (Ericsson) and Espoo in the Greater Helsinki metropolitan area (Nokia). Although these companies are non-residents to the regions in focus, they are originally from the same countries as the regions (Nokia is Finnish and Ericsson is a Swedish company, respectively).

Local innovative companies worth mentioning are Polar Electro and Pulse Finland, both based in Kempele (Northern Ostrobothnia, Finland). A Norrbotten-based innovative company, Gestamp Hard-Tech AB (30 applications), manufactures safety components for car manufacturers in Europe, North America, and Asia.

Today this company operates as a subsidiary of a Spanish-based group. However, the company was established locally, in Luleå (Norrbotten), in 1990.

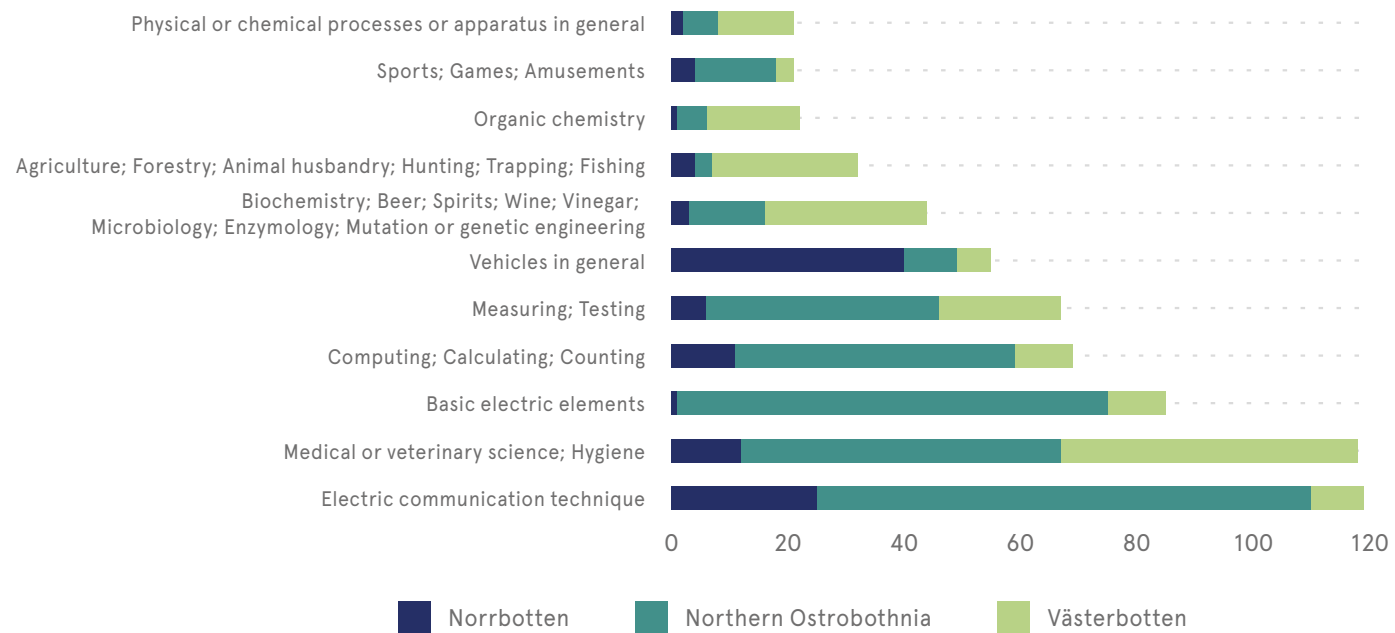
The region of Västerbotten has a dispersed ownership profile. There, top owners of inventions (with 3 or more patent applications per company) cover 30 % of the total and are either resident or non-resident companies. The largest innovator is a resident company, Swetree Technologies (15 applications), specializing on forest biotechnology innovations. 70 % of the EPO patent applicants in the region of Västerbotten had 1 or 2 EPO applications during the period extending from 1996–2014.

# Front-edge areas of the local companies

Besides externally owned innovations, there is a substantial number of local innovative companies and entrepreneurs - residents of the three high performing BIN counties. Through our analysis of the EPO patent applications filed by residents of these counties, we identified 11 front-edge competence areas<sup>3</sup> common for the applicants (Figure 12).

Figure 12 – Common front-edge competence areas in Norrbotten, Northern Ostrobothnia and Västerbotten

The most intensive areas of European patenting are related to electric communication, basic electric elements, computing, calculating, counting and measuring techniques. A probable historical reason for this is the presence of large telecommunication and IT companies such as Nokia and Ericsson. Another common competence area is medical and veterinary science<sup>4</sup>.



The figure shows the total number of mentions of different areas of technology in EPO patent applications filed in 1996-2014 from Northern Ostrobothnia, Norrbotten, Västerbotten. The areas of technology are classes from the International Patent Classification (IPC). Data source: EPO EPAB database and statistics.

Table 2 – Medical or veterinary science or hygiene – an example of a common front-edge area of competence accumulated by local companies in the BIN counties<sup>5</sup>

Region	Number of companies	Total number of EPO patent documents (A1, A2 type)	Examples of companies <sup>6</sup>
Västerbotten	50	51	<b>Umecrine AB</b> – R&D of pharmaceutical agents against negative mental and physical symptoms. <a href="http://www.umecrine.se">www.umecrine.se</a>
Northern Ostrobothnia	35	55	<b>Polar Electro Oy</b> – a well-known manufacturer of sports training computers. <a href="http://www.polar.com">www.polar.com</a>
Troms	16	39	<b>Lytix Biopharma</b> – a life science company developing technology for cancer immunotherapy that activates the patient’s own immune system. <a href="http://www.lytixbiopharma.com">www.lytixbiopharma.com</a>
Norrbotten	12	12	<b>Arctic City Counting House AB</b> – a manufacturer of sport goods for outdoor nature activities. <a href="http://www.acc-ab.com/">http://www.acc-ab.com/</a>
Nordland	5	3	<b>Slaateng AS</b> – A company aiming at development, production and sales of solutions for disposal of materials (e.g. solid pharmaceuticals) in the health care sector. <a href="mailto:Seponett@www.slaateng.no">Seponett@. www.slaateng.no</a>
Lapland	3	4	<b>Aromtech (Arctic Omega Technology)</b> – a berry oil innovator to provide people with natural, clinically tested solutions that improve health at any age. <a href="http://www.aromtech.com">www.aromtech.com</a>
Kainuu	3	2	<b>HighRoller® Finland LTD</b> – development and production of product for personal muscle care, a company owned by five entrepreneurs who all have background in sports. <a href="https://highrollerofficial.com/eng">https://highrollerofficial.com/eng</a>
Finmark	0	0	N/A
<b>Totals</b>	<b>124</b>	<b>166</b>	

Data source: EPO EPAB database and statistics, companies’ websites

<sup>3</sup> These 11 competence areas correspond to different types of technology called classes in International Patent Classification (IPC). The 11 IPC classes were mentioned 653 times in the patent applications from the three regions (which constitutes 64 % in total number of 1015 analyzed applications).

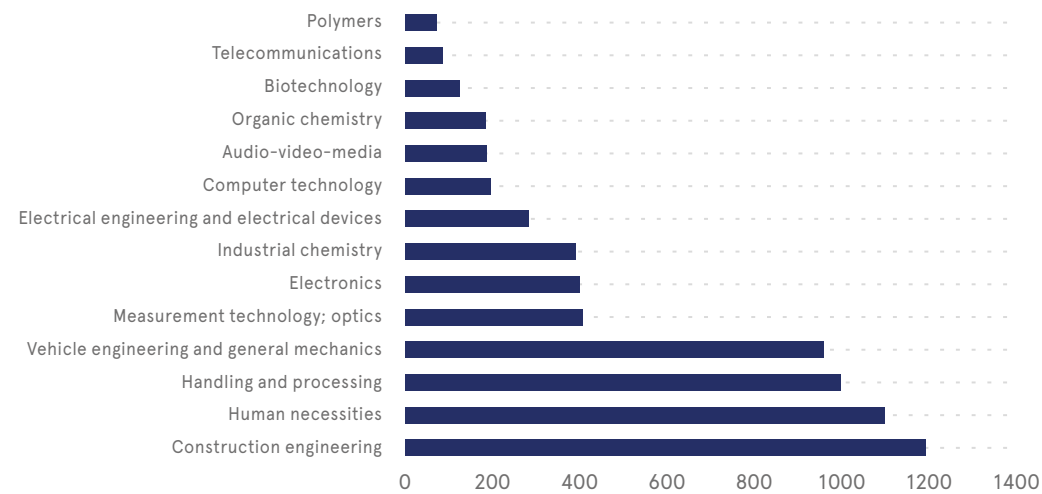
<sup>4</sup> Mentioned 118 times in patent applications by 97 local companies or entrepreneurs.

<sup>5</sup> Companies for this presentation are not selected as a result of ranking or any kind of benchmark. Our aim was only to show some examples of innovating companies from the BIN area, ranging from globally established companies like Polar to small local companies with niche products.



Figure 13 – Common fields of patented technology<sup>6</sup>, BIN area, 1990–2015

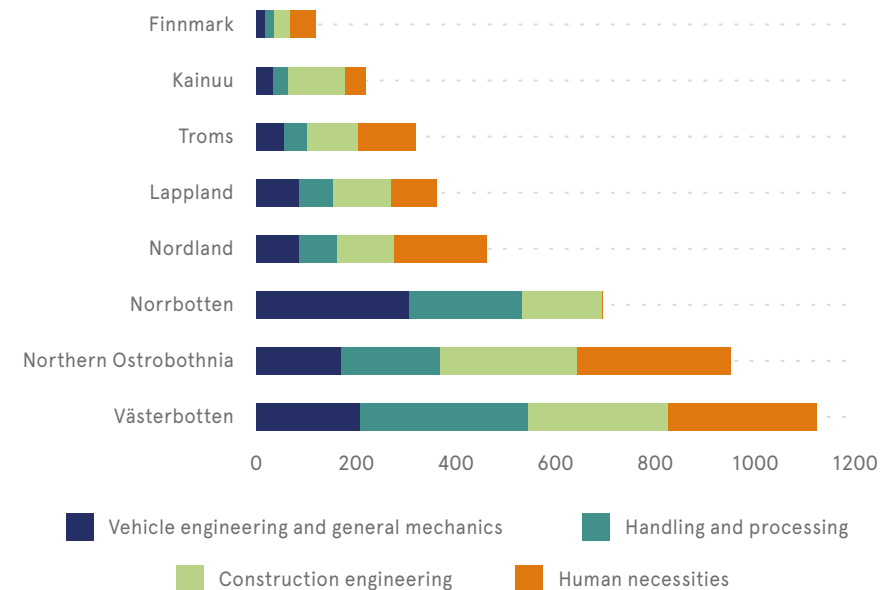
An analysis of patent applications filed by BIN residents to national patent offices showed that the biggest innovative potential common for the BIN area is accumulated in the following technology areas: construction engineering, human necessities, handling and processing, vehicle engineering and mechanics.



The figure shows 14 fields of technology and the total number of patent applications, classified for each field, filed by residents of the BIN area to domestic patent offices in 1990–2015. Data sources: national industrial property (patent) offices in Finland, Norway, and Sweden.

Figure 14 – Top 4 common fields of patented technology by BIN county, 1990–2015

Figure 14 demonstrates a rather balanced composition of the four top fields throughout the BIN area: construction engineering; human necessities; handling and processing; vehicle engineering and mechanics. Norrbotten has quite high vehicle engineering and general mechanics. The county of Västerbotten has the highest total number of applications.



The figure shows four fields of technology and total number of patent applications, classified for each field, filed by residents of the BIN area to domestic patent offices in 1990–2015. Data sources: national industrial property (patent) offices in Finland, Norway, and Sweden.

## Implications and further studies

Based on the analysis presented, our policy recommendation is to stimulate cross-border cooperation on innovation in the BIN territory, aiming at further development of the identified competence areas and fields, as well as nurturing the underdeveloped ones. The goals of such cooperation would be to increase the volume and specter of BIN innovations, as well as to increase in the regional invention ownership rate. The innovation policy for the BIN territory has to be developed through collaboration between national, international, regional authorities and involve representatives of both the industry and academia. The first step in this direction could be a more detailed study (a feasibility study) with the following objectives.

- Mapping of the BIN companies with innovation, looking for potential technical and technological complementarities<sup>7</sup>
- Assessment of market for cooperative solutions
- Identification of common challenges for innovating companies
- Mapping of the existing instruments supporting innovations
- Development of more detailed/focused policy recommendations

The next step could be the establishing of a third-party organization to foster cooperation on innovation in the BIN area. The strategy, structure, legal form and resources required of this organization are to be defined based on the results of the proposed feasibility study. The organization may serve as a platform for exchange of knowledge and experience between innovative companies, provide informational support on market and cooperation opportunities, and offer legal advice and administrative resources associated with patenting and commercialization of inventions. Apparently,

the latter can be crucial for SME's, as the cost of development and maintenance of a patent is rather high. Maybe the aforementioned third-party organization would be needed to provide brokerage for establishing new innovation consortia.

This work has to be coordinated with and correspond to principles of such institutions as the Nordic Council of Ministers (Nordic Arctic Program), the governments of the BIN counties, the Arctic Economic Council and the Arctic Council, Nordic Innovation, the Norwegian-Russian Cross-Border Commission, regional industry-related multiplying organizations in the BIN area (for example Business Oulu and Petro Arctic and others), as well as national, regional and international patent offices.

Patenting data used in our analysis is just one possible way of highlighting regional activities in innovation. We recognize that patents are suitable indicators for certain types of industries, however, not for all. The lack of patent applications suggests a lack of companies characterized by patent-intensive production and innovation, but one still may have healthy enterprises and industries with other types of innovation. In the future, our analysis of regional innovation could be extended with mapping of new emerging technologies and fields, e.g. health sector innovation (Oulu Health), iHealth movement and food sector innovation. Furthermore, since patenting does not, by and large, cover innovation in the service sector, it would be beneficial to develop a database of trademarks for the BIN area. According to OECD, "trademarks could contribute to measuring relevant aspects of innovation, especially non-technological innovation and innovation in the service industries". Other opportunities to study innovation considered for the next issues of the BIN report are the role of universities in development of innovations, the university-industry interlink, innovations in public sector and mapping of industrial clusters in the Arctic.

<sup>6</sup> Here we used classification of patents by 14 fields of technology (the classification provided by World Intellectual Property Organization). Each field includes a combination of various IPC sub-classes. An IPC sub-class is a particle of an IPC class. For more details on IPC classifications, please refer to the website of the World Intellectual Property Organization - <http://www.wipo.int/classifications/ipc/en/>

<sup>7</sup> By technical complementarity, we mean joining forces of several companies to increase production volume in the same technical field towards larger orders by big customers. Technological complementarity is about cooperation on development of new product.



# Renewable Energy in the North

This chapter focuses on renewable power production in the BIN area. The BIN area is a substantial provider of renewable energy to Norway, Finland, Sweden and the Nordic power market. The power production from the BIN area is dominated by hydropower, with a growing wind production. We will look into renewable power production, transmission structure and market conditions. We will also comment shortly on the development of nuclear power in Sweden and Finland. Nuclear power production is not renewable, but this energy source is an important part of the energy market in these BIN countries, and Finland is currently building its sixth reactor in Hanhikivi 1 in Northern Ostrobothnia. The next editions of the production chapter in the BIN report will focus on mineral production, forestry, paper and pulp production, which are large industries in the BIN area.

Climate change has in recent years evolved into one of the core political issues both in Europe and worldwide. In December 2015, 195 countries adopted the first universal, legally binding, global climate deal at the Paris Climate Conference (COP21). Policies that aim at reducing greenhouse gas emissions by 40 % by 2030 (relative to 1990) have been implemented in the European Union. The development of renewable energy sources is regarded an important lever to reduce energy-related greenhouse gas emissions. Currently, in several countries, the expansion of renewable energy and other measures to reduce greenhouse gas emissions are primarily policy-driven. Regulations affect consumption and production costs, but also the competitiveness of companies and overall economic growth. Changes in energy consumption, such as electrification in transportation and energy-efficiency measures in power intensive industries, are factors that are policy driven. The growth in new power-intensive industries, such as data processing and block chain technology, affect energy consumption and energy policies of the BIN area and its respective countries.

Results suggest that:

- The BIN area is a substantial provider of renewable energy to the BIN countries and the Nordic Power market. The BIN area has three counties with a surplus of renewable energy, and in 2014 the surplus in these regions were 10,7 TWh in Västerbotten, 7,1 TWh in Norrbotten and 5,6 TWh in Nordland in Norway . These regions are also increasing their renewable energy production
- Renewable energy production in the BIN area in 2014 by source;
  - Hydropower 50 783 GWh
  - Thermal power 8 289 GWh (including heat and power production combined)
  - Wind power 5 244 GWh
- Within the BIN area, several new wind power plants are under construction, enhancing the BIN area's position as an important renewable region in the North.
- The BIN counties in Finland are reliable on energy import. The planned Hanhikivi 1 nuclear power plant in Northern Ostrobothnia will change the energy balance in Finland.
- The BIN area is attractive for establishing new power-intensive industries

## The BIN area is a part of an emerging European market

The BIN area is a part of the Nordic power market. The Nordic countries deregulated their power markets in the early 1990s and brought their individual markets together into a common Nordic market. Estonia, Latvia and Lithuania joined the Nord Pool<sup>1</sup> market in 2010-2013. The term deregulation means that the state is no longer running the power market, and free competition was introduced. This process was undertaken in order to create a more efficient energy market, with the exchange of power between countries and increased security of supply. Available power capacity can be used more efficiently in a large region compared to in a small one, and integrated markets enhance productivity and improve efficiency.

Now that transmission capacity and coupling is in place between the Nordic countries, the European continent and the Baltics, the power market covers large parts of Europe. This means that power from many different energy sources such as hydro, thermal, nuclear, wind and solar sources – enters the grid. This ensures a more 'liquid'

market, where large volumes are traded daily, and a more secure power supply.

The main trends influencing the Nordic power market today is a closer European market orientation and integration, increasing amounts of intermittent generation, more centralized regulation, and changes in the consumption of energy. We see a trend where the renewable energy demand is rising rapidly among large corporations worldwide. The number of companies that have set renewable energy or sustainability targets is increasing. RE100 currently lists over 88 multinational and influential companies that have committed to 100 % renewable electricity. Ikea, Apple, the BMW Group, Google and H&M are among the RE100s companies<sup>2</sup>. In order to achieve this, they must match 100 % of the electricity used across their global operations with electricity produced from renewable sources, either sourced from the market or self-produced.

The development offers possibilities for the BIN area, both as host for new power-intensive industries and as a location for new renewable energy production. The BIN area is a large provider of renewable



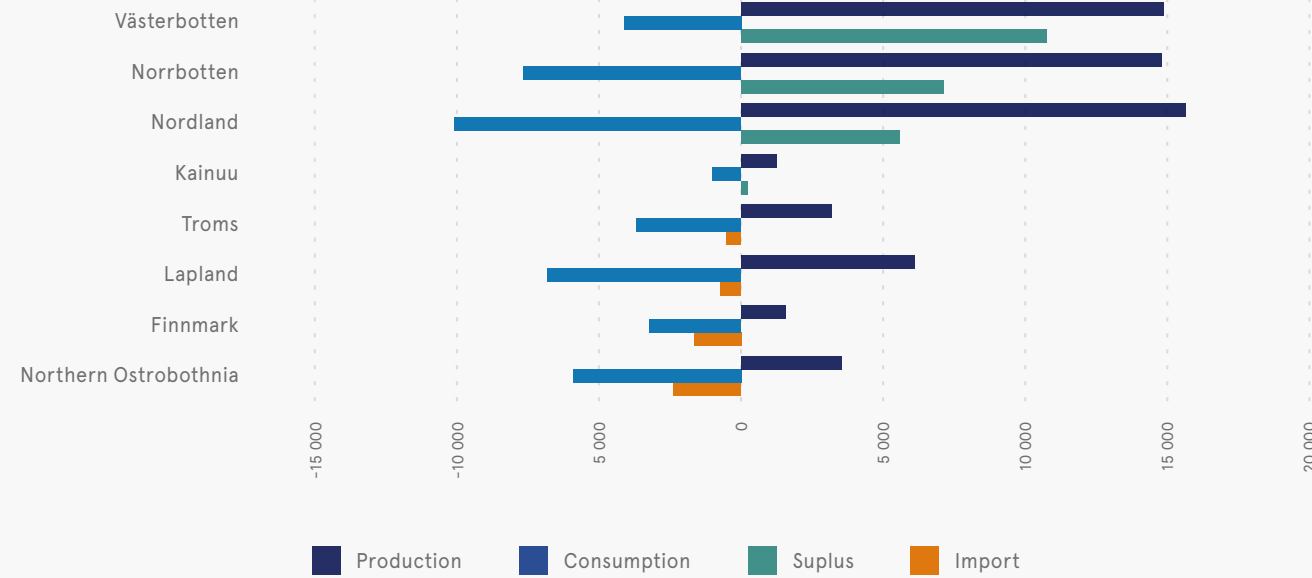
Øvre Forsland hydro power plant  
Photo: Helgeland Kraft AS

<sup>1</sup> Nord Pool is owned by the Nordic transmission system operators (TSOs) Statnett SF, Svenska kraftnät, Fingrid Oy, Energinet and the Baltic transmission system operators Elering, Litgrid and Augstsprieguma tikls.

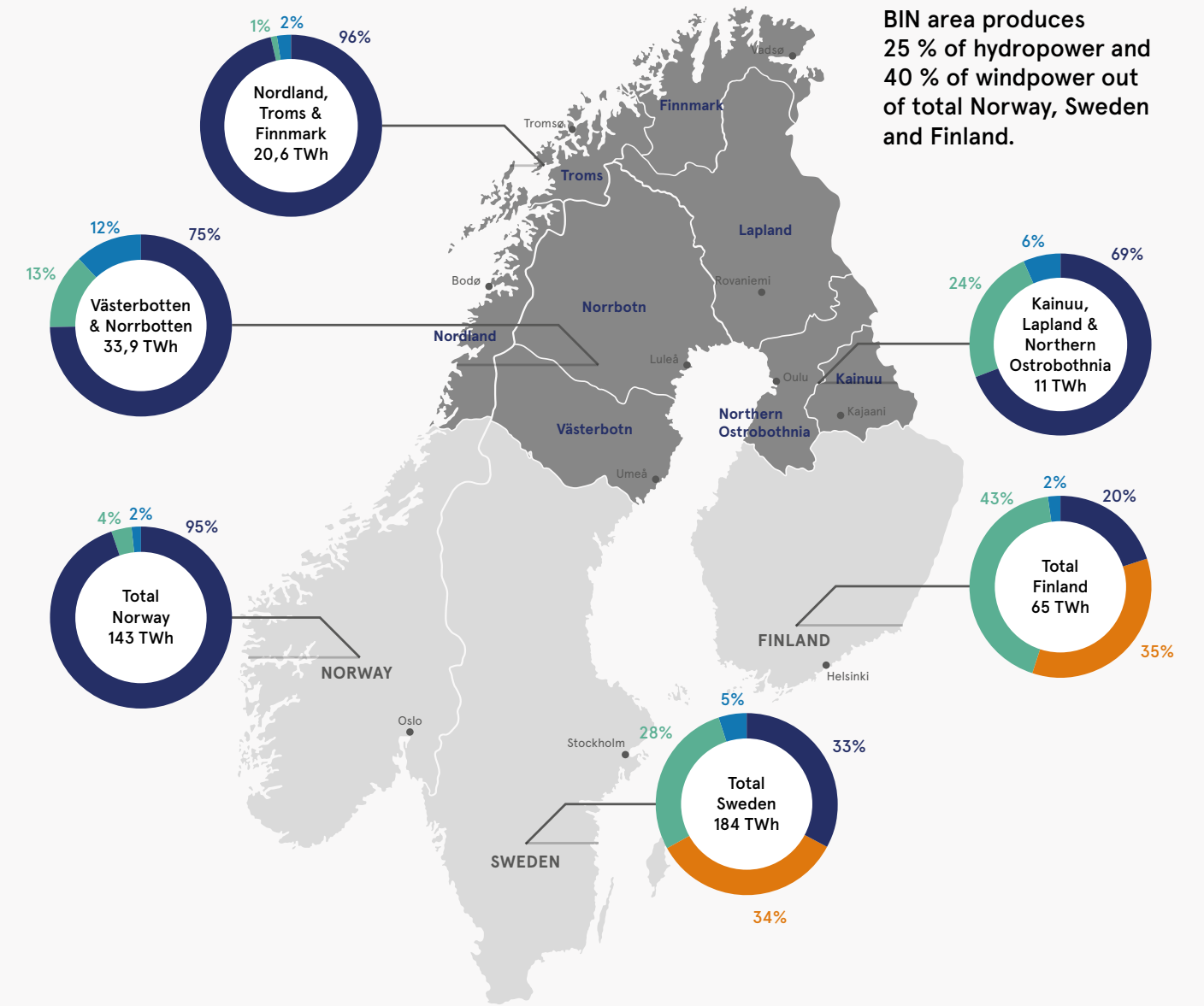
<sup>2</sup> [www.there100.org/companies](http://www.there100.org/companies).



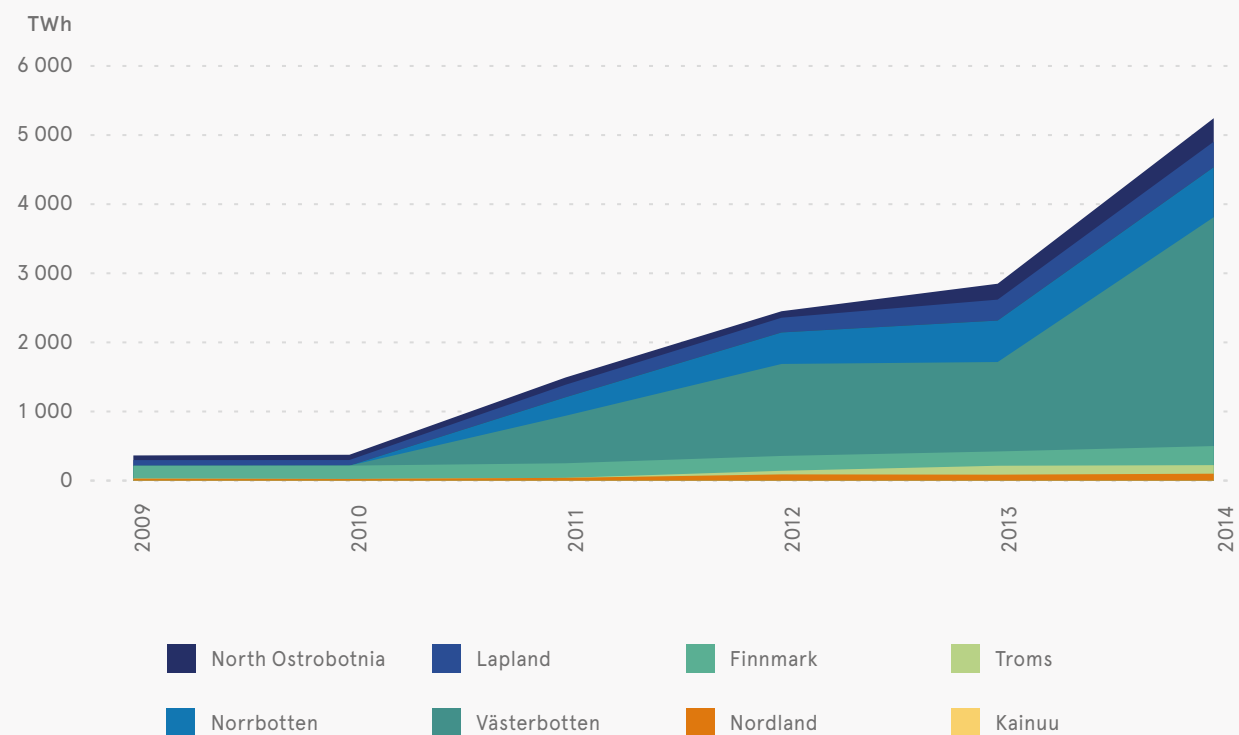
### Electricity production and consumption in the BIN area, 2014



### Map of power production in the BIN area at the county level, 2014



### Growth in wind power production in the BIN area, 2009-2014





energy, and has regions with power surplus. The BIN area also has a potential of further growth in renewable energy production, and an increasing share of foreign capital is realising renewable projects such as wind power plants in the BIN countries<sup>3</sup>. The combination of a cold climate, high level of digital infrastructure, accumulated human capital and political stable governance makes the BIN area highly attractive to new power-intensive industries establishments.

For instance, Facebook established their first European data centre in Norrbotten's largest town Luleå. After careful due diligence and consideration of more than a hundred different possible areas in Europe, Facebook outlines two factors for choosing Luleå: cold climate and stable renewable energy supply. The winter in Norrbotten averages -20C. According to Facebook, the freezing air from outside that is pumped into the building is one of the factors that enables this warehouse in Luleå to be the most energy-efficient computing facility ever built. The other main factor was the electricity supply and cost. Norrbotten and Västerbotten are the counties where a large part of Sweden's hydropower production is generated. These two regions alone represented 41 % of Sweden's hydropower production in 2014. Västerbotten is the largest wind power production county in the BIN area, where wind power production is growing. The decline in the steel, iron ore and pulp and paper industries in Sweden resulted in decreased energy consumption. As a result,

both Norrbotten and Västerbotten have a power surplus generated by hydropower. Facebook's data centre uses as much energy as the steel plant. The ripple effects of Facebook's establishment in Luleå are many, e.g. direct, indirect and induced impacts are estimated to generate 4,500 full-time workers (half of impacts accruing locally), other effects include the emergence of a new ecosystem for ICT<sup>4</sup>. In 2017, the Chinese tech company Canaan Creative also moves into Norrbotten. Canaan is the first Chinese company within this sector to open a data center in Europe. These examples demonstrate a growing potential for the BIN area to attract power intensive industries.

**Transmission capacity in the BIN area and the BIN Countries**

The BIN areas electricity production and consumption are connected through a transmission system. The transition from a centralized to a more decentralized power system also affects the grid and transmission capacity. The national main grid owners are the Transmission System Operators (TSO)<sup>5</sup>, who are responsible for maintaining the balance in the respective nations' power system through a bilateral agreements. In 2010, the TSOs in Finland, Sweden and Norway initiated the Nordic Balance Settlement to establish a common Nordic end-user market for electricity. The TSOs operates the high-voltage grid and interconnections. The distribution system operators (DSO) are at regional and local level.

Table 1 – Interconnector capacity from and between the BIN countries<sup>6</sup>

Table 1 shows the cross-border transmission capacity from and between the BIN area and the BIN countries. The Nordic energy market is integrated with Europe through several new interconnectors. The European Commission has suggested a requirement that member countries should establish minimum 15 % bilateral transmission capacity of their installed production capacity. Regulation of the power flow up or down between the countries and regions is used when the consumption exceeds production, or vice versa. It enables the TSO to ensure stable frequency in the transmission grid. A large part of the grid in the BIN area, as well as for the rest of the BIN countries, was built about 60–120 years ago. Thus, there are now large ongoing investments in the grid, in order to secure power supply and meet the increasing demands of consumers. This affects the net tariffs for the consumers in the area. There is an ongoing political discussion on how to divide these costs between the areas with high production capacity and the areas of high electricity consumption. Net tariffs are stands for about half of the consumer's energy costs, but this varies between regions, grid companies and what grid level industries or businesses are connected to.

NORWAY		SWEDEN		FINLAND	
Sweden	3 600 MW	Norway	3 600 MW	Sweden	2 600 MW
Denmark	1 700 MW	Finland	2 600 MW	Russia	1 000 MW
Netherlands	700 MW	Denmark	360 MW	Norway	100 MW
Finland	100 MW	Germany	600 MW	Estonia	1 200 MW
Russia	50 MW	Lettland	570 MW		
Lapland		Lithuania	1 000 MW		

**Under construction**  
 Statnett in Norway is currently building two new interconnectors. North Sea Link between Norway and the UK is a cooperation with British National Grid, the project is planned to be completed in 2021. NordLink is between Norway and Germany, built in cooperation with grid company TenneT and investment bank KfW, the project is planned to be completed in 2020. Both on 1 400 MW.

<sup>3</sup> Wind power Ownership in Sweden: Business Models and Motives by Tore Wizelius 2014.

<sup>4</sup> Source: Digital infrastructure and economic development: An impact assessment of Facebook's datacentre in Northern Sweden, captures the importance of large-scale data centres to the Swedish economy and the opportunity they provide. The Boston Consulting Group, Inc. 2014.

<sup>5</sup> TSO's in the BIN countries are Statnett in Norway, Svenska Kräfteffekt in Sweden, Fingrid in Finland and in Russia the TSO is Federal Grid Company.

**Price areas and power flow in the BIN area**

The electricity production is spread around the BIN countries, and a lot of the BIN areas' industry has been established close to power production. The cable grid has been developed based on this. Thus, there is capacity in the grid for power to be transported for consumption wherever there is a demand, but there are some bottlenecks in the BIN areas' transmission system today. The BIN nations need a system for handling this.

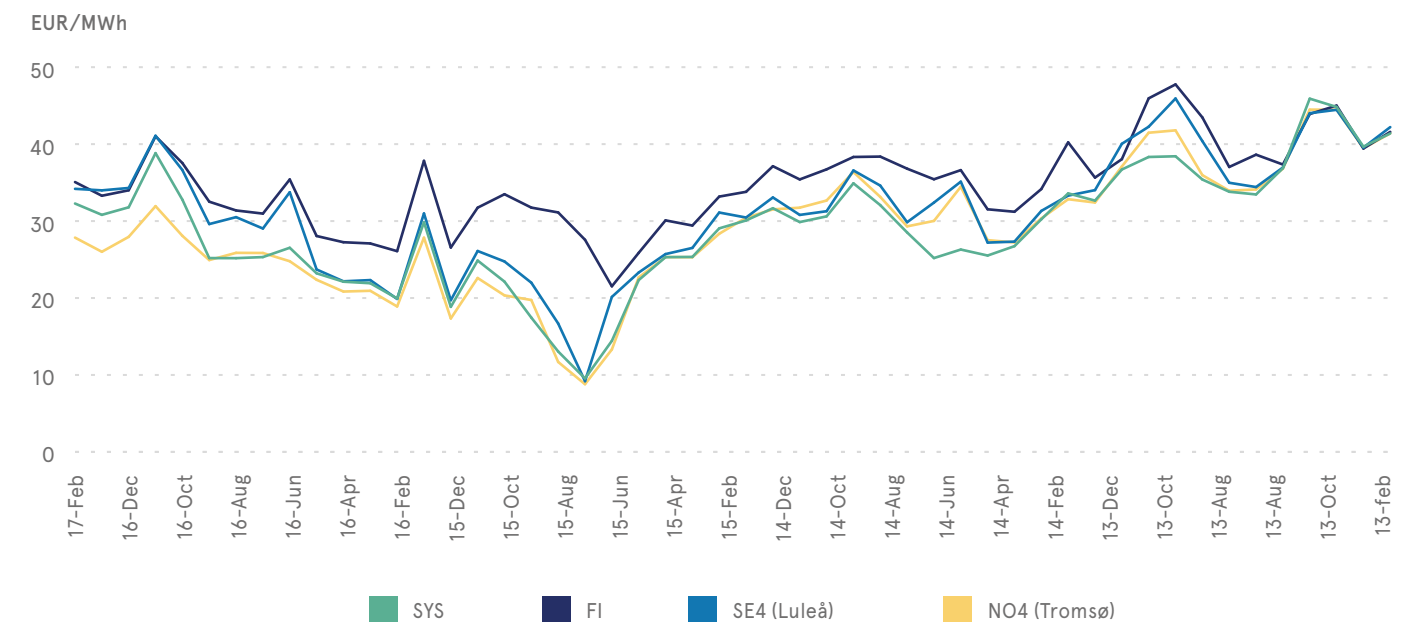
The authorities in the BIN countries have all chosen a market-based system for buying and selling power, and a market-based system for handling the bottlenecks that arise in the cable grid as a result of the power market; these are called el-spot areas (day-ahead market)<sup>8</sup>. Norway and Sweden are, furthermore, divided into market areas (price areas) that are used to handle larger capacity limits in the grid. Norway has five price areas, and the BIN region is area NO4, Tromsø. Sweden has four price areas and the BIN region is in SE1, Luleå. Finland has one price area. The price areas are

market areas for reporting power trading on the stock market. The energy price is a result of supply and demand on power reported on the stock market. As a consequence of this, the power and market situation of each area will determine which direction the power flows between the elspot areas.

In 2012, Sweden and Norway agreed on a common energy certificates market, which started in January 2012 and extends until 2035. The aim of this renewable subsidiary was to provide more renewable energy production. The subsidiary has been successful with regard to new renewable energy production, but has received criticism for holding renewable energy prices very low. The Norwegian ministry of oil and energy decided in 2016 that Norway will not continue the common Norwegian-Swedish market for electricity certificates after 2021. While Sweden has prolonged the certificate market until 2030. The energy authorities in the two countries have expressed their common opinion that there should be only one market for electricity certificates in the Nordic, should the market expand.

Figure 1 – Elspot prices in the BIN area, Q2.2013–Q2.2017, Source: Nordpool

Figure 1 shows the development in the monthly average elspot price in the BIN area. In addition to the system price (SYS), the three bidding areas in the BIN are shown. The Norwegian price area NO4 (Northern Norway) has limitations on the grid towards price area NO3, and this affects the prices in NO4. Nordland is one of the counties in Norway with the largest renewable energy production and has the largest annual surplus. Attracting new power-intensive industries in this area, as shown in Luleå, would increase the value creation from this natural resource greatly, through creating jobs in the regions where the power is produced and reducing the need for grid investments to export the electricity. In Sweden, the price in SE4 and the other three price areas are correlated.



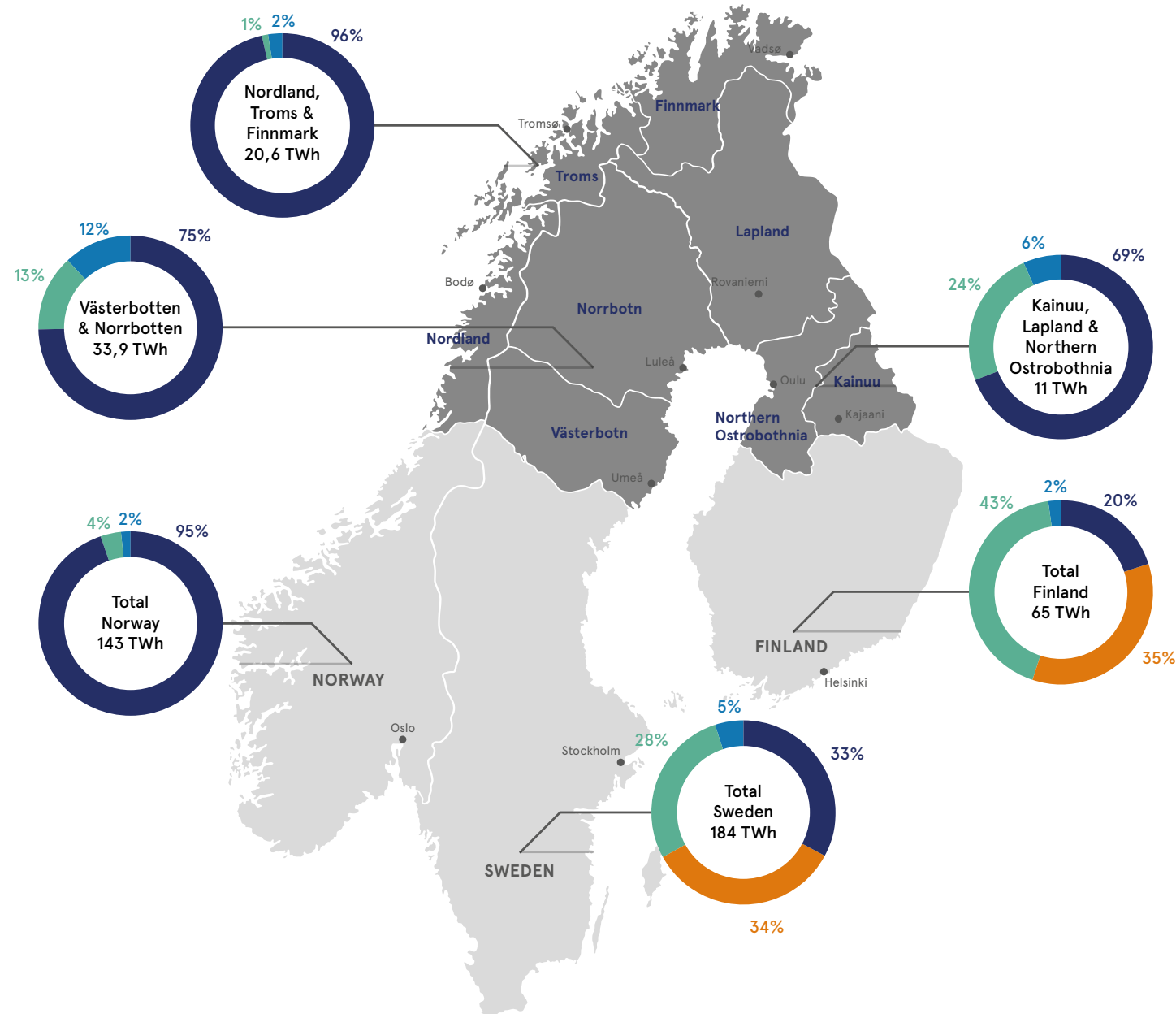
<sup>6</sup> Source: Statnett, Svenska Kraftnät and Fingrid.

<sup>7</sup> Elspot refers to the spot market for physical power turnover on the Nordic power exchange Nord Pool. This is wholesale turnover of electricity. Usually, the Nordic power market is divided into six so-called elspot areas. Elbas is the intraday market.

**Overview of electricity- and thermal power production in the BIN area**

Figure 2 – Map of power production in the BIN area at the county level, 2014

Figure 2 demonstrates that the power system in the BIN area is a mixture of different generation sources: Hydro, thermal and wind power. Wind power is rapidly growing in the BIN area. Thermal power is a large source of energy in Sweden and Finland, but has not had the same development in Norway. The map shows the BIN region’s importance as a renewable energy provider to the Nordic energy market. The figures in the map give an overview of the energy sources in the BIN area and the BIN countries.



**Hydropower**

Figure 3 – Hydropower production in the BIN area and the BIN countries (excluding the BIN area), 2014

Figure 3 shows hydropower production in the BIN area and the BIN countries when extracting the production in the BIN area. Hydropower represents 96 % of the electricity production in Norway, 42 % in Sweden and 20 % in Finland. In 2014, more than 50 TWh hydropower energy was produced in the BIN region. Almost 25 % of the BIN countries’ total hydropower production was produced in the northern parts of these countries. The yearly hydropower production varies from year to year due to consumption and rainfall. Most all of the hydropower production in the BIN area is regulatory. Regulatory hydropower generation can easily be increased or decreased on very short notice. This functionality allows grid operators to match production with varying demand in real time. Thus, the hydropower production plants play an important part in operating the energy balance in the grid. A large part of Sweden’s hydropower production is generated in Norrbotten and Västerbotten counties. These two counties in Sweden represented 41 % of Sweden’s hydropower production in 2014. Norway is the world’s seventh largest hydropower producer with a normal yearly production of 136 TWh. In 2014, 13 % of this was generated in the North of Norway, the year before this number was 17 %. In Finland, the total hydropower production in 2014 was 13 TWh, and 58 % of this was produced in Northern Finland.

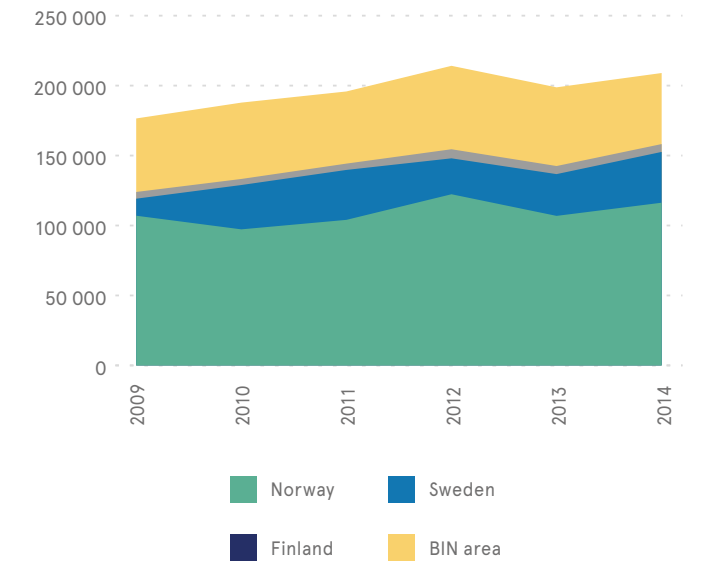
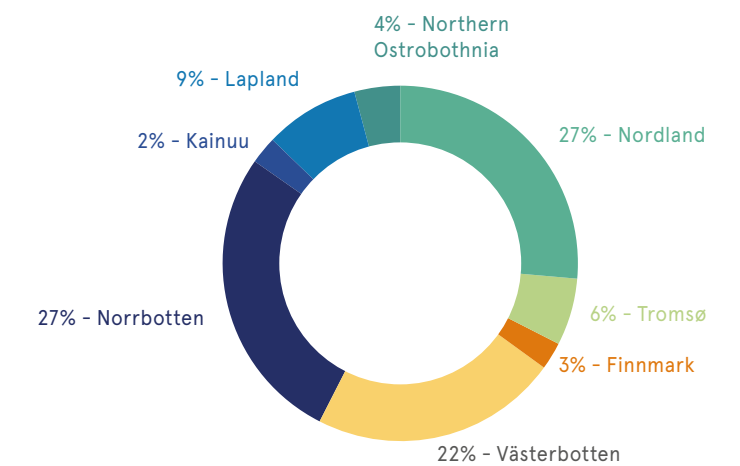


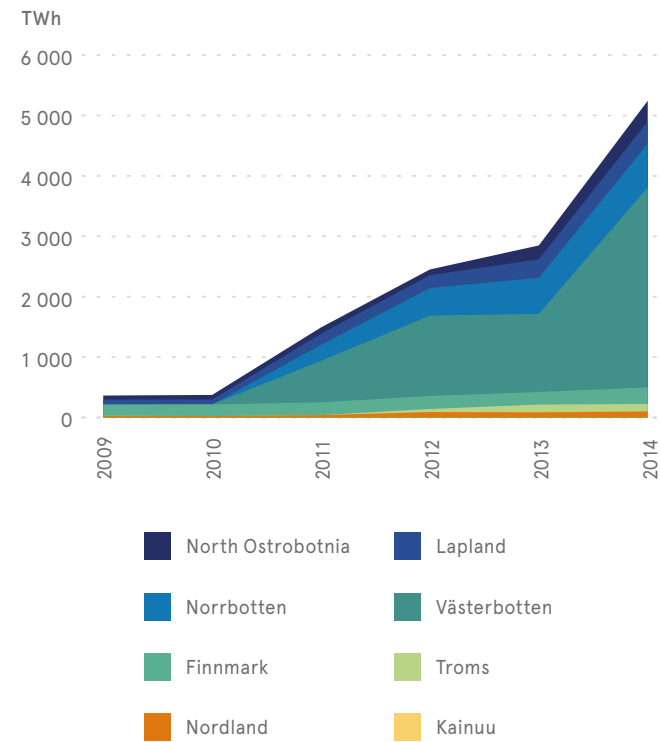
Figure 4 – Hydropower production at the BIN county level, 2014

Figure 4 shows the hydropower production in each of the BIN counties in 2014. Northern Sweden, with Norrbotten and Västerbotten, represents 25 TWh – which is 50 % of the hydropower production in the BIN area. In Norway, Nordland is the dominant renewable county and among Norway’s two largest hydropower producing counties. Lapland is the county in Finland that produces 50 % of Finland’s hydropower production. The hydropower production in the BIN area in 2014 was 52.7 TWh.



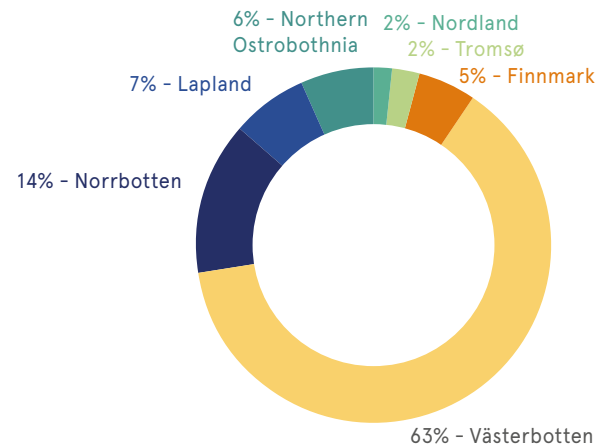
**Windpower**

**Figure 5 – Wind power generation in the BIN area, 2009-2014**  
 Figure 5 shows that the wind power electricity production from the BIN area is rapidly increasing. Almost 40 % of the BIN countries' wind power production is in the BIN area. The noticeable effect of wind power production has increased strongly in the recent 6-7 years. The importance of wind power is increasing, as several wind power parks are under construction in the BIN area, e.g. in Västerbotten and Nordland.



**Figure 6 – Wind power generation at the BIN county level, 2014**

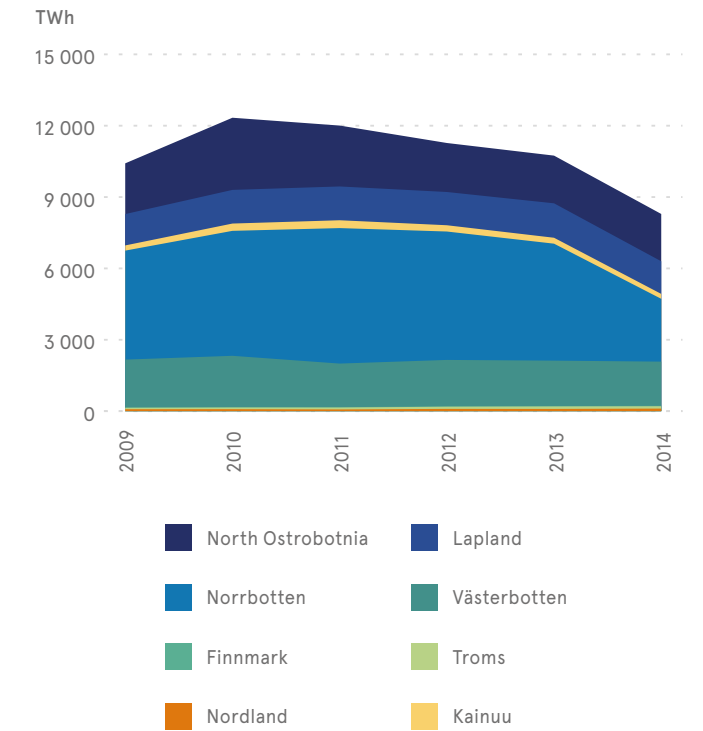
Figure 6 shows that Västerbotten<sup>8</sup> is the largest wind power production county in the BIN area. In 2014, Västerbotten produced 63 % of wind power production in the BIN area and 33 % of Sweden's wind power production. Västerbotten county has a large potential for increased wind power production. Lapland and Northern Ostrobothnia produced 68 % of Finland's wind power capacity in 2014. The production was similar in these two counties. At the end of 2014, there were 260 wind turbine generators installed, with a combined capacity of 627 MW. They generated 1.3% of Finland's electricity consumption in 2014. Finland has the potential to increase wind power capacity considerably. The largest wind power potential in Finland is estimated to be along the Bothnia coast and in the Finnish Lapland. In Norway, Finnmark county has a large potential for onshore wind, in 2014 Finnmark produced 12 % of Norway's total wind production. In Nordland, two new wind parks, Ånstadblåheia wind park and Sørfjord wind park are in the early phases of construction, and a third one, Øyfellet in the south part of the county, recently received its permit. The three parks will together have a capacity of 470 MW installed, and if all are built according to plan, they will produce 1,710 GWh. The BIN area is expected to be the location for a great share of the expansion in wind power generation.



**Thermal power**

**Figure 7 – Thermal power production including CHP in the BIN area, 2009-2014**

Figure 7 shows the thermal power production in the BIN countries. This includes thermal power from combined heat and power production (CHP). Thermal power is a large source of energy in Sweden and Finland. Sweden has 62 % of the thermal power production in the BIN countries. District heating has its own distribution systems. In Sweden, district heating has undergone steady growth over the years and accounts for more than half of all heating for homes and other premises in Sweden<sup>9</sup> now. CHP is what is produced when electricity and heat are produced at the same time. The heat that is produced when electricity is generated is utilized. According to the Swedish District Heating Association, 6 % of the electricity used in Sweden comes from CHP, which is less than elsewhere in the EU. In 2014, 10 % of the BIN countries' thermal power production was produced in the BIN area. The largest thermal power regions in the BIN area are Norrbotten with 32 % of the production<sup>10</sup>, Northern Ostrobothnia with 24 %, Västerbotten with 22 % and Lapland with 17 %. The decline in 2013 and 2014 in Norrbotten is due to reduced consumption by the industry during this period.



**Solar power production**

Solar power production is not yet a dominating energy production source in the BIN area. Swedish, Norwegian and Finnish researchers are cooperating to prove that solar power in the North is both possible and can be profitable<sup>11</sup>. A solar power test plant is established in Piteå, and advanced computer simulations show that there is a solar power potential. In spite of the high number of sun hours, high latitudes pose some challenges for solar power in the BIN area. Nights are long in the winter, and in the summer, the sun's path across the sky varies a lot. New technology can potentially give Northern solar power plants the opportunity to generate energy regardless of high latitudes. The solar power plant in Piteå is expected to generate 28 MWh annually<sup>12</sup>.

**Nuclear power production**

We include nuclear power in this overview, even though it is not a renewable energy source. It is an important part of electricity production in Sweden and Finland. Nuclear power is an important part of the Swedish, Finnish and Russian power systems; it represents as much as 41 % of the Swedish power production and 35 % of the Finnish power production. At present, there is no nuclear power production in the BIN area. In Northern Ostrobothnia, this will change, as Finland's sixth reactor in Hanhikivi 1 in Pyhäjoki outside Oulu and Raahen is under construction. Production is planned to commence during 2024, and the power plant will have an installed capacity of 1,200 MW electric power, which has been estimated to supply 10 % of Finland's energy demand, by 2024. The project is a cooperation between Finnish Fennovoima and Russian Rosatom Energy International.

<sup>9</sup> Swedish District Heating Association

<sup>10</sup> Regionfakta.com and Statistics Sweden

<sup>11</sup> Piteå in Norrbotten have more hours of sun in a year than any other town in Sweden. The Gulf of Bothnia is sunnier than Germany, the largest market for solar power in the world.

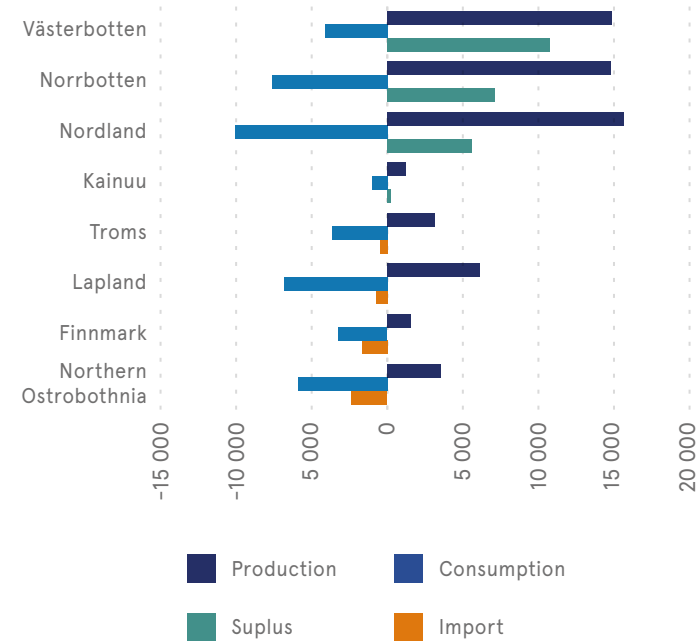
<sup>12</sup> This project is a cooperation between the Northern Research Institute (Norway), Kemi-Tornionlaakso Municipal Education and Training Consortium (Finland), Luleå Technical University (Sweden) and PiteEnergi AB (Sweden) and is supported by Nordic Energy Research.



## Electricity production and consumption in the BIN area

Figure 8 – Electricity production and consumption in the BIN area, 2014

Figure 8 shows electricity production and consumption in the BIN counties in 2014. The BIN area has three counties with a surplus of renewable energy. In 2014, the surpluses in these regions were 10,7 TWh in Västerbotten, 7,1 TWh in Norrbotten and 5,6 TWh in Nordland in Norway<sup>13</sup>. The BIN counties in Finland, Northern Ostrobothnia and Lapland, have a higher electricity consumption than production. The planned Hanhikivi 1 nuclear power plant in Northern Ostrobothnia will change the energy balance in Finland.



## Implications

According to RE100,<sup>14</sup> the private sector accounts for around half of the world's electricity consumption. Currently, they list over 88 multinational and influential companies that have committed to 100 % renewable electricity, and this list of companies with renewable energy demand seems to be growing. These companies use this in marketing their products and branding their companies. Switching influential consumers' demand to renewables will accelerate the transformation of the global energy market and aid the transition to a low-carbon economy. For the BIN area, which is already a large provider of renewable energy, the question is how to make the most of value creation in the BIN area from this natural resource. Power-intensive industry entering the BIN area generates jobs and provides income in the form of taxes and other ripple effects. In addition, it reduces the need for grid investments when power is consumed close to power production.

For example, the Facebook data center in Luleå is estimated to generate a total of 9 billion SEK in full economic impact (direct, indirect and induced impact) and to engage 4,500 full-time workers over the course of ten years nationwide. About half of the economic benefits will accrue locally<sup>15</sup>. Furthermore, such establishment lay the foundations for the BIN area gaining a competitive advantage in attracting additional similar investments. The framework conditions are important in this process.

In November 2016, the European Commission presented a package of measures to keep the European Union competitive as the clean energy transition is changing global energy markets. Under the name "Clean Energy for all Europeans" the Commission wants the EU to lead the clean energy transition, not only adapt to it. This is the fourth inner market package; these regulations, therefore, affect the power system in the BIN region. There are three main goals in the Commission's proposals; putting energy efficiency first, achieving global leadership in renewable energies and providing a fair deal for consumers. The BIN area plays an important part in this, but the aim of the renewable regions of the BIN area is to utilize the power locally to increase local value production. Therefore, it is very important that the energy- and climate policies in the BIN countries should support energy production and consumption in the BIN area.

An important ongoing project with relevance for the BIN area's energy policies and the Nordic electricity market is taking place in cooperation with the EU Commission, the Agency for the Coopera-

tion of Energy Regulators (ACER), the Council of European Energy Regulators (CEER) and the European Network of Transmission System Operators for Electricity (ENTSO-E). The European Commission is proposing to increase these organs' legislative authority between the member countries.

For policy makers recommendations include:

- Promoting the BIN area as an attractive place for establishing power-intensive industries
- The work of implementing the elements of the European Energy Union<sup>16</sup> should not work against local utilization of renewable energy. The BIN area provides the world markets with green power-intensive products. This is a great contribution to the clean energy transition, instead of just exporting the electricity. Framework conditions such as net tariffs and tax regime on renewable production are important parts of this.
- The BIN area has a strong ICT industry, especially Norrbotten and Northern Ostrobothnia. Policy makers should focus on increasing the synergies between access to natural resources and a strong ICT industry in the BIN area.
- There is an increase in European utilities who are investing in renewable projects in the BIN area, both directly in power plants and infrastructure projects, as well as through so-called Power Purchase Agreements (PPS) over a given amount of time

For the energy sector:

- Large changes in the Nordic power system presents challenges for the system operations, but also possibilities for increased value production.
- Implications from the BIN countries' Research Councils show that the energy sector in the BIN area has the possibility to increase their participation in research and development projects and programmes. Developing innovations and new technologies within renewable energy production and transportation are vital to securing cost levels with stable and secure supply of energy.

<sup>14</sup> RE100 is a collaborative, global initiative of influential businesses committed to 100% renewable electricity, working to massively increase demand for - and delivery of - renewable energy

<sup>15</sup> Source: Digital infrastructure and economic development: An impact assessment of Facebook's datacentre in Northern Sweden, captures the importance of large-scale data centres to the Swedish economy and the opportunity they provide. The Boston Consulting Group, Inc. 2014.

<sup>16</sup> Norway is not part of the European Union, but a lot of the regulation under the European Energy Union will be implemented in Norway through the European Economic Area (EEA).





Photo: Kimek Offshore AS

## Business in the North

This chapter concerns doing and creating a business in the BIN area. Business creation requires confidence in the market and trust in the growth potential. Institutional settings play a crucial role in new business creation. Finding reliable and comparable information for the BIN area on a company level presented a challenge. Therefore, this chapter only underlines some trends with available and comparable data. Firstly, applying data from World Bank we study the ease of doing business on a county level. The ease of doing business demonstrates the processes required to set up a business. Secondly, business activity is studied through an Active Enterprise Index (AE Index) that compares counties in the BIN area with the respective country averages. Active enterprises<sup>1</sup> here refer to a limited liability company that had either turnover or employment at any time during the reference period (without data on how many people the company employed). The AE Index accounts for enterprise opening and closures. The AE Index is used to analyzing the evolution of the enterprises' population over time as well as the growth rate of industry sectors. The limitation of this analysis is the lack of comparable data on enterprise openings and closures in the BIN area that would complement the AE Index. To mitigate this limitation, a longer time period 2008-2015 covering eight years is used to account for the effect of volatility of enterprises openings and closures.

The Active Enterprises Index is calculated for limited liability companies. Creation of limited liabilities companies requires more capital and is more complex in terms of management than other forms of business organization, e.g. a sole proprietorship. In 2016, the minimum amount of share capital required for establishing a company equaled EUR 2 500 in Finland, SEK 50 000 (EUR 5 300) in Sweden and NOK 30 000 (EUR 3 400) in Norway. The creation of limited liability companies is used as a proxy for business activity and market confidence in the BIN area. Income tax for limited liabilities companies varied from 20% in Finland to 23% in Sweden and 25% in Norway at the end of 2016. The AE index captures activity in all industries in the BIN area as well as in total for Norway, Finland, and Sweden during 2008-2015. Furthermore, in-depth analysis on selected industries within the BIN counties is conducted. For comparability reasons across countries, the following industries were omitted in this analysis: public administration (human health and social work activities, education, and defense) and agriculture, forestry, and fishing. We also estimate production value of goods and services using regional GDP statistics, excluding public sector and non-profit organizations. This indicator is used to measure private sector value creation in the BIN area.

Results suggest that:

- The BIN area is potentially attractive for establishing businesses in the form of limited liability company, because it is easy to do business

in Finland, Norway and Sweden, which are ranked in the top of the ease of doing business lists worldwide

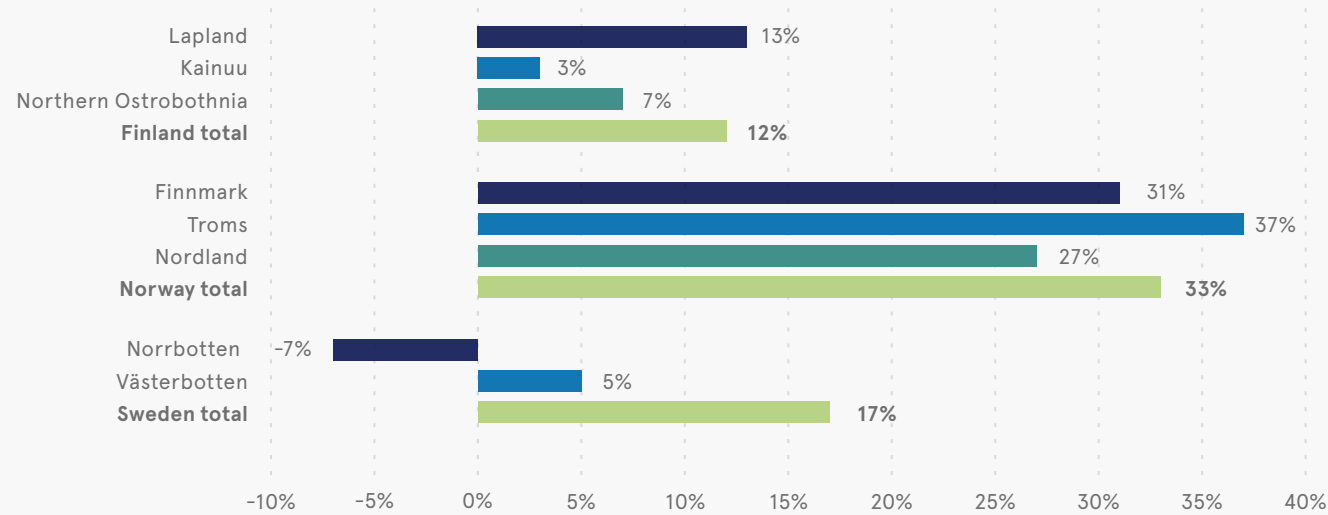
- The BIN area accounted for 6% of active enterprises in the form of limited liability out of total for Norway, Sweden and Finland in 2015
- The BIN area's AE index lagged by 6% behind the total for Norway, Sweden, and Finland (33.4%). This lag in growth can be explained by lower population density in the BIN area and the differences in the maturity of start-up ecosystems in the BIN area
- The Northern Ostrobothnia, Troms, and Norrbotten counties saw the largest increase in AE index during 2008-2015
- The five industries that experienced the biggest growth in the AE index in the BIN area are financial and insurance activities, arts, entertainment and recreation, administrative and support service activities, professional, scientific and technical activities and construction.
- On average, the BIN area's production value grew by 32 % in the last 10 years, compared to 42 % in the BIN countries as a whole. Norwegian counties saw the largest growth in production value averaging 80% during 2005-2015; Swedish counties' growth was volatile as a result of the crisis negative influence on global mineral and ore prices. Finnish counties experienced stagnation of production value growth as aftermath of the 2008 crisis.

<sup>1</sup> There are cross-country differences in identifying what constitutes an active enterprise. All enterprises included in this analysis are classified as active enterprises by Statistics Finland, Statistics Sweden and Statistics Norway.



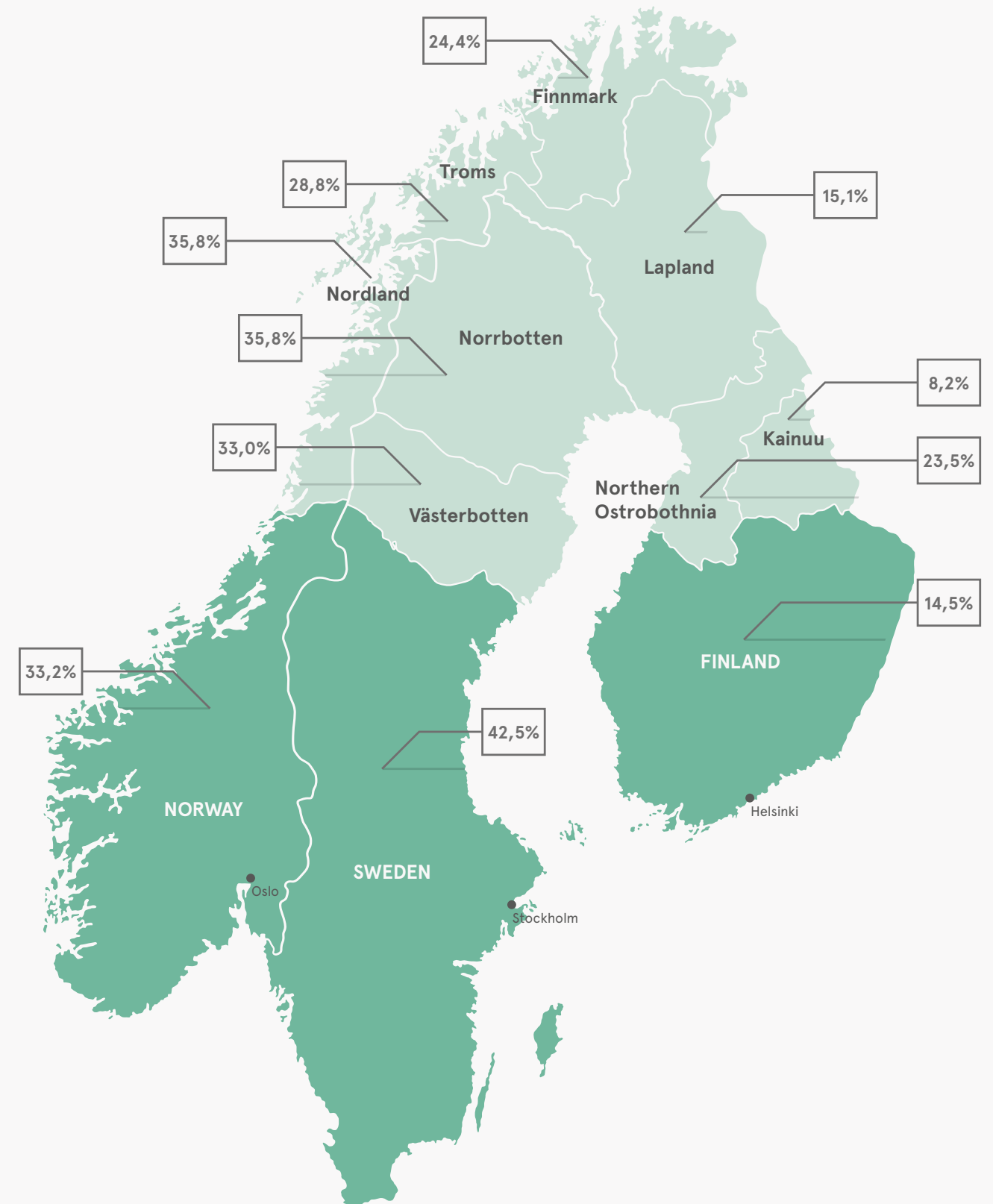
### Growth in production value expressed as index

2010–2015, index 2005 = 100



### Growth in number of active enterprises measured as index compared to countries averages

index 2008 = 100, 2008–2015



### 5 most growing industries in active enterprises

Index (excluding other services), 2008–2015

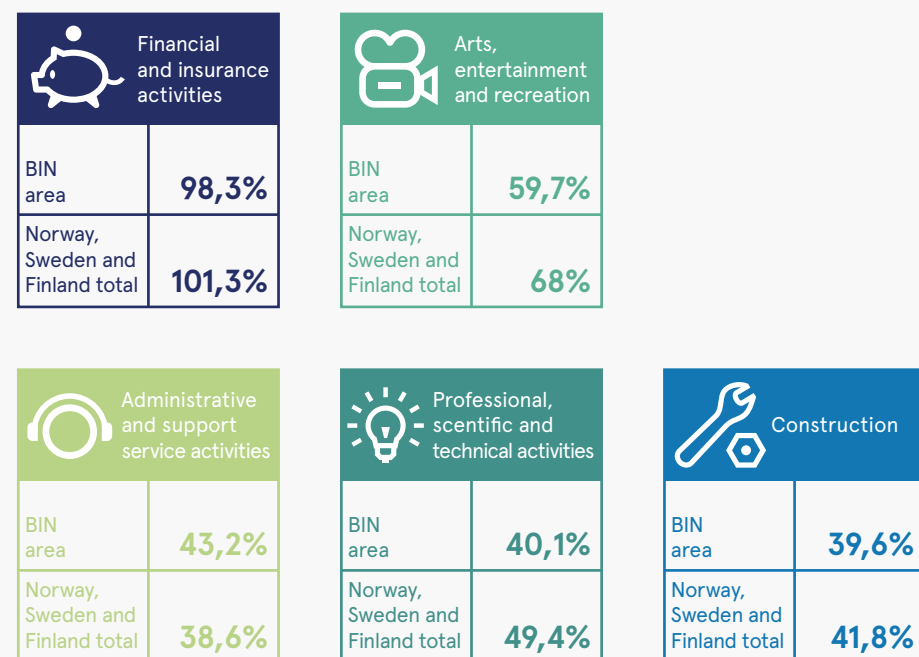




Figure 1 – Ease of doing business in Finland, Norway, and Sweden in 2016. (Source: The World Bank)

Figure 1 demonstrates the ease of doing business<sup>2</sup> rank and subsequent legal and institutional procedures associated with doing business in Finland, Norway, and Sweden. The data from the World Bank on ease of doing business are comparable across 190 countries in the world. Finland, Norway, and Sweden rank high compared to the rest of the world, but there are substantial cross-country differences. Norway is the 6th country in the world at the ease of doing business rank, while Sweden ranks 9th and Finland 13th and out of 190 countries in the world. Cross-country differences relate for instance to getting credit, in this respect Finland's ranks 45th in the world while both Norway and Sweden are ranked 75th, meaning that it is easier to get credit for business purposes in Finland than in Norway and Sweden. With regard to protecting minority investors, Sweden (19) and Norway (9) rank higher than Finland, which ranks 70th in the world. It appears to be more difficult to enforce contracts in Finland (30) compared to in Sweden (22) and Norway (4). In 2015 BIN area accounted for 6% of active enterprises in the form of limited liability companies out of total for Norway, Sweden and Finland (773 921 enterprises). On the country level in 2015 Finland in total had 160 060 active enterprises, out of which 0.8 % were in Kainuu, 2.7 % in Lapland and 5.2% in Northern Ostrobothnia. Sweden had 420 599 active enterprises in 2015, with the share of Västerbotten 2.4 % and Norrbotten 2.1 %. In Norway out of 193 262 active enterprises, Nordland accounted for 4.0 % , Troms for 2.6 % and Finnmark for 1.4 %. The numbers of active enterprises reflect low population density of the BIN area.

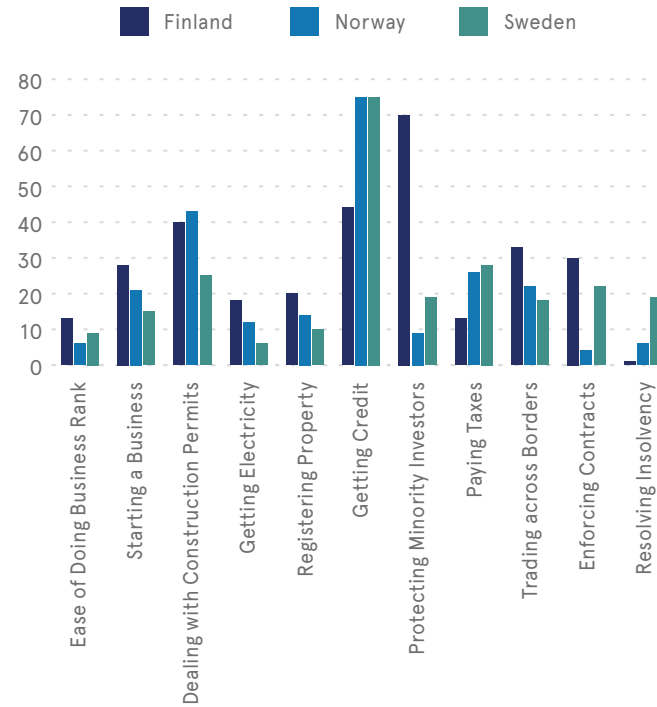


Figure 3 – Growth in active enterprises index at the BIN county level, 2008–2015, % change

Figure 3 demonstrates the differences on a BIN county level in the AE index. On a country level, Sweden saw the biggest growth (42.5%) in the AE index in the form of limited liability companies, followed by Norway (33.2%), while Finland saw the lowest growth with 14.5% during 2008-2015. All BIN counties lagged behind their respective country averages except Northern Ostrobothnia. Northern Ostrobothnia county saw an increase of 23.5% in the AE index, which is larger than country's total of 14%. This could be attributed to a more developed start-up ecosystem in Northern Ostrobothnia county, compared to other BIN area counties and the rise of newly started businesses as result of Nokia and Microsoft demises.

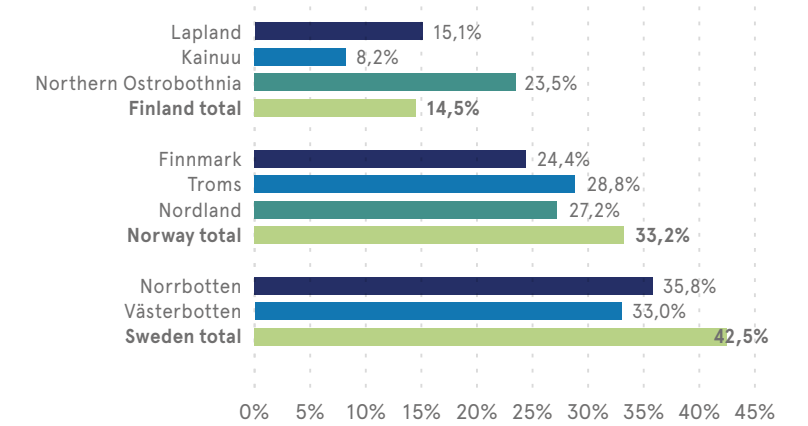


Figure 2 – Growth in active enterprises index, 2008–2015, index 2008=100

Figure 2 demonstrates trends in the AE index in the BIN area as well as in Norway, Sweden and Finland in total during 2008-2015. The BIN area's AE index (127.4) lagged behind the total for Norway, Sweden and Finland, which saw a growth in active enterprises population of 133.4%. This lag in growth can be explained by the lower population density of the BIN area and the differences in the maturity of start-up ecosystems<sup>3</sup> in the High North compared to the respective countries' capitals, i.e. Helsinki, Oslo and Stockholm, which have high-functioning start-up ecosystems.

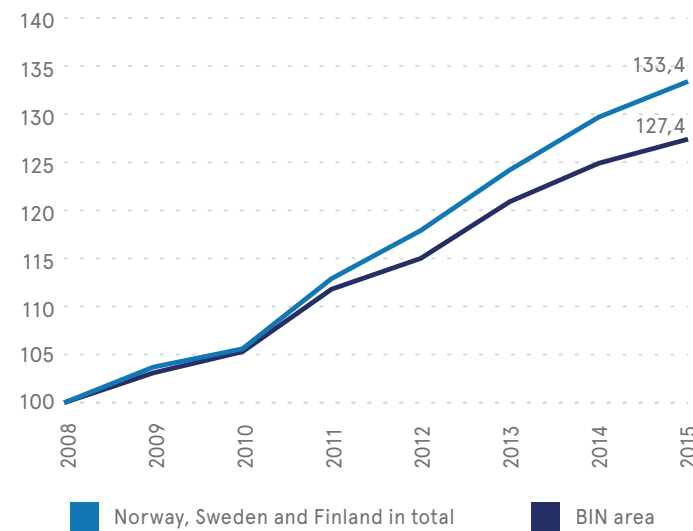
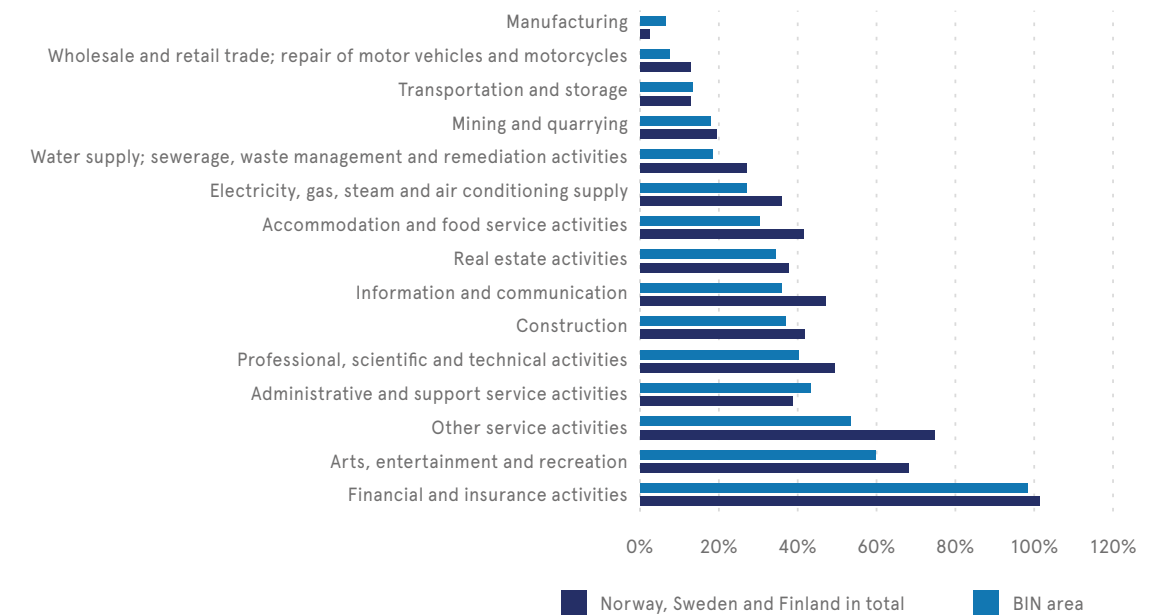


Figure 4 –Active enterprises index in the BIN area by field of business, 2008–2014, change %

Figure 4 provides a breakdown of the AE index by field of business<sup>4</sup> within the BIN area compared of the total for Norway, Sweden, and Finland. The composition of active enterprises during 2008-2015 has not changed much, with five industries making up about 70% of all active businesses: wholesale and retail trade; repair of motor vehicles and motorcycles, professional, scientific and technical activities, construction, real estate activities and manufacturing. Figure 4 is valuable for detecting industries that experienced the most rapid

growth in the active enterprises population. Financial and insurance activities experienced the biggest growth in both, in the BIN area with a growth of 98.1% and the total for Norway, Finland, and Sweden with a growth of 101.3%. The BIN area underperformed in all fields of business except manufacturing, with 6% compared to 2.5% in total for Norway, Finland and Sweden. A potential explanation for the growth in financial and insurance active enterprises is the rise of Fintech industry (the evolving intersection of financial services and technology, PwC). In order to understand the phenomenon, a case analysis of the financial and insurance activities industry should be conducted in a future BIN report.



<sup>2</sup> Doing Business records all procedures officially required, or commonly done in practice, for an entrepreneur to start up and formally operate an industrial or commercial business, as well as the time and cost to complete these procedures and the paid-in minimum capital requirement. This topic measures the paid-in minimum capital requirement, number of procedures, time and cost for a small- to medium-sized limited liability company to start up and formally operate in economy's largest business city.

<sup>3</sup> Start-up ecosystem is formed by people, start-ups in their various stages and various types of organizations in a location (physical and/or virtual), interacting as a system to create new start-up companies. (Source: Start-up commons)

<sup>4</sup> excluding agriculture, forestry and fisheries

Figure 5 – Active enterprises index in at the BIN county level, Construction, 2008–2015, % change

Figure 5 shows the trends in the AE index in the construction industry at a BIN county level. The leaders on the AE index were Troms 40.3%, Nordland 39.4%, Västerbotten 36.3% and Northern Ostrobothnia 34.1% counties. The rise in the AE index for the construction industry corresponds to the positive trends of population growth in these counties and hence increased demands for housing and other construction services.

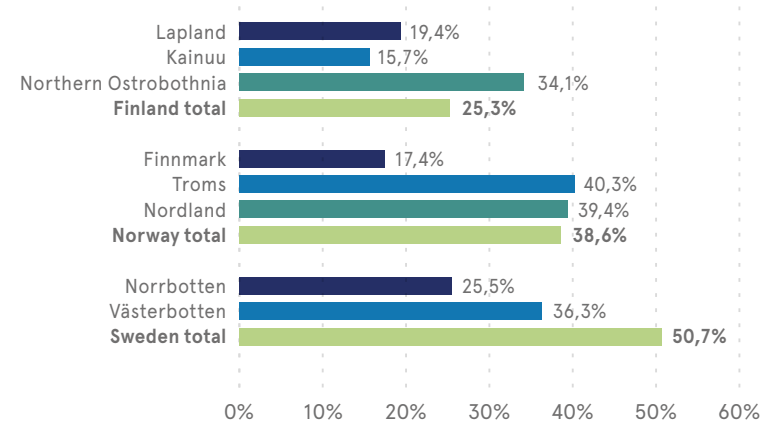


Figure 6 –Active enterprises index at the BIN county level, Real estate, 2008–2015, % change

Figure 6 shows the development of active enterprises in the real estate industry. Five out of eight BIN counties outperformed their respective country averages. The highest growth was observed in Norrbotten with 74.4% increase, followed by Northern Ostrobothnia 27.2%, Finnmark 37.6% and counties. The growth in the real estate active enterprises index both within the BIN area as well as within Norway, Sweden and Finland can be attributed to a low or negative interest rate policy. Following the 2008 financial crisis, a low or negative interest rate policy has resulted in attracting more capital investment and boosting confidence in the real estate market.

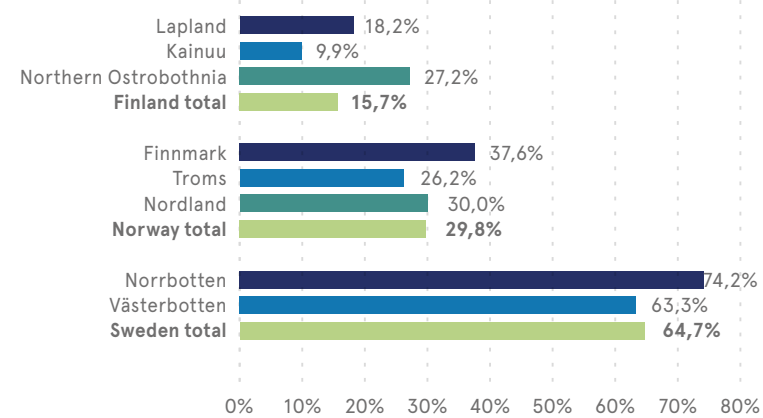


Figure 7 –Active enterprises index at the BIN county level, Accommodation and food, 2008–2015, % change

Figure 7 provides an overview of the AE index in the accommodation and food industry. All countries had an increase in their accommodation and food industry active enterprises index, with Sweden seeing a 55.8% increase, Norway 54.7%, and Finland 10.1%. The Finnish BIN counties Northern Ostrobothnia, Lapland, and Kainuu outperform Finland’s national average in the accommodation and food industry. A strong performance can be related to the growth in tourism in Finnish Lapland, and consequential increased demand for accommodation and food services. In Norway, Nordland county saw an increase of 55.5% in its accommodation and food active enterprises index during 2008–2015. This reflects the fact that the accommodation industry index in Nordland grew by 21.5% during 2008–2015. In Sweden, Norrbotten county had an increase of 53.0% in accommodation and food AE index. The growth in AE index in accommodation and food could be explained by the growing trend in tourists’ inflow and since 2010, the number of guest nights increased by 20% in Swedish Lapland.

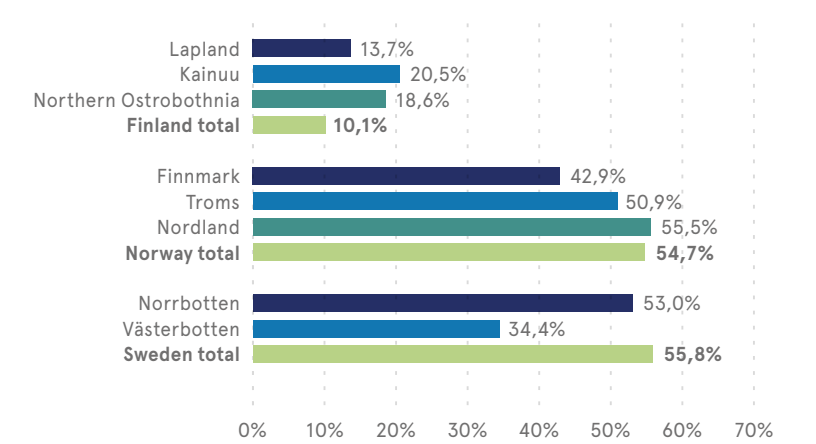


Figure 8 –Active enterprises index at the BIN county level, Arts, entertainment and recreation, 2008–2015, % change

Figure 8 demonstrates the AE index in the arts, entertainment and recreation industry. Troms (79.4%), Västerbotten (76.8%) and Northern Ostrobothnia (73%) counties saw the largest increase in the active enterprises’ population during 2008–2015. AE index in arts and entertainment industry reflects growth in tourism and appears to be more pronounced in the growing counties of Troms and Northern Ostrobothnia, compare to Kainuu’s (2.4%) and its diminishing population.

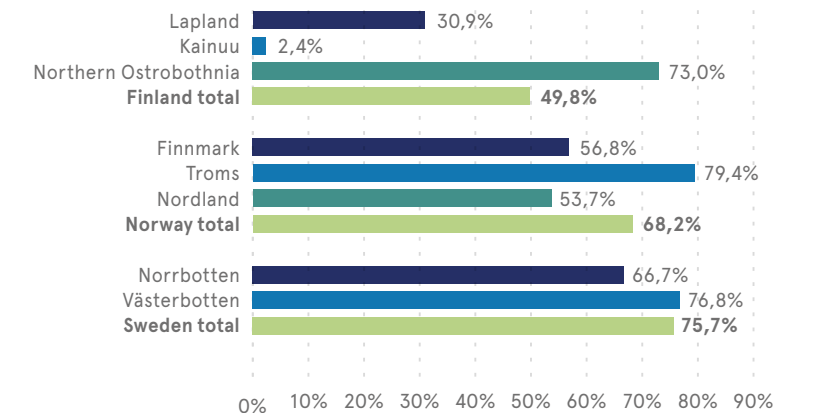


Figure 9 – Active enterprises index in at the BIN county level, Manufacturing, 2008–2015, % change

Figure 9 shows that the BIN counties succeeded outperform in the number of active enterprises in manufacturing compared to the total for Norway, Sweden, and Finland. A growth of 12.1% was observed in Norrbotten and 11.1% in Finnmark, while Kainuu county (-12.9%) experienced a reduction in the number of active enterprises in manufacturing. This phenomenon deserves further attention in order to identify the factors influencing the decision to develop manufacturing in the High North. One possible explanation could be the rise of manufacturing enterprises that use raw materials from the agriculture, forestry and fishery industry.

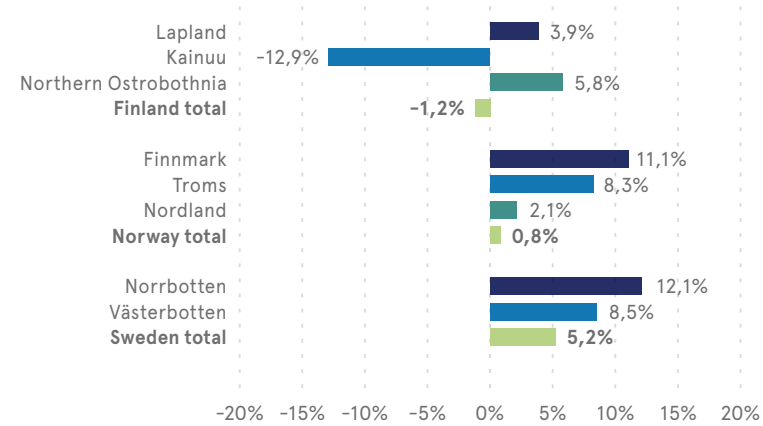


Figure 11 – Active enterprises index at the BIN county level, Water and sewage, 2008–2015, % change

Figure 11 shows the AE Index in the water and sewage industry. According to Cleantech Group, the way businesses and individuals think about water and waste is rapidly changing. New business models are emerging that reward conservation, reuse and recycling instead of consumption. The Swedish BIN counties Norrbotten and Västerbotten experienced the largest growth in the active enterprises' population with increases 55.6% and 70.8% respectively. This is much higher than Sweden's average of 37.3%. The growth in Norway occurred in Troms (30.0%) and Nordland (31.8%), while Finnmark lost 18.8% of its active enterprises since 2008. In Finland, only Lapland experienced a small growth of 2.4%, while Northern Ostrobothnia and Kainuu both had a decline in the number of the AE Index in the water and sewage industry. The AE index in water and sewage can be used as an indirect measurement of Cleantech enterprises' growth rate in water and sewage industry.

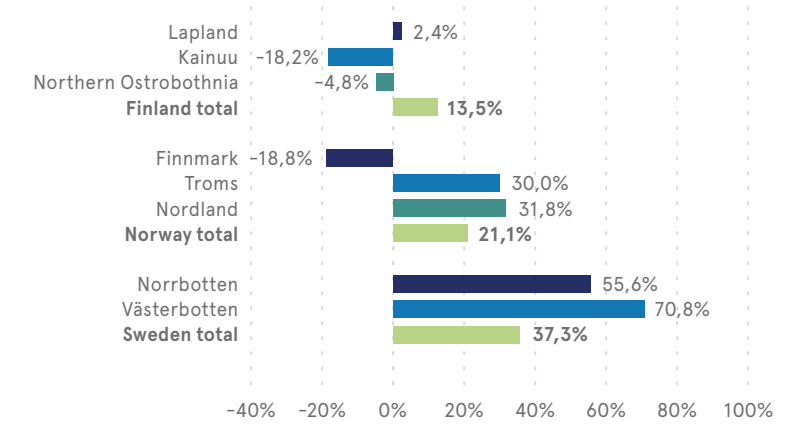


Figure 10 – Active enterprises index in at the BIN county level, Electricity gas, steam and air conditioning supply, 2008–2015, % change

Figure 10 shows the trend in the electricity, gas, steam and air conditioning supply active enterprises index. The leading county in the electricity, gas, steam and air conditioning supply active enterprises index was Northern Ostrobothnia 91.4%, followed by Västerbotten 47.5% and Finnmark 38.5%. The growth above the respective country's average can be attributed to the rise of Cleantech<sup>5</sup> industry in those counties. On the global scale Finland ranks 2<sup>nd</sup>, Sweden 4<sup>th</sup> and Norway 14<sup>th</sup> in the Global Cleantech Innovation Index<sup>6</sup>.

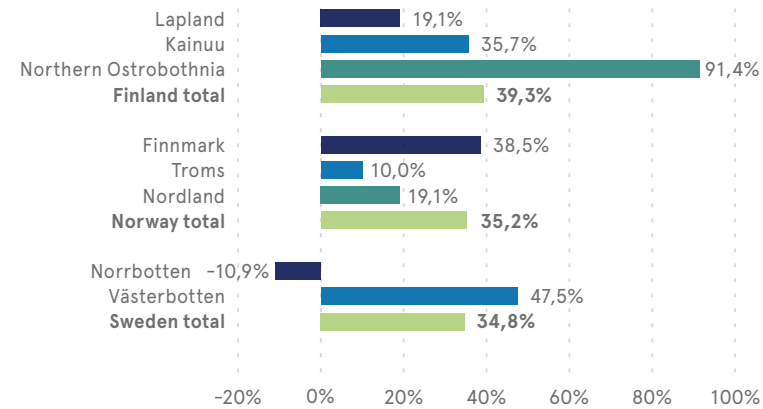
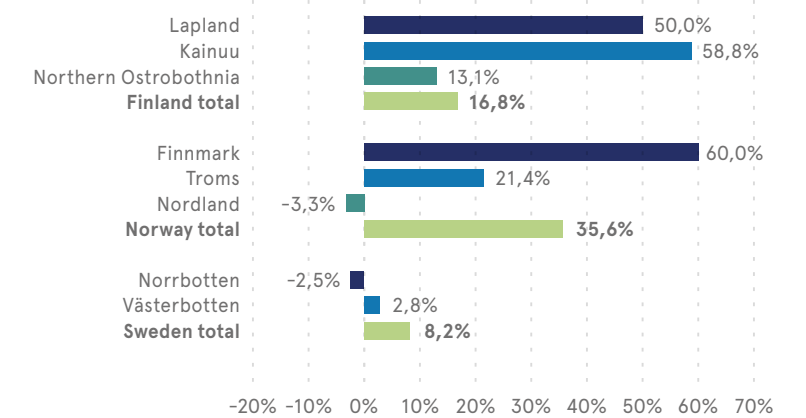


Figure 12 – Active enterprises index at the BIN county level, Mining and quarrying, 2008–2015, % change

Figure 12 illustrates the change in the AE Index in mining and quarrying during 2008–2015. The Finnish counties Lapland and Kainuu experienced a growth of 50.0% and 58.8% respectively, while the overall AE Index in Finland rose by 16.8%. In Norway, Finnmark saw a growth of 60%, followed by Troms (21.4%), Nordland experienced a decline of (-3.3%). For comparison, the AE index shows that the total growth in Norway was 35.6%. The growth pattern in Sweden was the slowest, with the total for Sweden reaching 8.2%, with Västerbotten's growth of 2.8% and a decline in Norrbotten (-2.5%). The growth in the AE Index in the Finnish counties Lapland and Kainuu can be attributed to the growing number of exploration projects<sup>7</sup> in search for precious metals as well as base metals (nickel

and copper). In Norway, permissions have recently been granted to proceed with development of a copper-noble metal mine at the Nussir and Ulveryggen deposits in the northern Norway. Nine deposits in Norway meet the specifications for deposits considered to be large or potentially large<sup>8</sup>. Low growth in the AE index for the Swedish counties may be due to dominant position large players have and high entry barriers for new businesses. Statistics on employment for the time period 2008–2014 reflect that the mining and quarrying industry experienced the largest job losses. Jobs losses in the mining and quarrying industry 2008–2014 combined with the growth in the AE Index for 2008–2015 may mean that the companies had not started employing people yet during the exploration phase. Moreover, missing employment statistic for the year 2015 may have had an impact on the results.



<sup>5</sup> Cleantech – or clean technology – refers to products, services and processes that promote the sustainable use of natural resources while reducing the harmful effects of industrial processes on the environment. Cleantech is cross-sectoral technology for the promotion of material and energy efficiency, renewable energy, water and material recycling, and environmental management (TEKES definition).

<sup>6</sup> The Global Cleantech Innovation Index 2014, where 40 countries were evaluated on 15 indicators related to the creation, commercialisation and growth of cleantech start-ups.

<sup>7</sup> Geological survey of Finland (Statistics on active metal ore mines and current projects)

<sup>8</sup> Mineral Resources in the Arctic (2017). Geological survey of Norway, p.47.



Figure 13 – Active enterprises index at the BIN county level, Financial and insurance activities, 2008–2015, % change

Figure 13 demonstrates the change in the AE index for financial and insurance activities. This industry had the highest growth in the number of active enterprises since 2008. However, the growth is not uniform on a BIN county level. The highest growth in the AE index in financial and insurance activities is observed in Norrbotten (116%) and Västerbotten (109.8%), much higher than Sweden's total of 95.6%. The total for Norway has grown by a record-high 194.8%, followed by Finnmark (160.0%), Troms (140.7%) and Nordland (138.0%). In Finland, the growth in the AE Index for financial and insurance activities has been moderate, compare Finland's total of 12.3% to Northern Ostrobothnia's (28.1%) and Lapland's (18.4%), and with a decline in Kainuu (-21.4%). This industry deserves a more thorough study in order to understand what created an increase in the index. A potential explanation could be the uptake of digitalization in financial and insurance activities and openings of Fintech enterprises.

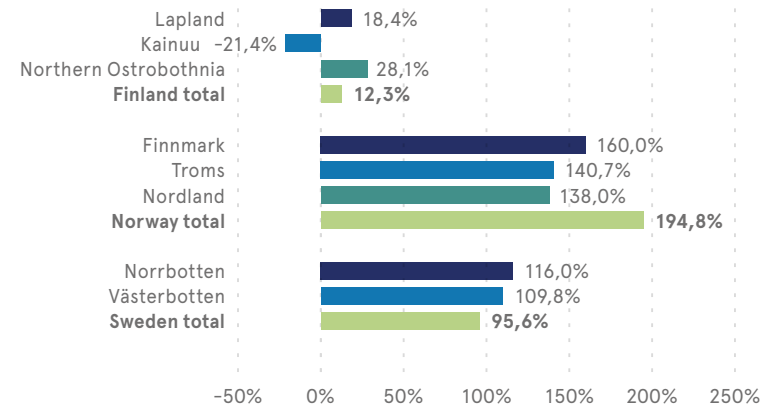


Figure 15 – Active enterprises index at the BIN county level, Professional, scientific and technical activities, 2008–2015, % change

Figure 15 shows the trend in the AE index for professional, scientific and technical activities. The rise in the number of enterprises in professional, scientific and technical activities is illustrative for measuring how many of high-skilled workers with tertiary degrees (human capital) are contributing to business creation in the BIN area. In Finland, the counties Northern Ostrobothnia (33.3%) and Kainuu (30.4%) outperformed Finland's total of 21.9%. At the same time, Lapland saw an increase of 15.2% in the AE index for professional, scientific and technical activities. In Norwegian BIN counties, the rise varied from 27.1% in Nordland to 37.5% in Finnmark, while the total for Norway's the AE index in professional, scientific and technical activities grew by 45.1%. In the Swedish BIN counties Västerbotten (55.1%) and Norrbotten (49.4%), growth lagged behind the country's total of 61.3%. Growth in the BIN area (excluding Kainuu and Northern Ostrobothnia) below Nordic countries' average in professional, scientific and technical activities can be attributed to the still-developing start-up ecosystems in the BIN area and the ability to attract capital, when compared to the more metropolitan areas of Finland, Norway and Sweden.

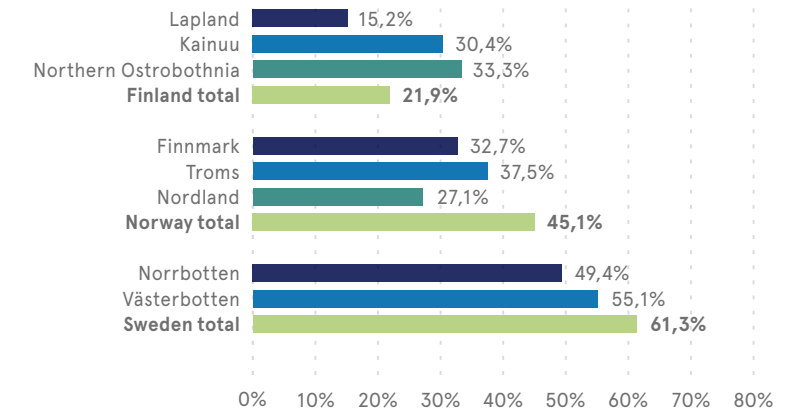


Figure 14 – Active enterprises index at the BIN county level, Information and communication, 2008–2015, % change

Figure 14 demonstrates the change in the AE index for information and communication. Comparing growth on a country level, Sweden led with its 56.6% increase in the AE index for the information and communication industry, followed by Norway (39.8%) and Finland (29.7%) during 2008–2015. The Norwegian counties Finnmark, Troms and Nordland all followed the country's pattern, with nearly 40% increase in the AE index for the information and communication industry. The Swedish counties Västerbotten (38.9%) and Norrbotten (23.7%) fell behind the country's total of 56.6%. In Finland, the growth in active enterprises in the information and communication sector was concentrated in the county of Northern Ostrobothnia, which has served as a hub to global product development units in ICT<sup>9</sup>.

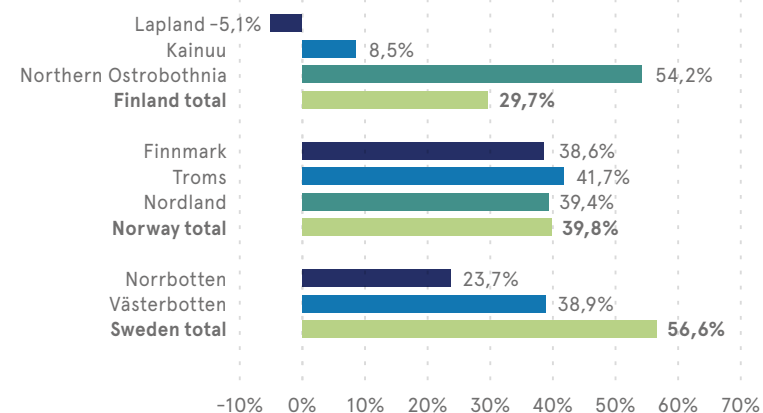


Figure 16 – Active enterprises index at the BIN county level, Wholesale and retail trade, repair of vehicles and motorcycles, 2008–2015, % change

Figure 16 illustrates patterns in the AE index for the wholesale and retail trade, repair of vehicles and motorcycles. On a country level, Sweden (17.9%) saw the biggest growth in its the AE index, followed by Norway (8%) and Finland (6%). In Finland, Northern Ostrobothnia and Lapland counties both saw a growth in their AE index of 11.8% and 9.7% respectively, while Kainuu experienced a decrease of 3%. In Norway, a decline was observed in Finnmark (-3.5%) and Troms (-2.5%), and a slight increase in Nordland (0.1%). The Swedish counties Västerbotten and Norrbotten experienced growth of 12.2% and 16.6% respectively. The interpretation of these results can be twofold. Counties experiences declines may have oligopolistic markets dominated by few strong players, which creates barriers for the entry of new enterprises. The decline could be also attributed to the increase in online shopping, whereby the local active enterprises population suffers as result of competition with online shops.

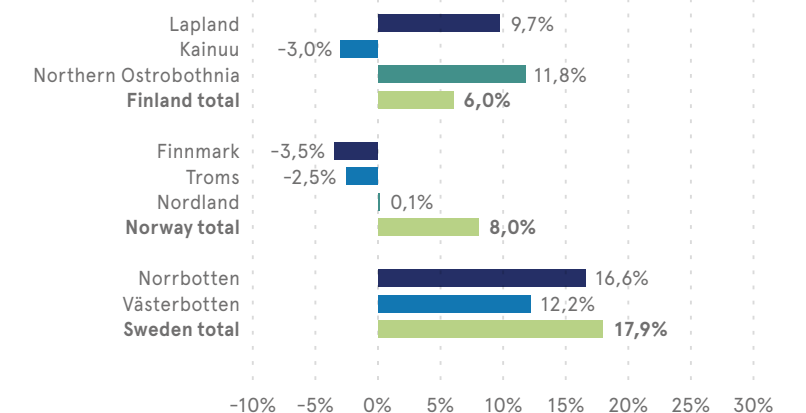
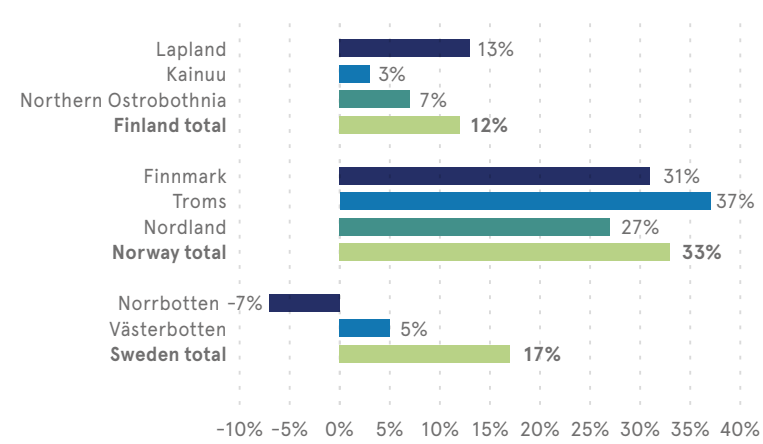


Figure 17 — Growth in production value expressed as index (index 2005=100) for the period 2010–2015

Figure 17 demonstrates growth in production value as % during 2010–2015 at the BIN county level. Production value of goods and services is calculated using GDP statistics, excluding public sector and non-profit organizations. This indicator can be used to measure the growth in private sector value creation. This indicator does not measure directly growth in production value of active enterprises (limited liability companies), it only provides indicative and approximated estimation of private sector value creation in the BIN area. Production value exceeded 103 billion euro in the BIN area in 2015. This accounts for 8 % of mainland production value for goods and services in the BIN countries. Lapland experienced stronger growth than Finland’s average. In Norway, Troms (37%) had the largest growth in production value, followed by Finnmark (31%). Nordland’s production value (27%) grew slower than Norway’s country average of 33%. In Sweden, BIN counties of Västerbotten (5%) and Norrbotten (-7%) did not achieve the growth at national level (17%). Negative growth in Norrbotten is attributed to mining industry challenges. Strong growth in production value in Troms is due to high government activity, increased tourism, and aquaculture activity, while Finnmark benefited from higher oil and gas activity and aquaculture.

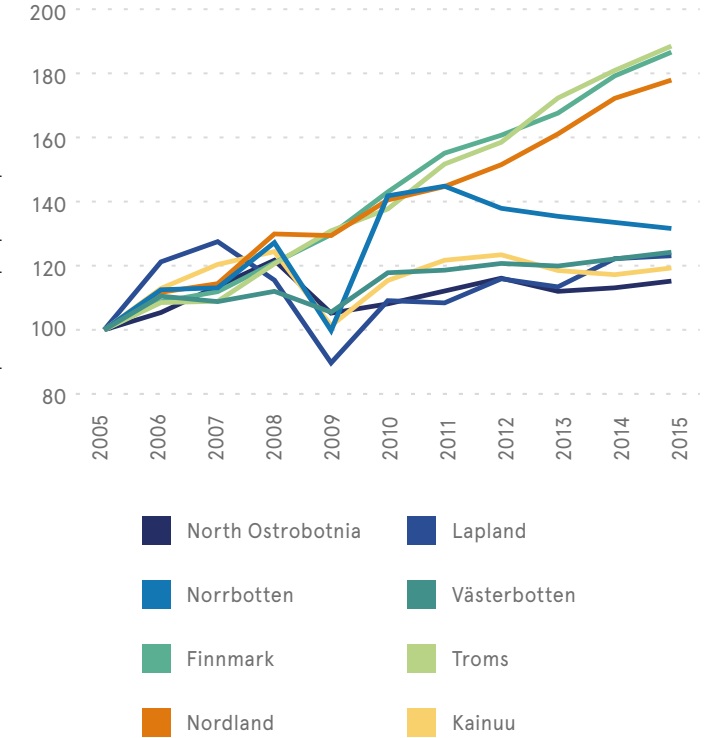


Production value exceeds 103 billion euro in the BIN area. This is 8 % of mainland production value for goods and services in BIN countries. Lapland experience stronger growth than Finland's average. In Norway, Only Nordland grows slower than country average in Norway. In Sweden None of the regions achieve growth at national level. Norrbotten, due to mining industry challenges, experience reduced product value. Strong Growth in Troms is due to high government activity, increased tourism, and aquaculture activity, while Finnmark benefits from higher oil and gas activity and aquaculture.

Figure 18 — Growth in production value expressed as index (index 2005=100) for the period 2005–2015

Figure 18 presents growth in production value expressed as index (index 2005=100) for the period 2005–2015. Counties of Lapland and Norrbotten have by far experienced the most volatile production value fluctuations in the 10 years between 2005 and 2015. These counties are heavily influenced by the financial crisis negative influence on global mineral and ore prices. Northern Ostrobothnia struggled to grow production value in the aftermath of the 2008 crisis, resulting in the lowest 10-year growth in the BIN area. Weak growth in the Swedish and Finnish BIN counties, contrast powerful mainland production value growth in all BIN Norwegian counties. A mix of increased exports of fish from farming and wild catch, increased metal and chemical product export, and multiple large oil and gas site developments fuel the strongest growth in Norwegian counties out of the BIN area. On average, the BIN area’s production value grew by 32 % in the last 10 years, compared to 42 % in the BIN countries as a whole.

Counties of Lapland and Norrbotten have by far experienced the most volatile production value fluctuations in the 10 years between 2005 and 2015. These regions are heavily influenced by financial crisis negative influence on global mineral and ore prices. North Ostrobothnia struggles to grow production value in the aftermath of the 2009 crisis, resulting in the lowest 10 year growth in the BIN area. Weak growth in Sweden and Finland, contrasts powerful mainland production value growth in all North Norwegian counties. A mix of increased exports from fish from farming and wild catch, increased



metal and chemical product export, and multiple large oil and gas site developments, fuel the strongest growth found in the Bin area. On average, BIN areas production value grow 32 % in the last 10 years, compared to 42 % in the BIN countries as a whole.

## Implications

Statistics from the AE index provides a useful tool for stakeholders interested in the BIN area. It allows mapping areas of economic activity and profile counties based on the goods and services provided by its active enterprises organized as limited liability companies. Growth in the active enterprises population can serve as an indicator of future job creation in and increased inflows from taxes to the BIN area. Moreover, through analyzing the active enterprises population, policymakers can evaluate the vitality of each individual county and if needed target support to business creation. The limiting factor of this study was finding comparable and reliable information on business openings and closures, therefore only an aggregated AE index was used instead.

For policy makers recommendations include:

- Joining efforts for creating unified detailed statistics at a county level in the BIN area. Statistics created by National Bureaus should be easily accessible and comparable. Adding data levels on the people employed and turnover of active enterprises would create a very meaningful set of data for future analysis
- Mapping the areas of expertise in the BIN area including the developing fields of Healthtech<sup>10</sup>, Cleantech and Fintech and facilitation of each cluster cooperation

- Evaluation of service economy impacts on traditionally public services (e.g. health care, education) in the BIN area
- Learning from BIN counties that are more successful in growing active enterprises population and from those that have grown their production value during 2005-2015

For business:

- The Active Enterprises Index may aid in important decision-making by highlighting areas of growth and decline in the active enterprises population and in production value on a county level in the BIN area
- Enterprises in the BIN area with similar expertise fields (e.g. Cleantech) could join forces to enter international markets through facilitated cooperation platforms in the BIN area
- Ripening the advance of digitalization by enhancing the visibility of the BIN area. Use the brand of High North to attract capital investment. The brand implies abundance of natural resources, highly educated people and a destination to establish business ranked as easy to do business in on a world scale.

<sup>10</sup> Application of organized knowledge and skills in the form of devices, medicines, vaccines, procedures and systems developed to solve a health problem and improve quality of lives (WHO definition)



## Highlights of Cross-Border Cooperation in the North

“A prerequisite for achieving successful cross-border business cooperation is having knowledge about each other – knowledge about actors, regulations, political conditions and decision-makers in the different countries.”

Arne O. Holm, Norwegian journalist and newspaper editor

This chapter is motivated by our strong belief that cross-border cooperation is key to a successful development of business and society in the northern regions. In this regard, we highlight some important examples of cross-border cooperation within the Barents Euro-Arctic region. The examples come from various sectors in the BIN counties: business, international institutions, media, and the university sector. The list of examples is far from complete. Our aim is not to map all the existing cases of cooperation, but rather to highlight and analyze some of them. Based on the analysis we have produced several learning points relevant for cross-border cooperation in the Barents Euro-Arctic and the northern regions. If you know about other interesting projects, whether ongoing or to be started, please let us know and we will consider them for further studies.

Our data material comes from the publicly available sources as well as from written communication with the experts involved in the cases presented. We asked the experts the same question: “How do you see cross-border business cooperation in the Euro-Arctic Region in 10 years and where is the main potential?” The ideas and visions shared with us by the experts laid a solid foundation for discussing the opportunities for cross-border cooperation. Our key observations are as follows:

- Successful cross-border cooperation in the Euro-Arctic requires a new mindset. We should drop the mental boundaries associated with borders between countries and fields

of knowledge; there is a need to secure flows of knowledge, information, goods, workforce, and students.

- Existing transport infrastructure and resource flow in the north of the Nordic countries has already developed along a north-south dimension. This represents a challenge for developing a west-east cooperation mindset.
- The potential lays in cross-border cooperation in the SME sector and in creation of new industries in the Euro-Arctic; for instance, industries utilizing steel or local suppliers to large infrastructure projects.
- International joint ventures may be a way forward in developing vast northern resources and territories.
- Equal partnerships between universities and industry is a key principle for the successful development of business in the Arctic.
- Long-term commitment of international cooperation institutions signals how the overall economy of the Arctic region is going to develop – local companies have to think how they identify with this.

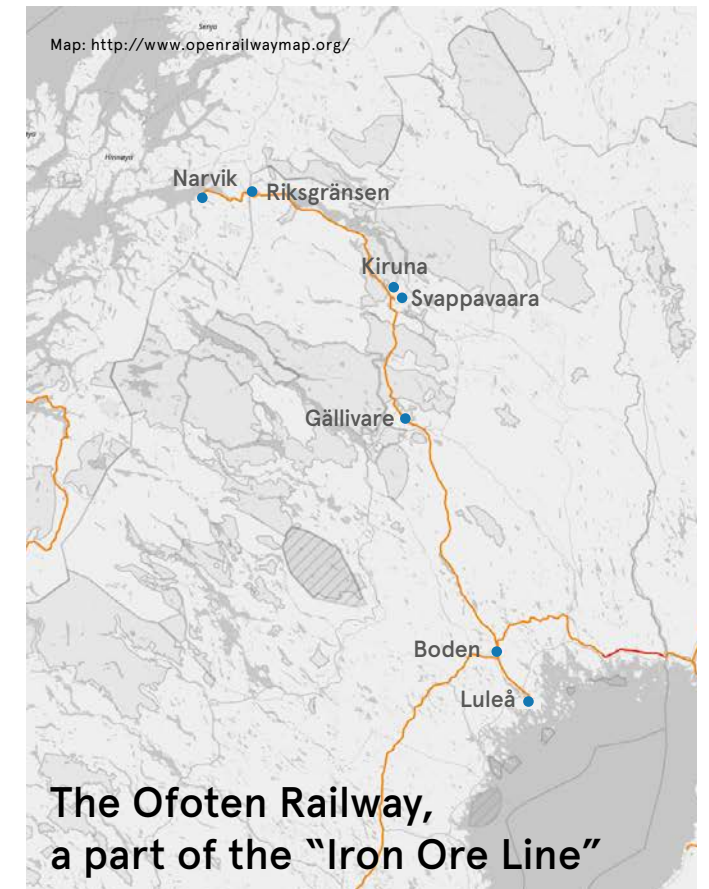
In the remainder of the chapter, we present selected cooperation cases and our learning points. The chapter ends with concluding remarks about approaches to successful cooperation in the North.

## Cooperation Cases from Business

### The Ofoten Railway<sup>1</sup>

The Ofoten Railway is a 43 km long railway line between the Norwegian port of Narvik and the Swedish border, where it connects with the Swedish railway network. The Ofoten Railway is the most trafficked stretch of railway in Norway. The bulk of the traffic consists of ore from mines in Kiruna, Sweden. Every day, 10–12 ore haulage trains travel in each direction on the line for the Swedish mine company LKAB. The Ofoten Railway is an important freight corridor for the Nordics, a part of the “Iron Ore Line” – a nearly 500 km long railway between the ports of Narvik in Norway and Luleå in Sweden. The railway is also important for freight transport between Southern and Northern Norway, with 90% of Northern Norway’s grocery supply routed through Narvik by train. The capacity of the Ofoten Railway is limited, and plans for expansion to double-track are being explored.

According to a transport development expert we were in touch with, “the Nordic Euro-Arctic countries are located in a north-south direction, as is the majority of the transport infrastructure... Developing East-West transport infrastructure is a key to international business cooperation in the BEAR”. Obviously, the Ofoten Railway serves as a good example of a crucial East-West corridor. However, further extension of the traffic infrastructure eastwards appears to be vital. As mentioned by our expert, “improving and integrating the Ofoten Railway to the east-west railway connections east of Sweden, represents a main potential for improved regional business development and development of new international transit solutions. By connecting this railway to ocean going corridors, based on new and environmental viable propulsion systems, a sustainable transport corridor for the future can be developed”.



<sup>1</sup> <http://www.banenor.no/Jernbanen/Banene/Ofotbanen/>



**The Kimek Companies<sup>2</sup>**

Kimek has a strategic location in Kirkenes, on the doorstep of the Arctic region, Russia and the Barents Sea. The company has a network of partners in Russia and is one of the largest northernmost mechanical environments. Kimek was established in 1986 with the Russian fleet in the Barents Sea as its main market, and also provides service for the mining industry and the Norwegian-Russian trade cooperation. Kimek has local owners who also own an offshore company (Kimek Offshore AS) and an engineering company in Murmansk (Kimek Engineering/Sevgiproybflot). Kimek Offshore AS is a service company for the Arctic oil and gas industry, with firm positions in both Norway and Russia since its establishment in 2000. Kimek Engineering performs design and engineering services on both sides of the border and has its main office in Murmansk.

One of the company directors told us: *“if one looks at the Arctic as one region and does not consider national borders, then knowledge and links between studies and businesses will be the focus area with the greatest potential [...] we are world champions when it comes to Arctic expertise, meaning that we (the local companies in the north) can operate in harsh climate conditions, tackle challenges associated with under-developed infrastructure and digital vulnerability [...] this is how we live and work here”*. It looks like Kimek has a strong identity in being a “cross-border company” due to its proximity and commitment to integration with Russia. At the same time, it is an “Arctic company” with people used to living and working in harsh conditions.



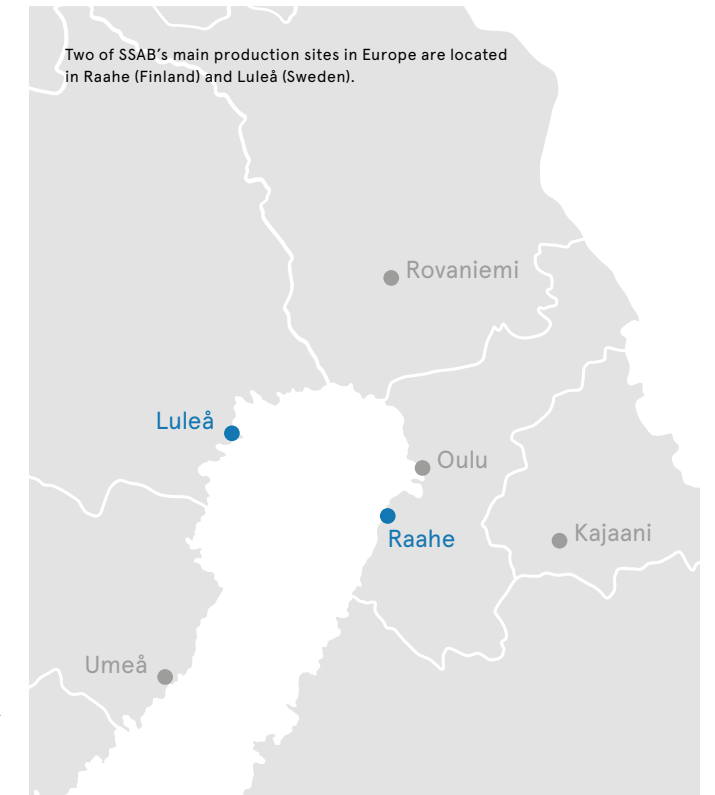
Kimek Offshore’s Russian employees involved in service at Skarv FPSO, Kværner Stord, 2011  
Photo: Kimek Offshore

**SSAB<sup>3</sup>**

As a steel company, SSAB is a leading producer in the global market for advanced high-strength steels and quenched & tempered steels, strip, plate and tubular products, as well as construction solutions. SSAB’s production plants in Sweden, Finland and the US have an annual steel production capacity of 8.8 million tons. The company also has capacity to process and finish various steel products in China, Brazil and many other countries. Two out of SSAB’s three main production sites in Europe are located in the north (Raahe in Finland and Luleå in Sweden). The Raahe site (in the Northern Ostrobothnia county) employs 2,800 professionals who are involved in the manufacturing of steel, plate and strip products. The site also houses the second largest blast furnace in the Nordic countries. The site in Luleå (Norrbotten) involves 1,200 employees. Major shareholders of SSAB is the Swedish Industrivärden and The Government of Finland through the investment company Solidium.

A company expert working in North Finland shared some ideas with us regarding the potential for economic development in the Nordic North. According to him, a next step could be developing local industries that utilize steel, since high-quality iron ore and steel industry are already in place. There are already companies producing lifting equipment, equipment and parts for the car industry, pipes and building materials. This idea of proactive regional industry development is different from the more conventional view of regional business as an attribute to large projects, be it extracting industries or transport infrastructure investments.

At present, however, most of the extracted steel and steel products from the north are subject to exports. At the same time, as we know from the experience in Northern Norway (consider for example the Snowwhite LNG plant), when the project is already there, it is



Two of SSAB’s main production sites in Europe are located in Raahe (Finland) and Luleå (Sweden).

too late for most of the local companies to step in as equipment and service suppliers. Investments in the local industry should be made years before that.



SSAB’s Raahe site in Northern Finland  
Photo: SSAB



#### Fennovoima<sup>4</sup>

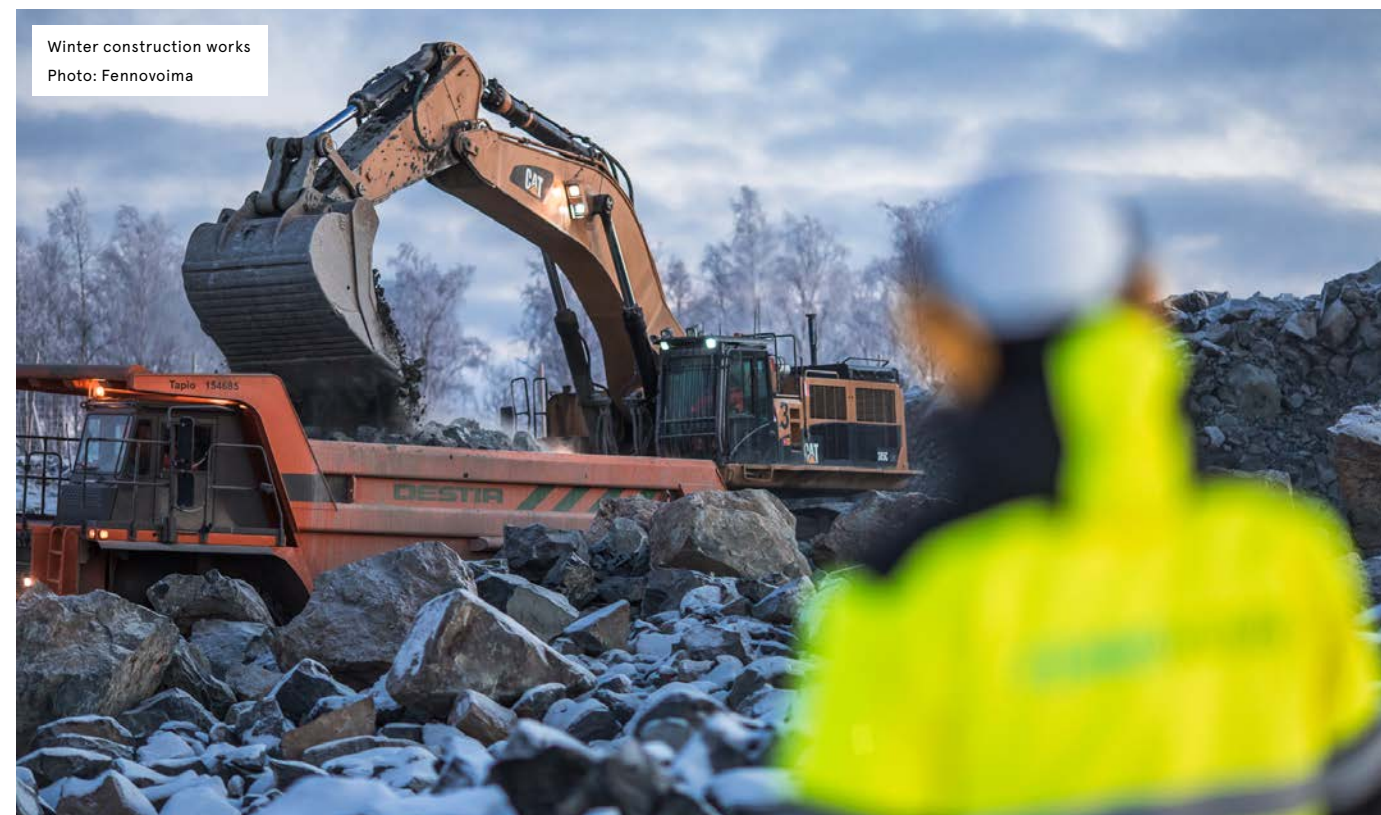
Fennovoima was founded in 2007 by a group of Finnish electricity consumers: industrial companies and energy utilities in need of safe, stable-priced and reliable low carbon electricity generation, aiming to build a nuclear power plant Hanhikivi 1. The Fennovoima and RAOS Project, a subsidiary of Rosatom Energy International (a part of the Russian State Nuclear Energy Corporation Rosatom), has a plant supply contract for the Hanhikivi 1 nuclear power plant. According to a schedule agreed with Rosatom, the Hanhikivi 1 plant will start producing electricity in 2024.

The plant site in the coastal municipality of Pyhäjoki is located in Northern Ostrobothnia on the shore of the Baltic Sea. Fennovoima is meant to strengthen domestic power generation within the EU in the long run (today Finland imports almost 20% of its electricity from neighboring countries). Fennovoima also constitutes a significant investment in low-carbon electricity production in the EU. In May 2014, the local council of Pyhäjoki voted in favor of the project. According to a poll in December 2015, 68% of the residents of Pyhäjoki were in favor of the project.

Although the project got government approval in Finland, the Finnish-Russian nuclear energy cooperation has been criticized by environmental organizations, opposition politicians in Finland, a part of the local population, and some academics. We leave this debate to political, energy security and other experts in the field. As a business-oriented report, we would like to make two points. Firstly, we recommend the Hanhikivi project already now as a potential market for equipment and services for local companies in the Euro-Arctic to consider. As an interviewed expert from Fennovoima mentioned to us, *the construction project already opens a uniquely large market for diverse companies for e.g. design, construction*



*and industrial service companies. The project will use a high number of sub-supplier companies. The procurement process is international and expected to raise interest in industrial companies in Northern Sweden, for example. The value of the entire project is 6.5-7 billion euros. Secondly, it looks like special-purpose companies organized through international joint ventures like Fennovoima could serve as a model for developing resources and territories of the North (consider also the special-purpose company SDAG of the Shokman project in Russia).*



Winter construction works  
Photo: Fennovoima

#### Learning points from the business cases:

There is a cooperation potential in the developing of East-West transport corridors in the Barents Euro-Arctic. The relative lack of such corridors today is a challenge for economic development of the area. It might be difficult to develop “a west-east cooperation mindset”, as the transport infrastructure in the north of the Nordic countries has already developed along a north-south dimension.

Furthermore, there is a potential in developing new industries in the north. Industries utilizing steel deserve a particular attention.

International joint ventures and special-purpose companies may serve as a tool for developing northern resources and territories. Regional companies should be aware of upcoming large infrastructure projects in the North if they are interested in contributing as suppliers.

The Arctic environment puts pressure on people and businesses operating there, making some of them more proactive and less concerned with mental borders between countries, cultures or fields of knowledge. Lack of such mental borders is a specific feature of some companies committed to cross-border work and to constantly developing solutions to overcome practical challenges associated with borders.

## Cases of International Institutions Supporting Cooperation

#### The Arctic Economic Council<sup>5</sup>

The Arctic Economic Council (AEC) is an independent organization that facilitates Arctic business-to-business activities and responsible economic development through sharing of best practices, technological solutions, standards, and other information. The AEC was created by the Arctic Council during the Canadian Chairmanship in 2014. It aims at providing advice and a business perspective to the work of the Arctic Council. The AEC Legacy Members represent a wide range of businesses operating in the Arctic— from mining and shipping companies to reindeer herding and Aboriginal economic development corporations. Representing the people and businesses of the Arctic, it is essential for the AEC that the work is carried out in an inclusive and sustainable manner.

The core of the work of the Arctic Economic Council takes place within five overarching themes: establishing strong market connections between Arctic states, promoting stable and predictable regulatory frameworks, encouraging public-private partnerships for infrastructure investments, facilitating knowledge and data exchange between industry and academia, and focusing on traditional indigenous knowledge, stewardship and focus on small businesses. These

are all also relevant for those operating in the Euro-Arctic Region. Overall, these are important aspects in the Councils’ vision of making the Arctic a favorable place to do business.

As we learned from the representative from the AEC, *the circum-polar business community has identified selected business areas in which the AEC will focus its work. They also reflect the AEC view on current Arctic business opportunities. These include infrastructure and related matters (maritime transportation, communications and IT, and aviation); energy, including oil, gas and renewable sources; mining; tourism; fishing, and human resources investments and capacity building. These selected business areas are also reflected in the AEC Working Groups. The current four Working Groups focus on Maritime Transportation, Telecommunications and Broadband, Responsible Resource Development, and Arctic Stewardship.*

#### Arctic Programme of the Nordic Council of Ministers<sup>6</sup>

The Nordic Council of Ministers’ Arctic Cooperation Programme 2015-2017 was adopted by the Nordic Council in 2014. The overall objective of the programme is “sustainable development” and it has four priority themes: 1) The people of the Arctic, 2) Sustainable economic development, 3) Environment, nature and climate, 4) Education and skills enhancement. The programme provides funding for projects, studies and initiatives in line with the programme objectives. Since 2014, the ministers for Nordic co-operation have earmarked DKK 2 million annually from the programme budget for political initiatives designed to generate Nordic synergies in work in the Arctic. The Nordic Council of Ministers, founded in 1971, is the official body for inter-governmental co-operation in the Nordic Region. The overall responsibility for co-operation lies with the respective prime ministers, but in practice it is delegated to the ministers for Nordic co-operation.

As we learned from the NCM experts, at present the cross-border cooperation development is observed within small-scale businesses in the Euro-Arctic regions, especially within trade, building and construction supplies, service provision and tourism; in particular, the construction industry in Northern Norway obtains its expertise from other Nordic countries. The experts also meant that this trend in small-scale businesses and entrepreneurship would continue to rise within the next ten years in fields such as service supply, engineering, IT and tourism. Thinking cross-border business cooperation will be a more natural part of business in the Euro-Arctic regions for the future. As for the large-scale industry, the main potential is based on the overall objective of cross border cooperation in the petroleum industry, where all the Euro-Arctic countries are engaged in developing infrastructure and extraction of resources.

#### Learning points from the cases of international institutions:

The long-term commitment of international institutions like the AEC and the NCM plays an enabling role for the development of businesses, as it gives us signals on how and what sectors of the overall economy of the region are going to develop. SMEs in the Euro-Arctic region have already begun to recognize the importance of cross-border cooperation.

## Cases from the Media

### The Independent Barents Observer<sup>7</sup>

The Independent Barents Observer is a journalist-owned online newspaper covering the Barents Region and the Arctic. With a devotion for cross-border cooperation, dialogue and mutual understanding, the Independent Barents Observer provides daily news reports from and about Scandinavia, Russia and the Circumpolar Arctic to global audiences interested in Arctic issues. The Independent Barents Observer follows the key trends and developments in climate change, energy and industry, shipping, politics, civil society, national security and indigenous people's issues. The Independent Barents Observer publishes in English and Russian. By providing impartial information and opinions across the borders of the Arctic and the Barents Region, the newspaper serves local societies, supports regional development and promotes international cooperation.

### High North News<sup>8</sup>

High North News (HNN) is an independent newspaper published by the High North Center at the Nord University. The news service issues daily news, editorials and analysis from and about the High North and the Arctic. High North News covers issues that are borderless by nature, with a focus on policy, business and industry, and culture in the High North, written with respect and indeed love for the people of the enormous, circumpolar North. From the outset, the newspaper has aspired to achieve a broad geographical scope. With correspondents in seven different countries, High North News is a bilingual news service, in English and Norwegian, and reaches an increasing number of international readers and stakeholders in the North. Recently, the newspaper entered into a formal cooperative agreement with three other newspapers that cover the Arctic: the Alaska Dispatch, the Arctic Deeply and the Arctic Journal, as well as becoming a partner for the Arctic news portal [www.arcticnow.com](http://www.arcticnow.com). The HNN's commitment to journalism and analyses from the High North will serve as a tool for anyone who wishes to do business in this geographical region. HNN is currently undertaking an initiative that will make the source available in Russian and Chinese too.

According to the HNN's Editor-in-Chief, *a prerequisite for achieving successful cross-border business cooperation is having knowledge about each other – knowledge about actors, regulations, political conditions and decision makers in the different countries. In this regard, the HNN's goal is to contribute to mutual understanding and mutual knowledge within a region marked by both diversity and strong converging interests within a number of fields. On one hand, a notable common ground for the region is its role as an international supplier of raw materials. On the other hand, there is also impressive knowhow within digital technology and logistics. Where these two fields intersect, there is a largely untapped future market.*

### Learning points from the media cases:

Awareness of business opportunities, mutual understanding and knowledge about each other, exchange of impartial information and opinions across borders appears to be an important pre-requisite for economic development in the Arctic and the Barents Region. It is important to secure media sources' contribution to these issues that are widely used by people living in the North.

## Cases From the University Sector

### The University of the Arctic<sup>9</sup>

The University of the Arctic (UArctic) is a cooperative network of universities, colleges, research institutes and other organizations concerned with education and research in and about the North. UArctic builds and strengthens collective resources and collaborative infrastructure that enables member institutions to better serve their constituents and their regions. Through cooperation in education, research and outreach, UArctic works to enhance human capacity in the North, promote viable communities and sustainable economies, and to forge global partnerships.

### International Projects: Arctic Bridge, ARPOL, EduGov

The core activities of these projects are related to planning and implementation of joint short-term courses for international PhD and master students. The Arctic Bridge project aims at strengthened Norwegian-Russian knowledge cooperation in the field of Management in Extractive Industries in the High North. The ARPOL aims at strengthening the Norwegian-Russian institutional partnership in order to increase knowledge about relevant Arctic politics and business, and the connection between them. The EduGov's aim is to extend the existing scientific cooperation between Norway and Russia by developing research and practical competences related to local government budgeting reforms. The projects are administered by the High North Center at Nord University Business School<sup>10</sup> and partner universities in Russia, with financial support from the Norwegian Centre for International Cooperation in Education (SIU).

An expert working with these projects told us: *“the ongoing cooperation between universities and companies of the Euro-Arctic region lays a solid foundation for the next ten years. The willingness to involve universities in knowledge production for business development and university-business partnerships make me believe that this potential will be realized and will assist in establishing new links between academics, researchers, practitioners, and industry representatives. It will be equal partners' cooperation, where universities and companies together with policymakers will shape the regional development and offer support for cross-border cooperation.*

### Learning points from the university cases:

The Arctic moves toward formation of a common space for exchange of knowledge, research and higher education activities; equal partnerships between universities and the industry is a key to successful development of business in the Arctic.

### Concluding Thoughts

The BIN project will continue to work to describe and analyze interesting and on-going cooperation cases within the northern regions. In doing so we will point at cross-border industrial cooperation and related institutions, which we see might have significant influence on sustainable value creation within the Arctic region in the future, also seen from the national perspectives. Based on the findings presented above, we argue that enabling conditions for successful development of the Barents Euro-Arctic can be achieved through

- strengthening the transportation infrastructure between the northern parts of Norway, Sweden and Finland (roads, railways, flight routes, etc.) with further extension to Russia;
- strengthening the cooperation between universities in the northern region, taking into account geographical proximity to challenges in businesses, societies and nature; and
- the national states together with the regional authorities should cooperate even closer to stimulate new industrial cooperation and growth in the on-going and well-established sustainable business cooperation.

Knowledge and continual communication between the political and business societies, both on the national and at the regional level, are crucial in order to succeed in future cooperation. The BIN project and other reports about the Arctic can contribute to this process by providing insightful information and analytics for decision makers.

<sup>7</sup> <http://thebarentsobserver.com/en>

<sup>8</sup> <http://www.highnorthnews.com/>

<sup>9</sup> <http://www.uarctic.org/>

<sup>10</sup> <https://www.nord.no/en/>



# Concluding remarks

Business Index North (BIN) is a project that contributes to sustainable development and value creation in the Arctic. The overall goal is to set up a recurring, knowledge-based, systematic information tool for stakeholders such as businesses, academics, governments and regional authorities, as well as media in the Arctic states. The present issue of the BIN report is the first step in this direction. We started with an analysis of eight counties in the Nordic Arctic: Finnmark, Troms, Nordland (Norway), Norrbotten and Västerbotten (Sweden), Lapland, Northern Ostrobothnia and Kainuu (Finland) that were referred in the text collectively as the BIN area or the BIN counties. Focusing on business opportunities and cross-regional cooperation potential, we addressed the BIN area as a whole and showed its role in the economy of the Nordic countries. At the same time, we offered a nuanced view of the situation in the BIN counties. This work resulted in the developing of a set of comparable indexes and indicators and a set of recommendations for coordinated policy support and cross-regional business development in the BIN area.

We started working with the report late 2015 and the whole journey until this publication was truly explorative. We faced challenges of finding comparable detailed statistics at regional and municipality levels. It was a surprise that the same things were measured in different ways in neighboring Nordic countries, especially when it came to business statistics, industrial production and to some extent also patent and labor statistics. The fact that we got different answers from the respective statistics authorities and agencies in Norway, Finland and Sweden may be an indication of us raising questions nobody have asked before. However, in the course of constructive cooperation with the data providers, we managed to find comparable statistical data and develop a set of comparable indexes and indicators.

We hope that this report places the BIN area on the global map by illustrating its challenges and opportunities through its people, innovations, businesses and resources. We would like to challenge the conventional view of the High North as a prospective area that is interesting only because of its rich natural resources and its being exotic. There are fantastic people, vibrant

communities, innovative businesses and universities, unique cross-border cooperation and huge potential for business development in many sectors and industries. If you start analyzing the BIN area in our way, you would see that the potential is much larger than the expected ripple effects of encroaching global production systems and extractive industries. One of the key arguments of our report is that successful cross-border cooperation in the whole Euro-Arctic (including the BIN area) requires a new mindset. We should ease up on the mental constraints associated with borders between and centralized administrative systems within the countries in order to enable a flow of knowledge, information, goods, workforce, and students in the cross-regional dimension of the BIN area.

The first BIN report comprises three broad topics: People, Business and Production. We study people through demographic changes, human capital and employment in the North. In the Business-related chapters, we address business creation, innovations and cooperation in the North. We investigate production in the BIN area addressing renewable energy production. In the future, we are going to continue studying the same topics but would deepen the analysis. In addition, we are considering focusing on topics such as Infrastructure in the North, Digitalization and Indigenous People Businesses. The next issue of the BIN report, scheduled for winter-spring 2018, is to add an analysis of the territories of North-Western Russia. We will furthermore establish our identity as a business-oriented report, a relevant tool for decision-makers interested in value creation and sustainable development in the Arctic. As you could see in the presented report, every topic we analyze (even questions about population development and education) offers implications for the development of businesses through either politics, investments or cross-sectoral collaboration.

We invite all interested stakeholders to a dialogue and hope that the findings and indexes presented in the report would provide a background for interesting discussions and fruitful cooperation. The contributors to the BIN report come from universities and research institutions in the northern areas of Norway, Sweden,

and Finland. Russia is going to join the work in 2017 and we have initiated the process of involving universities in Canada and the USA. We are a network of dedicated academics and analysts closely connected with businesses and governmental institutions. If you are interested in a certain topic or a deeper study, we are open for potential cooperation.

To secure both the long-term development and practical value of the project, our ambition is to gradually involve commercial partners in all countries participating in the BIN. As a commercial partner in the BIN, your organization will be able to make a positive impact on the strategic development of the project and participate in a communicative arena for business, political and academic actors interested in sustainable development and value creation in the Arctic. The project results are disseminated through various national and international arenas, though the main communication platform of the BIN project is the annual conference High North Dialogue in Bodø (Norway)<sup>1</sup> and also the online newspaper High North News<sup>2</sup>.

Preliminary results of the BIN report were presented 15 times on international and national arenas during March 2016–March 2017. The presentations raised interest, stimulated good discussions about business development in the north and created expectations among the stakeholders. The prospects for further work are exciting. We are going to do our best to meet the expectations of our stakeholders.

April 3rd 2017,

The team of the contributing authors representing  
 Nord University Business School  
 and the High North Center (Norway)  
 Bodø Science Park (Norway)  
 Oulu University Business School (Finland)  
 Luleå University of Technology (Sweden)

<sup>1</sup> Web site of the conference - [www.highnorthdialogue.no](http://www.highnorthdialogue.no)

<sup>2</sup> Web site of the newspaper - [www.highnorthnews.com](http://www.highnorthnews.com)

## BUSINESS INDEX NORTH

Business Index North (BIN) is a project that contributes to sustainable development and value creation in the Arctic. The overall goal is to set up a recurring, knowledge-based, systematic information tool for stakeholders. This is the first “Business Index North” periodic analytical report that focuses on the BIN area, including eight northern counties of Norway (Finnmark, Troms, Nordland), Sweden (Norrbotten and Västerbotten) and Finland (Lapland, Northern Ostrobothnia and Kainuu). For the second issue of the report we would include Russian territories of High North. Our further plan is to gradually include the northern territories of the USA, Canada, Denmark (Greenland), and Iceland.

This report places the BIN area on the global map by illustrating its challenges and opportunities through its people, innovations, businesses and resources. We challenge the conventional view of the High North as an area that is interesting only because of its rich natural resources and its being exotic. There are fantastic people, vibrant communities, innovative businesses and universities, unique cross-border cooperation in many sectors and industries. The BIN report highlights the potential for investments and new business development.

The BIN project is based on an international partner network and coordinated by the High North Center for Business and Governance at Nord University Business School (Norway). Nordland County Council and The Norwegian Ministry of Foreign Affairs provide basic funding for the BIN project.

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