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Socio-Economic Resilience in the Barents Arctic

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Cover Image
Paraglider, paragliding over the arctic city of Tromsø in Northern Norway.
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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 coordinator of the BIN project is the High North Center for Business and Governance at Nord University Business School (Norway). The project is implemented through the international network of partners from Norway, Sweden, Finland, and Russia.

This is a special issue of the "Business Index North" that focuses on the socio-economic resilience of the northern regions of Norway (Troms and Finnmark, Nordland), Sweden (Norrbotten, Västerbotten), Finland (Lapland, North Ostrobothnia, Kainuu) and Russia (Murmansk oblast', Arkhangelsk oblast', the Republic of Karelia, the Nenets Autonomous District, the Komi Republic and the Yamal-Nenets Autonomous District). Socio-economic resilience is associated with regions' capacities to maintain, adjust and transform their socio-economic systems in the face of challenges.

The regions studied are referred to collectively as the "BIN area" (map below). The BIN area runs across national borders has common characteristics and challenges in terms of infrastructure, industry, geo-demographic and environmental conditions.

The total population of the BIN area is approximately 5.5 million with 70% living on the Russian side and 30% on the Nordic side. Major industries operating in the BIN area are mining, manufacturing, construction, transportation, and wholesale and retail trade. In addition, fisheries and aquaculture businesses are represented in Northern Norway and Murmansk Oblast in Russia.

Please refer to the project website www.businessindexnorth.com to see our previous reports, download this report, and use our numerous tools for visual data analysis.

Executive summary

The focus of this report is on the socio-economic development of the European (Barents) part of the Arctic (hereafter the BIN area), asking the question to what extent this part of the Arctic is a resilient region. Resilience is seen as the capacity to use the latent property of the environmental, social, and economic resources to create a positive development path.

The BIN area represents an abundance of natural and environmental resources, both on land and at sea.

Value creation in the BIN area has been on a continuous growth path, for the last decade or so with a higher growth rate than the respective national averages for most of the BIN regions. The increased international interest in the area is for the most part related to its natural sources – its oceans, its energy, its minerals, and its tourism potential, but is also related to infrastructure, transport, and hence also to search and rescue, and of course geopolitical issues.

Yet despite its abundance of natural resources and a positive economic growth path in most of the BIN area, its most important resource and the main engine for further development – its people – is declining, in terms of number, skills, and quality of the demographic structure. The demographics of the Arctic is directly related to societal and economic development, and now it is on a dangerous path.

The young, and especially young females, are leaving, and the educational level is significantly below the respective national averages for most of the BIN regions. The share of people of working age is declining and the population is ageing in the Nordic part of the BIN area. Most of the Russian BIN regions have experienced a dramatic decline in numbers of young people and jobs during the past decade. Also, the educational gap between males and females is growing (men being the less educated), and the concentration of R&D workers in the business sector is low. The negative demographic trend is the most alarming underlying structural challenge related to the prospects for building a resilient Arctic. There is also a heavy dependence on in-migration.

We also observe a growing urban–rural divide, where the general trend is that the larger municipalities get larger – and the smaller ones get smaller. It is generally the larger cities in the Arctic, and especially those who host universities, that have a positive growth path, indicating a long-term gradual deterioration in a large number of municipalities. But the Arctic is not only losing people; it is also losing jobs in many sectors, thereby exacerbating the negative demographic situation.

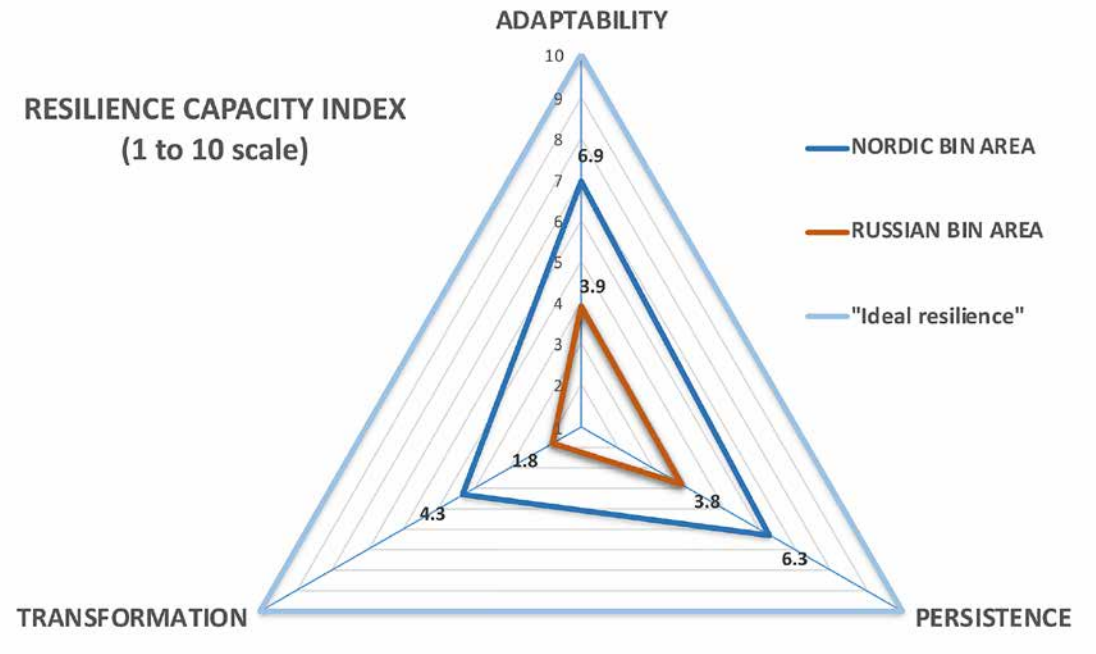
Although we see a positive economic growth path in the BIN area, there are considerable challenges related to the industrial mix. The rationalization of industrial production leads to a diminishing need for workforce. Although we find that the services sector is economically lucrative in the Arctic, we see an alarmingly small proportion and a reduction in services, especially in knowledge-intensive services. The small and decreasing proportion of knowledge-intensive services, a deficit of R&D workers and a deficit in R&D investments makes the region less attractive to highly educated people.

Traditionally, most of the Arctic regions have reacted to upcoming changes with persistence, aiming at resisting the negative implications of such changes. Today, we need to move away from an excessively strong focus on persistence towards a more opportunity-driven adaption and a focus on transformation. There is a need to create a development path where more of the value created in the Arctic is actually utilized in and for the Arctic. Specifically, we have to search for mechanisms where the value chains are expanded. Expanding the value chains implies a growth in knowledge-based services, alongside a stronger focus on innovation and entrepreneurship to increase the capacity to adapt and transform. Thus, to increase the resilience of the Arctic regions, we need to search for mechanisms that increase both the quality and quantity of the main engines for further development – people. Figure 1 below presents the resilience capacity index of the BIN area as a whole, through its capacity to persist, adapt, and transform.

The figure depicts a rather grim picture, especially of the resilience capacities of the Russian BIN areas through their capacity for persistence, adaptability, and not the least their capacity for transformation. Although the situation is better in the Nordic BIN area, there remains considerable room for improvement. Low capacity to transform is likewise a big obstacle in the Nordic area.

To move forward we need to increase the region's attractiveness for the young, and especially for highly educated people, not only for those already living there, but also from other parts of the world. To succeed, we need to transform the industrial mix of the region toward an increase in jobs within the service sector, and especially within knowledge-based services. This also requires searching for mechanisms to increase both R&D investments and R&D workers in the region. There is also a need to strengthen the higher education and research institutions in the Arctic, and to build more Arctic knowledge conducive to a positive development. The larger cities have to be strengthened and serve as engines for a positive overall regional development, but not at a cost of the surrounding municipalities. We also need to create new models for creating and coordinating stakeholders, both inside and outside the region, which also involves energizing those stakeholders that have been left out in several development processes – especially the young people.

Figure 1. Resilience capacity index (1 to 10 scale)



	ADAPTABILITY	PERSISTENCE	TRANSFORMATION	TOTAL RESILIENCE
NORDIC BIN AREA	6.9	6.3	4.3	5.8
RUSSIAN BIN AREA	3.9	3.8	1.8	3.2
"Ideal resilience"	10.0	10.0	10.0	10.0

This figure shows resilience capacity index calculated for the Nordic and Russian parts of the BIN area.

The index is based on 8 selected indicators discussed in this report (economic growth, employment, net-migration, R&D activity, employment in knowledge intensive services, stability of rural areas, educational attainment, relative poverty). Index scale is 1 to 10, with 1 associated with least desirable outcome and 10 with most desirable outcome.

The index is three-fold as it includes the capacities:

Persistence - coping capacities leading to persistence
Adaptability - capacities leading to incremental adjustments and adaptive changes
Transformation - capacities leading to structural or systemic reconfigurations.

Contents

Introduction

The objective of this report is to investigate Arctic regions through the lenses of a resilience framework adapted to Arctic contexts and focusing on the socio-economic resilience of the Arctic communities.

1.1. What is Arctic resilience?

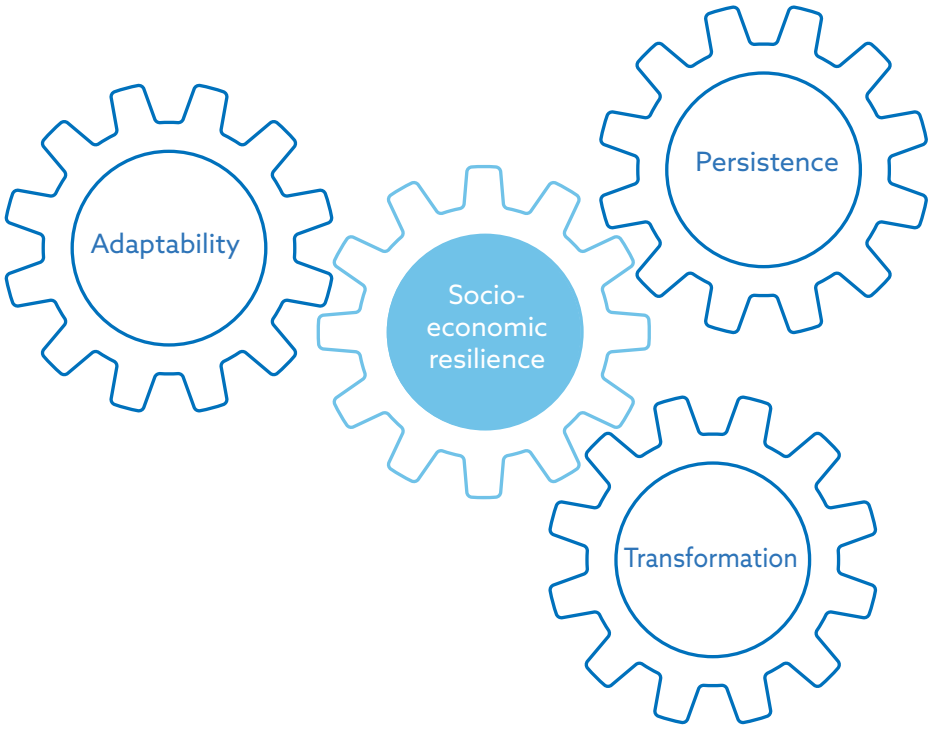
Resilience originates from the Latin word "resilere", meaning "jumping back", "rebounding", or simply to "bounce back". The term was first used scientifically in the mechanical sciences from the end of the 18th century[1], and then spread to psychology, ecology, and a number of other scientific disciplines such as geography and economics.[2] Since then, the concept of resilience has undergone an essential development, moving from understanding it via the original meaning of "returning to the original state (bounce back), towards an understanding that a different and possibly better state can be achieved through adaption and transformation (build back better/bounce forward)[3].

Given the profound changes the Arctic regions are facing, the remedy of the past will not provide the necessary cure for the future. Hence, our approach to resilience is that it is a result of a combination of a region's capacity not only to persevere, but also to adapt and/or transform. This leads to three different responses:

1. Persistence (coping capacities leading to persistence)
2. Adaptability (adaptive capacities leading to incremental adjustments and adaptive changes)
3. Transformation (transformative capacities leading to structural or systemic reconfigurations).

We follow the argument that the dynamism of resilience, and hence the ability to act upon changes stems from "multiple pathways to resilience" – rather than a single one – including: persistence, adaptation, and transformation[4], hence presenting our view of responses to resilience in Figure 1.1. below.

Figure 1.1 Socio-Economic resilience and regional development strategies.



[1] Referring to the extent which materials are able to deform and return to their original state

[2] Copeland, S; Comes, T; Bach,S; Nagenborg, M,; and Schulte, Y (2020). Measuring social resilience: Trade-offs, challenges and apportunities for indicator models in transforming societies. International Journal of Disaster Risk Reduction, 51, ,101799

[3] i bid. 5

[4] Luna Khirfan & Hadi El-Shayeb (2019): Urban climate resilience through socio-ecological planning: a case study in Charlottetown, Prince Edward Island, Journal of Urbanism: International Research on Placemaking and Urban sustainability, DOI: 10.1080/17549175.2019.1650801

We argue that for a region to become resilient, it needs to both persist, adapt, and transform simultaneously. Without some degree of persistence, the region and its local communities will become unstable. At the same time there is a need to continually adapt and transform to be able to respond to today'spressing societal, economic, and environmental issues .

Persistence, adaptability, and transformation are related to the notion of exploitation and exploration[5]. Persistence is related to exploitation and involves activities such as refinement and efficiency, whereas adaptability and transformation are related to exploration, and involve activities such as search, risk-taking, experimentation, discovery, and innovation. Adaptability is related to incremental innovations, whereas transformation is related to radical innovations. It is widely argued there is a need to both explore and exploit to remain successful.

Take, for instance, North Ostrobothnia in Finland. They were able to handle the situation arising when Nokia surpassed and managed to create a dynamic region with substantial growth potential, following a profound transformation of the high-tech industry. They had access to and were able to deploy the necessary "fuel" in the form of economic, human, and social resources/capacities. They pursued a holistic approach in creating resilience, by bringing together the different actors in the system to create not only persistence, but also to lay the foundations for both a stronger adaptability and transformation. And hence, were able to persist, adapt and transform simultaneously. As a result, they managed to create diversification within industries and were successful in marked diversification.

However, gaining access to human and social resources/capacity is challenging for many of the Arctic regions, and especially for those in the most rural areas, as these regions' demographic, societal, community, and knowledge capacities are mostly below not only the average of the countries to which the different regions belong,, but also within the region they are part of. Hence, the challenge for some regions, or parts of regions, entails long-term deterioration, (ageing population, lack of education, etc), especially in rural areas. These areas will struggle more to cope with transformation and restructuration simply because they lack "fuel" in the form of human, social, and economic resources/capacity.

1.2. Measuring Arctic socio-economic resilience

Arctic socio-economic resilience is a multidimensional construct, including capacities on both the individual and the collective, or community scale. In measuring socio-economic resilience, we consider regional capacities: demographic, societal, economic, knowledge, as well as the capacity of communities.

Demographic capacity is defined as the ability of populations to resist and recover from alterations in their demographic structure, usually with concomitant change in population size. [6] [7]

Societal capacity is built upon the adaptive and transformative capacities of individuals in society stemming from their knowledge, skills, and economic wellbeing.[8] Societal capacity reflects social cohesion and relative prosperity.

Community capacity refers to the interaction between individuals and their community and to the success of the community in meeting the needs of its members and the extent to which individuals are helped by their community.[9] Therefore, it is also related to metropolitan stability as resident tenure within the region.

Knowledge capacity refers to problem-solving skills relevant for building resilience.[10] As a result of responding to extreme events, regional economies will rely on their adaptability to achieve industrial transformations.[11]

Economic capacity is measured using indicators that reflect the economic situation of people, industries, and businesses and incorporate the elements of regional competitiveness in terms of industry mix.

Although one can distinguish between these five resilience capacities, in practice they also interconnect. Following this kind of reasoning we tend to look for cross-cutting themes and indicators for the five capacities. Based on our observations we selected eight indicators of socio-economic resilience: economic growth, employment, net migration, R&D activity, employment in knowledge intensive services, stability of rural areas, educational attainment, relative poverty. These indicators were used to calculate the resilience capacity index.

An important characteristic of our approach is a focus on long-term trends. As resilience is a dynamic notion, it needs to be observed over time. History is full of unexpected events with significant outcomes and structural changes (oil prices, financial crises, changes

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[6] Capdevila, P; Stott. I, Beger, M; Salguero-Gómez, R. (2020.) Trends in Ecology & Evolution, September 2020, Vol. 35, No. 9 https://doi.org/10.1016/j.tree.2020.05.001

[7] Although this definition is borrowed from the field of community ecology, we argue that it is also applicable to the demographic capacity within a region populated by humans.

[8] Keck, M., & Sakdapolrak, P. (2013). What is social resilience? Lessons learned and ways forward. Erdkunde, 5-19.

[9] Bonanno, G.A., Romero, S.S., Klein, S.I., 2015. The temporal elements of psychological resilience: an integrative framework for the study of individuals, families, and communities. Psychol. Inq. 26 (2), 139–169

[10] Berkes, F. (2007). Understanding uncertainty and reducing vulnerability: lessons from resilience thinking. Natural hazards, 41(2), 283-295.

[11] Martin, R., & Sunley, P. (2015). On the notion of regional economic resilience: conceptualization and explanation. Journal of Economic Geography, 15(1), 1-42.

in consumer markets, pandemics, changes in the political climate etc). To measure regional resilience, one needs to pay attention to receptivity associated with these events and changes.

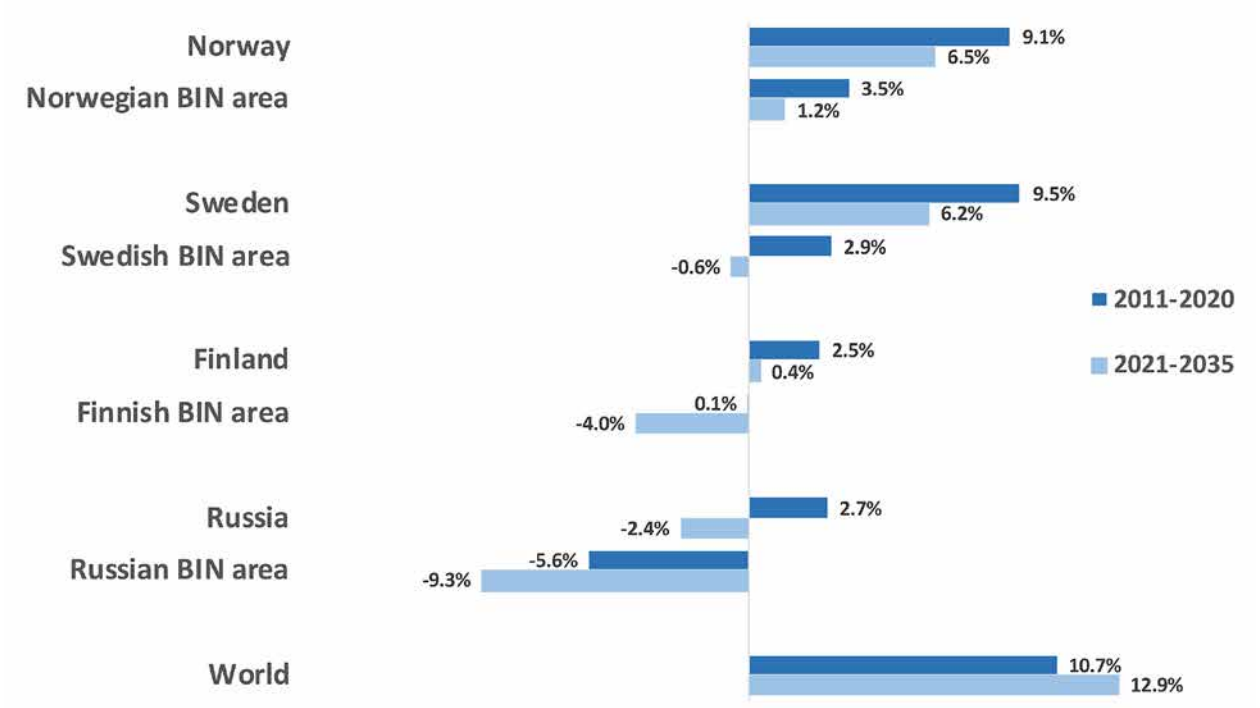
1.3.Outline of the report

In Chapter 2 we consider whether we have a demographic and community capacity in the Arctic that contributes to regional resilience. Chapter 3 is devoted to the region's societal capacity. Chapter 4 considers issues related to the region's economic and knowledge capacity. Chapter 5 presents a synthesis of our observations in the form of a resilience capacity index. The index is based on eight selected indicators studied throughout this report. In Chapter 6 we elaborate on various resilience strategies – where we call for action.

Demographic and community capacity

Regional resilience is dependent on both stable or growing population and on its demographic composition. Population change and demographic composition in the communities is directly related to availability of services, infrastructure, jobs, and housing. Likewise, shrinking population, with low fertility rates and a high proportion of elderly people creates a burden on the economy and social services, and threatens the sustainability of social security systems, vital infrastructures, and services.

Figure 2.1 Total Population Change 2011-2020 and 2021-2035, %



This figure shows population change (%) from 2011 to 2020 (historical data) and forecasted population change from 2021 to 2035 (based on moderate demographic forecasts made by the statistic authorities).

Data sources: Rosstat, Statistics Norway, Statistics Sweden, Statistics Finland, United Nations

2.1 Trends overview

In the past decade the Norwegian and Swedish BIN areas had slower population growth than their countries as a whole. In the Finnish BIN area population remained approximately the same, and the Russian BIN area declined in population. Both Finland and Russia as a whole had a slight growth in population. For the next 15 years, according to the forecasts, the population in the Russian and Finnish BIN areas is going to decline. The Swedish BIN population will stop growing and the Norwegian BIN population will continue a slight growth, yet much lower than that in Norway as a whole. These trends for the BIN areas and their countries differ significantly from the global trend for continued population growth.

Table 2.1 below presents an overview of the demographic trends in the BIN regions comparing them to their corresponding national averages. While half of the BIN regions experienced total population growth in the last ten years, this growth was slower than the repsective national average rates. The majority of the BIN area is to experience decline of the total population during the next tenyears and the rest will see a close to zero growth rate. A change in the share and number of working age population is projected for the whole Nordic BIN area. An opposite trend is expected for the Russian part of the BIN area. This would, however, present not only opportunities but also major potential challenges to Russia. The last column of Table 2 illustrates the expected change in the number of working age people in absolute numbers.

Table 2.1 - Overview of the Demographic trends in the BIN regions

BIN region	Total population change 2011-2020, %	Difference between regional and national population change 2011-2020, %	Expected total Population change 2021-2035, %	Expected change in share of people in working age 2021-2035, %	Expected change in number of people in working age 2021-2035
Nordland	1.7	-7.4	-0.18	-3.2 %	-7580
Troms og Finnmark	5.3	-3.7	2.65	-3.5 %	-8671
Lapland	-3.6	-6.1	-5.87	-2.4 %	-4011
North Ostrobothnia	3.1	0.7	-1.69	-0.1 %	-354
Kainuu	-8.1	-10.6	-12.45	-3.3 %	-2146
Västerbotten	5.2	-4.2	2,41	-0.9 %	-2471
Norrbotten	0.4	-6.3	-3.98	-1.8 %	-4352
Arkhangelsk Oblast (excl. NAO)	-7.6	-10.4	-11.73	6,8 %	69409
Komi Republic	-8.8	-11.5	-15.39	5.9 %	44043
Murmansk Oblast	-6.6	-9.4	-8.23	6.8 %	47933
Nenets Autonomous Okrug	4.8	2.0	-0,68	6.3 %	2783
Republic of Karelia	-4.4	-7.2	-8.71	6.3 %	36913
Yamalo-Nenets Autonomous Okrug	3.7	1.0	1.63	9.1 %	50368

(based on the historical and demographic forecast data from: Rosstat, Statistics Norway, Statistics Sweden, Statistics Finland)

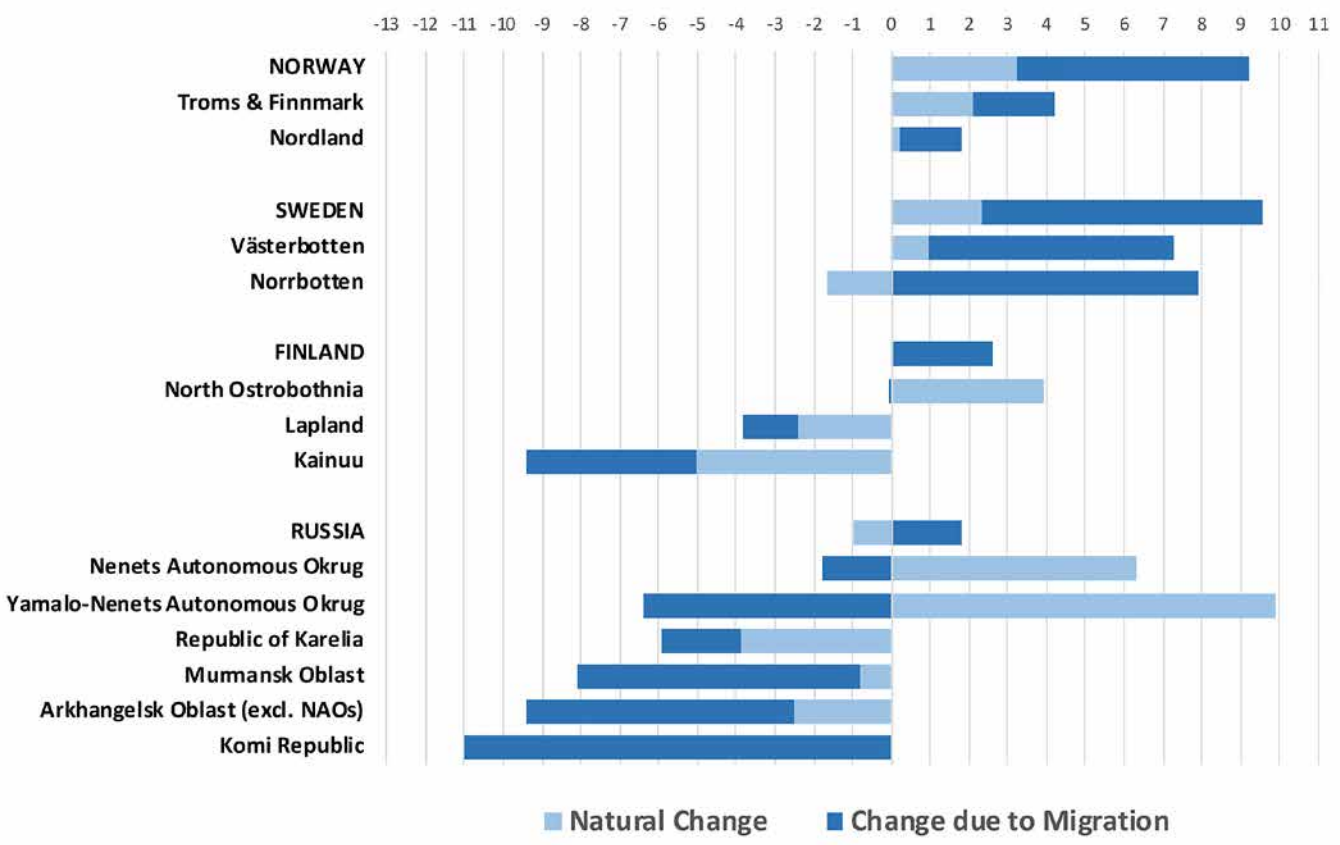
A diminishing share of people of working age presents a structural challenge for the Nordic Arctic. By 2035 there are expected to be 30,000 fewer people of working age in the Nordic BIN area compared to the present-day situation. While the share of people of working age was close to 60% in this area in the 2000s, by 2040 it will be around 55%.

The situation in Russia is different. Since the mid-2000s the share of people of working age dropped from 67% in the Russian BIN area and 63% in Russia to a historical minimum of 57% in 2018 (both for the Russian BIN area and for Russia as a whole). This happened mainly due to the demographic dip of the 1990s as a result of the collapse of the Soviet Union. Now Russia is emerging from that decrease; since the mid-2000s the economic situation of people has been improving, and new social security and welfare schemes have been introduced. Hence, a substantial increase in the working age population has been predicted in the Russian BIN area and in Russia as a whole (64% and 62% respectively). Furthermore, the increase in the number of people of working age in Russia is attributable to the state pension reform. During the period 2019-2028 the pension age is to rise from 55 to 60 years for women and from 60 to 65 years for men.

2.2. Attractiveness, reproductivity, and the urban-rural divide

Population growth in North Norway and North Sweden largely depends on migration. Outmigration and lack of reproductivity (measured in terms of natural demographic change) are problems in most areas of the Russian BIN area. However, outmigration is counterbalanced by higher reproductivity in the resource regions of Nenets and Yamal-Nenets. Outmigration and negative natural demographic change were observed in North Finland except in the cities of Oulu (North Ostrobothnia) and Rovaniemi (Lapland). In the figure below, population change due to migration serves as a proxy for regional attractiveness, while natural change is a proxy of reproductivity of the regional population.

Figure 2.2 Net Population Change per 1000 Population - Annual Average (2011 - 2020)



This figure shows annual average net population change for 2011-2020, measured as number of people per 1000 of regional population (data for 2010-2019 are used for Russia). Net population change here is broken down into natural change (difference between number of births and deaths) and migration (difference between in-migration and out-migration).

Data source: Statistics Norway, Statistics Sweden, Statistics Finland, Rosstat.

Metropolitan stability measured by resident tenure within the region is one of the key factors for community resilience. A question of metropolitan stability in the Arctic is often associated with the urban-rural divide. Urbanization is a global trend which also affects the Arctic. Even large cities in the Arctic are small and peripheral in relation to other parts of the world. Do people living in Arctic cities want to move to larger metropolitan areas outside the Arctic? What happens with small rural Arctic communities? Are they stable or witnessing depopulation? Is there migration from smaller to larger towns within the Arctic? We found that larger communities (urban) and smaller communities (most of them are rural) in the BIN area have different, often incoherent development patterns (Table 2.2).

Table 2.2. Summary of community demography trends and urban-rural population patterns in the national BIN areas (based on dataset for 2010-2019).

Northern area	% of people living in municipalities with growing population	% of people living in municipalities with declining population	Number of municipalities with population growth	Number of municipalities with population decline	Urban-Rural population pattern
Sweden	96%	4%	26	3	Growth in both rural and urban areas due to in-migration
Norway	74%	26%	31	56	Urban areas get larger, rural areas get smaller (with few exceptions)
Finland	53%	47%	11	48	Growth is only around two largest urban areas, decline in the other both urban and rural areas
Russia	28%	72%	15*	74*	Weak growth in urban areas, decline in rural ones; Outmigration both from rural and urban areas

** Municipal Districts are used as statistic units for Russia*

Northern Norway is experiencing a kind of regional urbanization trend, where larger municipalities (accommodating the majority of the population) tend to grow and smaller ones tend to shrink. Whether this trend is associated with a growing overall resilience is a subject for possible future research. In Northern Finland there are worrying trends of a widening gap between urban metropolitan areas and rural areas. There, even medium-sized industrialized municipalities are not able to generate population growth. Northern Sweden follows its own path with overall population growth due to in-migration. The Russian BIN area is facing a major structural challenge. Here, not even large Arctic cities are generating population growth, and young people are leaving. Rural areas population is declining at a worrying speed rate.

2.3. Reflections – demographic structural problems

The situation related to a diminishing population in a region also reveals a larger underlying structural problem that may create a downward spiral, contributing to long-term deterioration. However, the various regions are exposed to these structural problems to a different extent. The Nordic BIN areas, for example, are more exposed to these structural problems than nationally, while the overall decrease in population as such is not so dramatic. In the Russian BIN area (except for Yamal), there are both severe underlying structural problems and a dramatic depopulation. However, failure to address the underlying structural problems may lead to a long-term deterioration in an increasing number of regions in the whole BIN area.

A region may suffer from depopulation. This is often due to increased emigration, less immigration, and declining birth rates. Yet a decline in a region's population is often accompanied by a more severe underlying problem. It is usually proportionally more young people, and especially females, who leave. At the same time, the remaining population is gradually getting older. The region is then left with a situation where the proportion of the region's inhabitants belonging to the working population is in decline. For many regions, these are often less educated than the country's national average. Then three developments occur: First, the region will generate less tax revenue. Secondly, as the population ages,, the demand for health and social services will increase. Third, the diminishing budgets, due to less tax revenue have to be allocated toward health and social services, leaving less money for other services necessary to attract young people to the region. Moreover, the region will lack people with higher education, thereby reducing the chances of creating a positive future trajectory for the region seen in an inability to create a resilient region capable of persisting, adapting, and transforming. A downward spiral is in place. The question is: What to do?

Our analysis shows that, in contrast to the Nordic BIN area, the share of

working population in Russian BIN will grow. This, of course, presents different kinds of challenges, given that the job market, the education system, and the health care system and are not sufficiently modernized to take advantage of such a rise. Hence, it could be argued that while the Nordic BIN areas are facing the problem of "what to do with the growing share of the elderly?", the Russian BIN area is faced with the problem of "what to do with the growing share of the working aged people?" since the Russian government introduced a pension reform, it has to ensure that health care infrastructure and the job market developing apace, also in the Arctic.

The general picture emerging from our data is that the urban-rural divide related to decreasing populations, with a few exceptions, is increasing in the BIN area. Small is getting smaller, and large is getting larger, and the structural problem for the BIN area is growing.

Societal capacity

A region's societal capacity is related to the capacity of individuals in the region to contribute to adaptability and transformation through their knowledge, skills, and economic wellbeing. This in turn depends on the level of educational attainment, health, and economic well-being. We have selected five indicators to illustrate societal capacity: household disposable income, risk of poverty, unemployment, share of people with higher education, and total death rate due to chronic diseases.

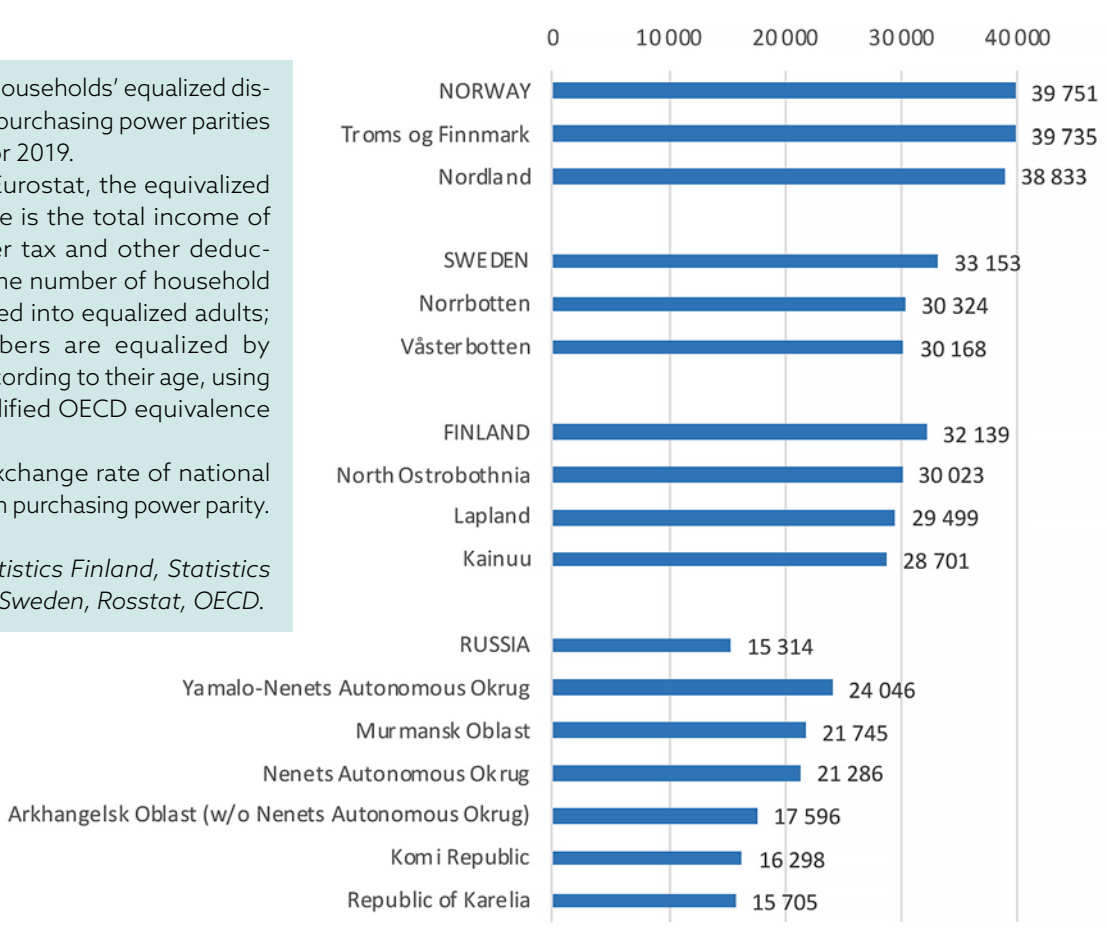
Figure 3.1 Households disposable income in USD PPP (2019)

This figure shows households' equalized disposable income in purchasing power parities adjusted to USD for 2019.

As defined by Eurostat, the equivalized disposable income is the total income of a household, after tax and other deductions, divided by the number of household members converted into equalized adults; household members are equalized by weighting each according to their age, using the so-called modified OECD equivalence scale.

We used the exchange rate of national currencies to USD in purchasing power parity.

Data sources: Statistics Finland, Statistics Norway, Statistics Sweden, Rosstat, OECD.



3.1. Societal capacity indicators

Figure 3.1 shows that the Norwegian BIN regions have the highest income level in the whole of the BIN area. Here the level of income is at about the same level as the country average. The Swedish and Finnish BIN areas have slightly lower level of income than their respective countries as a whole. The Russian BIN regions have in general a higher level of income than in Russia as a whole.

Figure 3.2 % of people at risk of poverty, average 2017-2019

The at-risk-of-poverty rate is the share of people in population with an equivalized disposable income (after taxes and social transfers) below the at-risk-of-poverty income threshold, which is set at 60 % of the national median equivalized disposable income.

Data sources: Eurostat and Rosstat

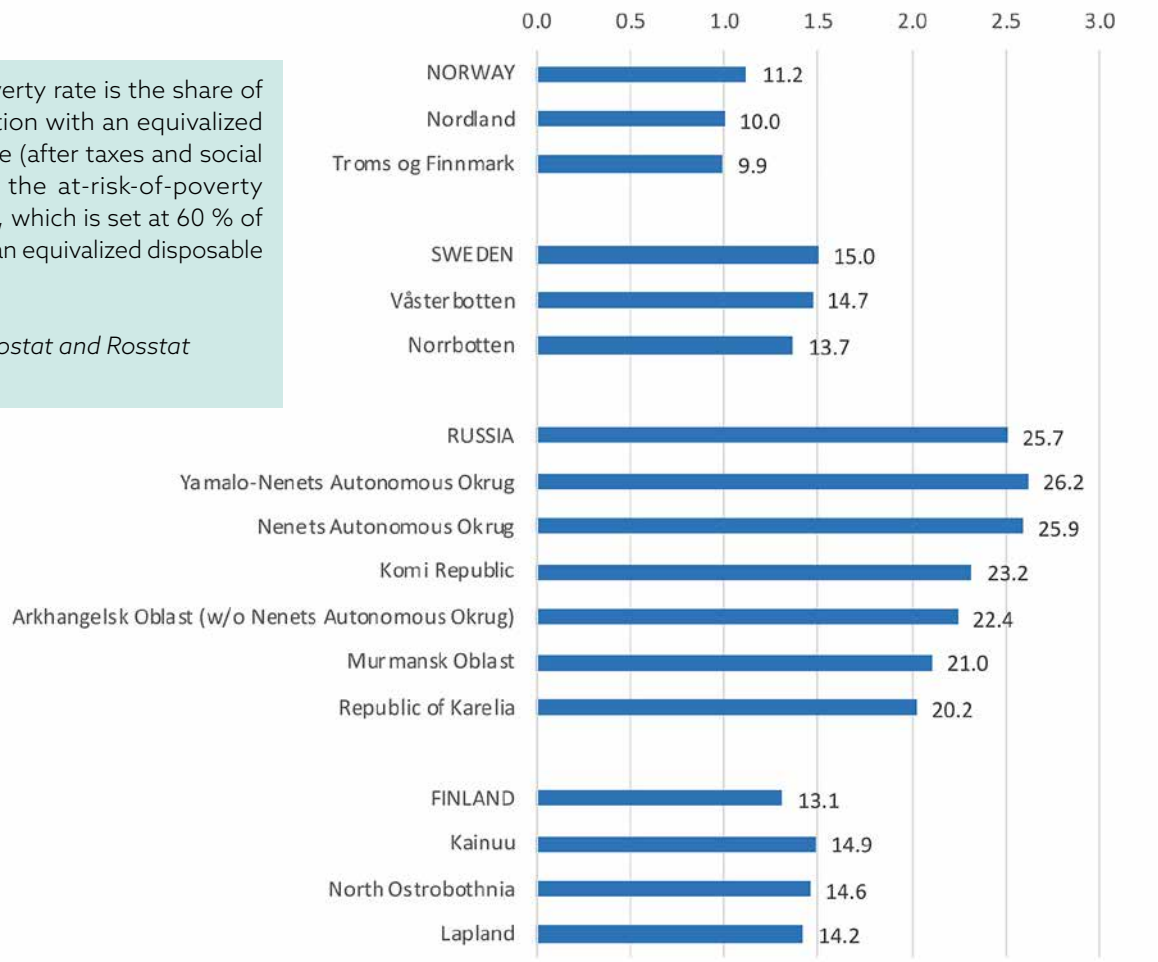
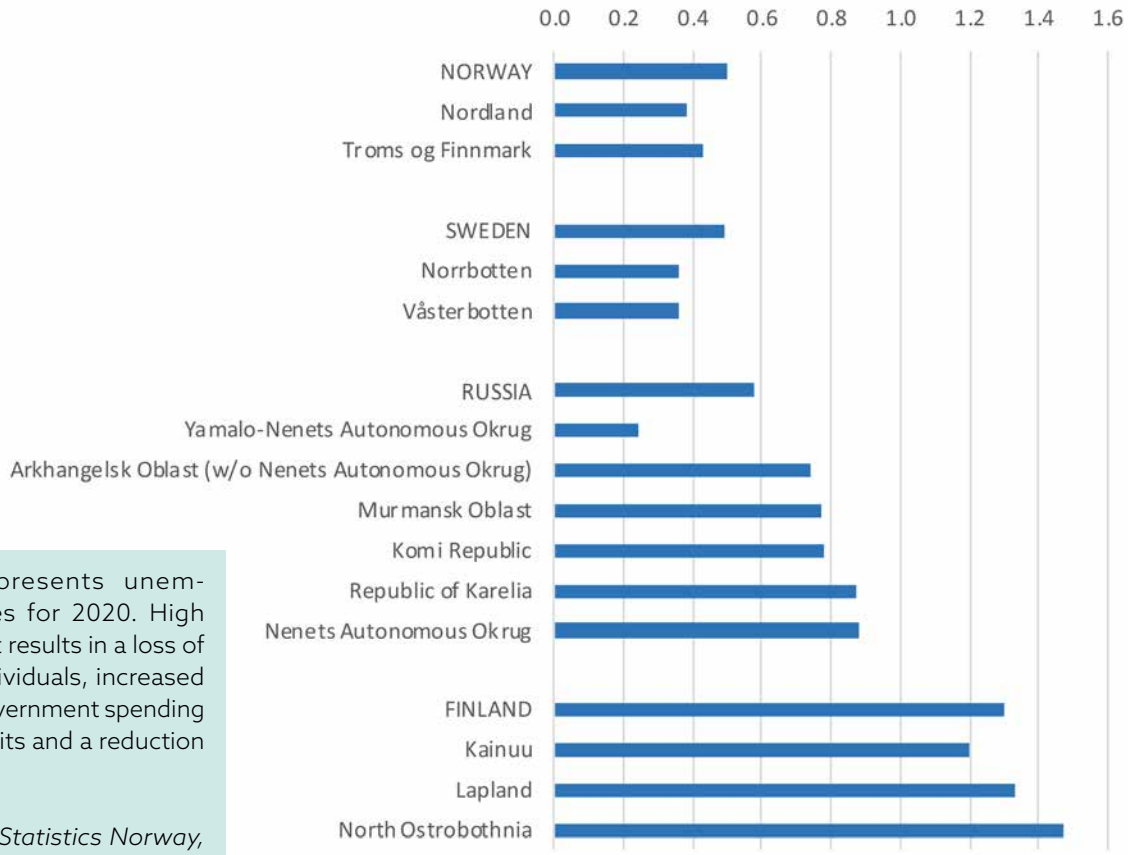


Figure 3.2. reveals large proportions of people with living standards below the standard for the respective nation as a whole. In times of pandemic (and any other crisis) these groups are exposed to increased pressure.

The average at-risk-of-poverty rate in the Norwegian and Swedish BIN regions, respectively 10% and 14.2% is slightly lower than their countries' averages. In the Finnish BIN area the rate is 14.5% which is 1.4% higher than in Finland on average. The at-risk-of-poverty rate in the BIN Russian regions on average was about 23.2%. In the Russian BIN regions the proportion of people exposed to risk of poverty is nearly twice as high as in the Nordic BIN regions.

Figure 3.3 Unemployment 2020, % (annual average)



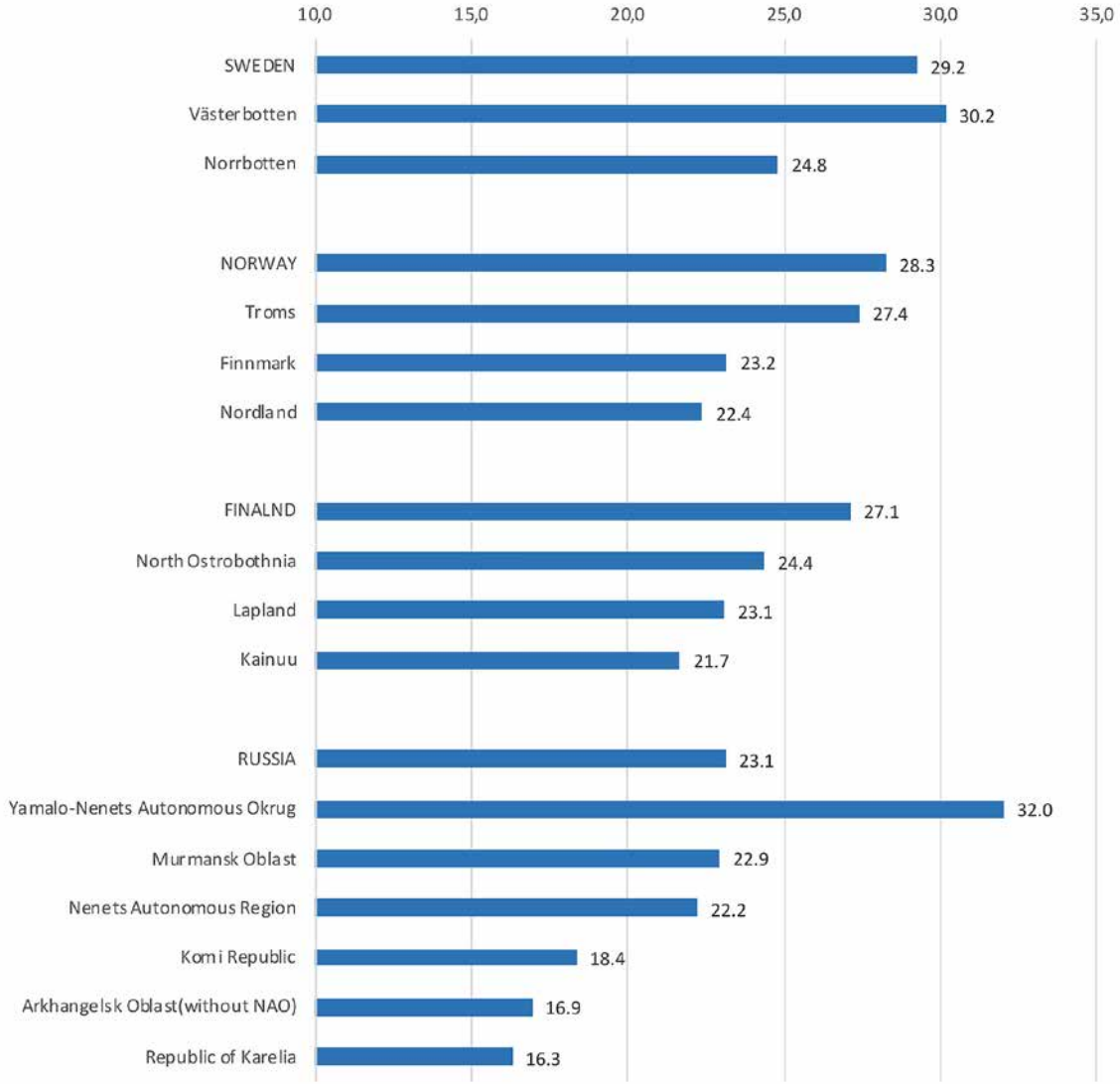
This figure presents unemployment rates for 2020. High unemployment results in a loss of income for individuals, increased pressure for government spending on social benefits and a reduction in tax revenue.

Data sources: Statistics Norway, Swedish Public Employment Service, Statistics Finland, Rosstat. Nordic data are based on unemployment register (2020). Russian data are based on survey using method of World Labour Organization.

The unemployment rate has grown from 2018 to 2020 throughout the whole BIN area and in the respective countries due to the COVID-19 pandemic. The impact of COVID-19 on the Norwegian and Swedish BIN regions was less pronounced. In 2020 these areas had unemployment rates (3.6% and 4.3%) lower than their countries' averages. The Russian BIN regions, except for the Yamalo-Nenets Autonomous Okrug, had significantly higher unemployment (around 8%) than the national average. The Yamalo-Nenets Autonomous Okrug was not impacted due to the continuing activity in the oil and gas industry.

Originally high unemployment rates in Finland are due to structural unemployment arising after the recession of the 1990s after the disruption of the Soviet economy.

Figure 3.4 Share of people with tertiary education, %



This figure shows the share of people with tertiary (higher) education in total population. Data for the Nordic BIN regions and countries are from 2020. Russian data are from 2015 (latest available year).
Education affects individuals' quality of life in many ways; it predicts employment opportunities, earnings potential and reduces the risk of poverty. The level of education is fundamental in predicting individuals' health and life expectancy. At the regional level, strong higher education infrastructure is key to regional competitiveness. It is a building block for a knowledge economy.

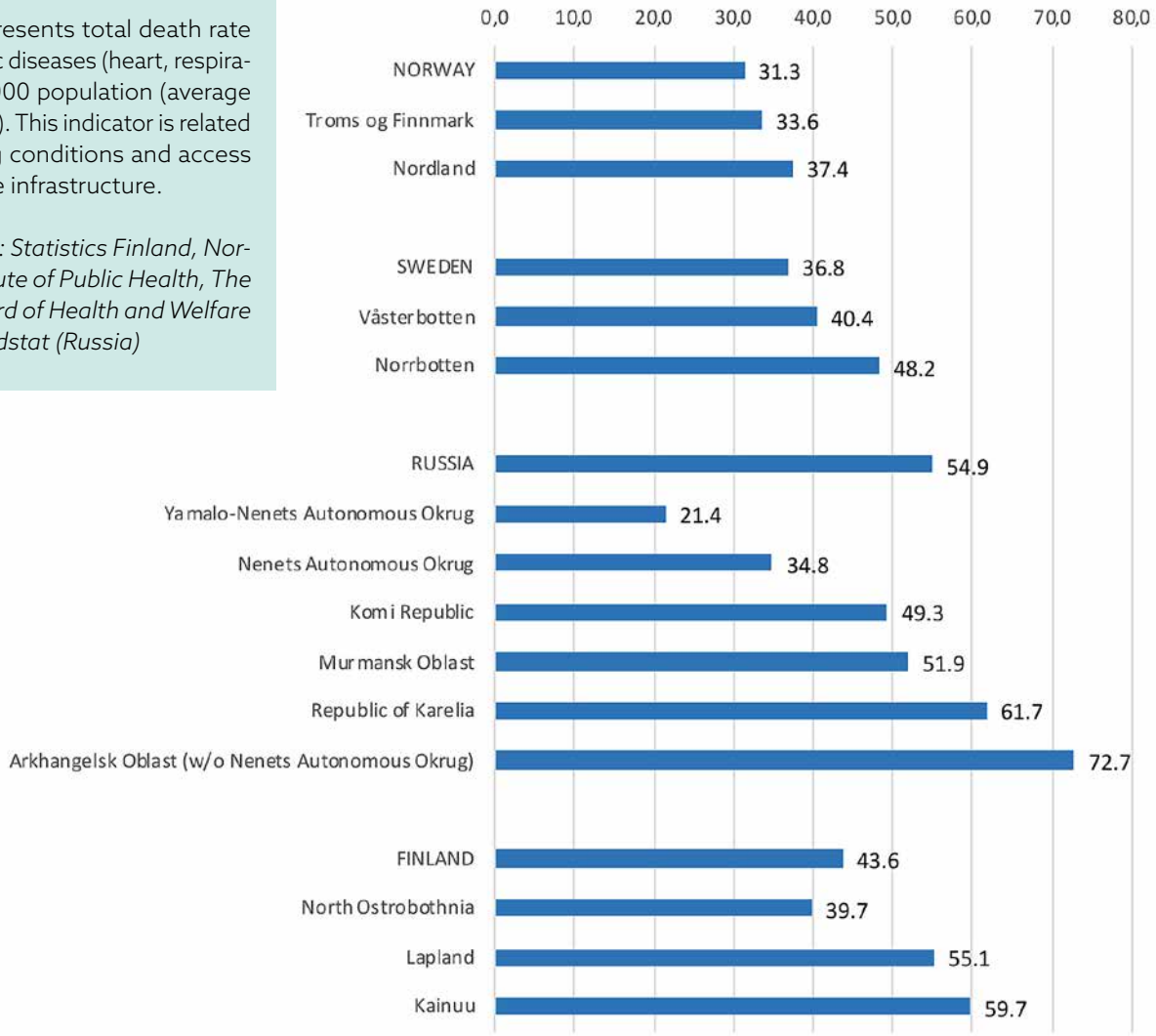
Data sources: Statistics Finland, Statistics Norway, Statistics Sweden, Rosstat.

All BIN regions except Västerbotten in Sweden and Yamal-Nenets in Russia are lagging behind their respective countries' averages. This results in a general deficit in the number of people with higher education. For example, Nordland needs 14,301 highly educated people to reach the national level in Norway. Norrbotten and North Ostrobothnia lack respectively 10,872 and 11,370 people with higher education to catch up with national "standards" in Sweden and Finland. The most dramatic shortage of highly educated adults can be observed in Arkhangelsk, Karelia, and Komi. Altogether, these three regions lack about 150,000 highly educated adults to catch up with the national average in Russia. Yamal-Nenets still has a higher proportion of educated people than Russia as a whole, making a regional surplus of 48,120 adults with higher education.

Figure 3.5 Total death rate of chronic diseases, average 2017-2019

This figure presents total death rate due to chronic diseases (heart, respiratory) per 10,000 population (average for 2017-2019). This indicator is related to both living conditions and access to health care infrastructure.

Data sources: Statistics Finland, Norwegian Institute of Public Health, The National Board of Health and Welfare (Sweden), Fedstat (Russia)



All Nordic BIN regions except North Ostrobothnia have higher death rates from of chronic diseases than their respective countries' averages. In Russia, there are wide discrepancies among the regions ranging from 21.4 in the Yamalo-Nenets Autonomous Okrug to Arkhangelsk Oblast (without Nenets), where it amounted to 72.7 (the highest in the BIN area). Excess of deaths due to chronic diseases in Arkhangelsk oblast comparing to national average was +1,961 deaths per year in 2017-2019. Already high death rates due to chronic diseases in most BIN regions indicate potentially higher death rates in the population in case of a pandemic like COVID-19.

3.2. Reflections

The regions in the BIN area differ somewhat in their societal capacity. However, the number of people with higher education represents a considerable challenge for most of the BIN area. The BIN area overall lacks 204,370 highly educated people compared to the national average in the BIN countries. Only Yamal-Nenets and Västerbotten score above their national averages. For the region as a whole, this puts a tremendous strain on the societal capacity when it comes to the ability to contribute new knowledge to processes of adaptability and transformation.

The economic wellbeing of the people in the BIN area differs between the Nordic BIN and the Russian BIN. While disposable income in the Nordic BIN area is lower than in their respective countries, both unemployment and the risk of poverty are generally lower (with a few exceptions). This indicates that their economic wellbeing is relatively sound, as they do not face the prospect of being unemployed or poor. Although their disposable income is lower than the respective national averages, this is not so marked as to have a major impact on the societal capacity of the region except in situations where lower salaries make it less attractive for people outside of the region to migrate to the region.

For the Russian BIN area a different picture emerges. There, disposable income is higher than in Russia as a whole, while the risk of unemployment, with a few exceptions, is higher. Hence, we have a situation where those who are employed are doing quite well, but where a large proportion of the population is lagging behind (also keeping in mind generally high risk of relative poverty in Russia). This will put a greater strain on the societal capacity of the Russian BIN region than on the Nordic BIN area.

Regarding health, we have usednumber of deaths due to chronic diseases as a proxy. For all regions in the Nordic BIN area except for North Ostrobothnia, the inhabitants are more likely to die from chronic diseases than in the rest of their respective countries. For the Russian BIN area, the health situation appears to be better than the national average in all other regions, except for Arkhangelsk and Karelia. More research on excess mortality due to the COVID-19 pandemic is needed.

The overall picture emerging of the societal capacity of the BIN region is that the most formidable challenge is the educational level in the region, where a lack of more than 200,000 highly educated people will put a tremendous strain on the regions' ability to adapt and transform in the face of global and regional challenges and opportunities.

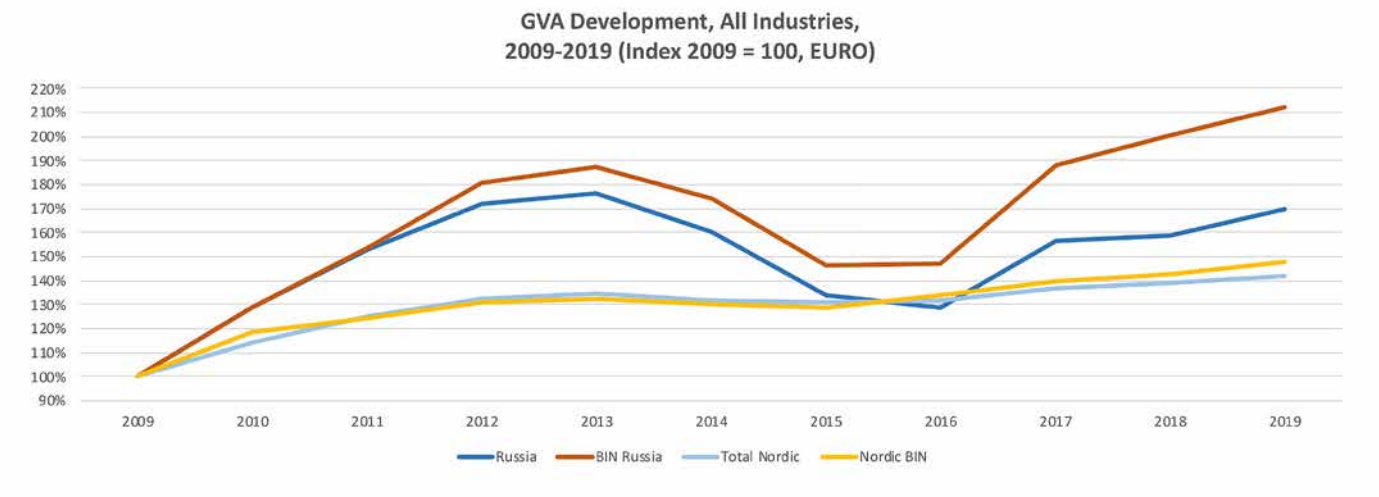
Economic and knowledge capacity

Resilience depends on stable and growing business activity and a workforce with the necessary skills and competence. Economic capacity is a necessary condition for positive development in Arctic communities and a cornerstone for job creation and the generation of wealth. There is a direct relationship between favorable economic conditions in a region (salaries, taxes, prices) and attractiveness for people to live there. Knowledge capacity is important for economic transformation, the development of new technology, the ability to develop new products and to access new markets. Before we discuss each of the economic and knowledge capacity elements, let us see how Arctic regions' GVA (gross value added) and employment are changing together.

4.1 Does Arctic business need more wokers?

A crucial question is whether the rapidly developing Arctic economy and business have the necessary workforce. Figure 4.1a below indicates stronger growth trends in value creation both in the Nordic BIN areas and Russian BN areas, especially from 2015 onwards.

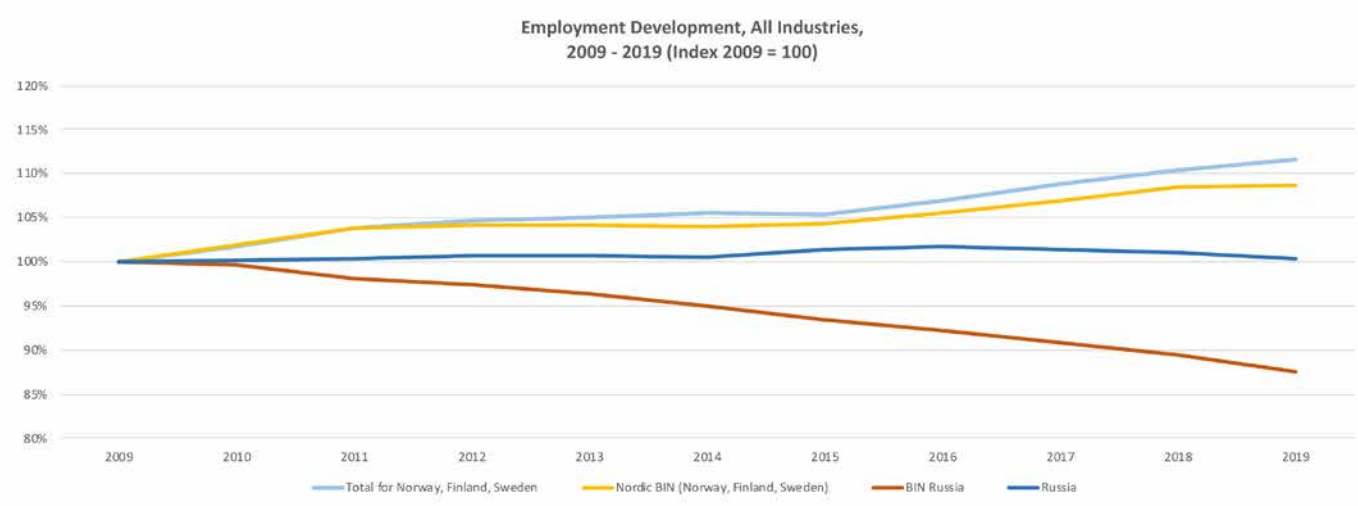
Figure 4.1a Gross value added development as index of GVA in 2009 =100, Euro (current prices).



Since 2009, value creation in the Russian BIN area has more than doubled, reaching a level 40% higher than national levels. In the Nordic countries, Arctic areas followed national economic development, until 2015, and then accelerated to exceed national level by 8% (reaching a growth level close to 50 % compared to 42 % at national level in 2019). Russian growth is driven by oil and mineral extraction ("uphills and downhills" as seen in the graph are typical for this). In additional to conventional resource extraction and processing industries, in the Nordic BIN areas, added value is created through increased fish farming, renewable energy, tourism, power transforming industries, and also technology companies in North Finland.

In contrast to growth in value creation, employment trends are negative in the Russian BIN area overall. In the Nordic BIN it is positive but significantly lower the national rates (Figure 4.1.b)

Figure 4.1b Employment development (job creation) trend 2009 to 2019, Index where 2009=100.



While Russia overall had unchanged employment levels for the last ten years, the Russian BIN regions experienced a 15 % drop in employment, mainly attributed to job loss in the Murmansk and Archangelsk regions. Nordic Arctic regions grew by 8 % in ten years compared to 12 % at national level. At the same time, productivity in BIN area businesses has increased,, thereby creating more value per worker. Such improvement indicates a stronger economic transformation, probably due to automation, than in national economies driven by natural resource extraction, ocean farming, renewable energy, and petroleum resources.

As shown, the BIN areas typically experience faster economic growth but slower employment growth than do national economies. Slow employment growth or lack of it in the economically growing business sectors indicates the industrial structure in the BIN area, which relies on natural resources or means of production which can be automated. Lack of access to suitable workforce is one possible reason for the limited development of work intense businesses areas (e.g. services sector).

4.2 Do we have the right industrial mix?

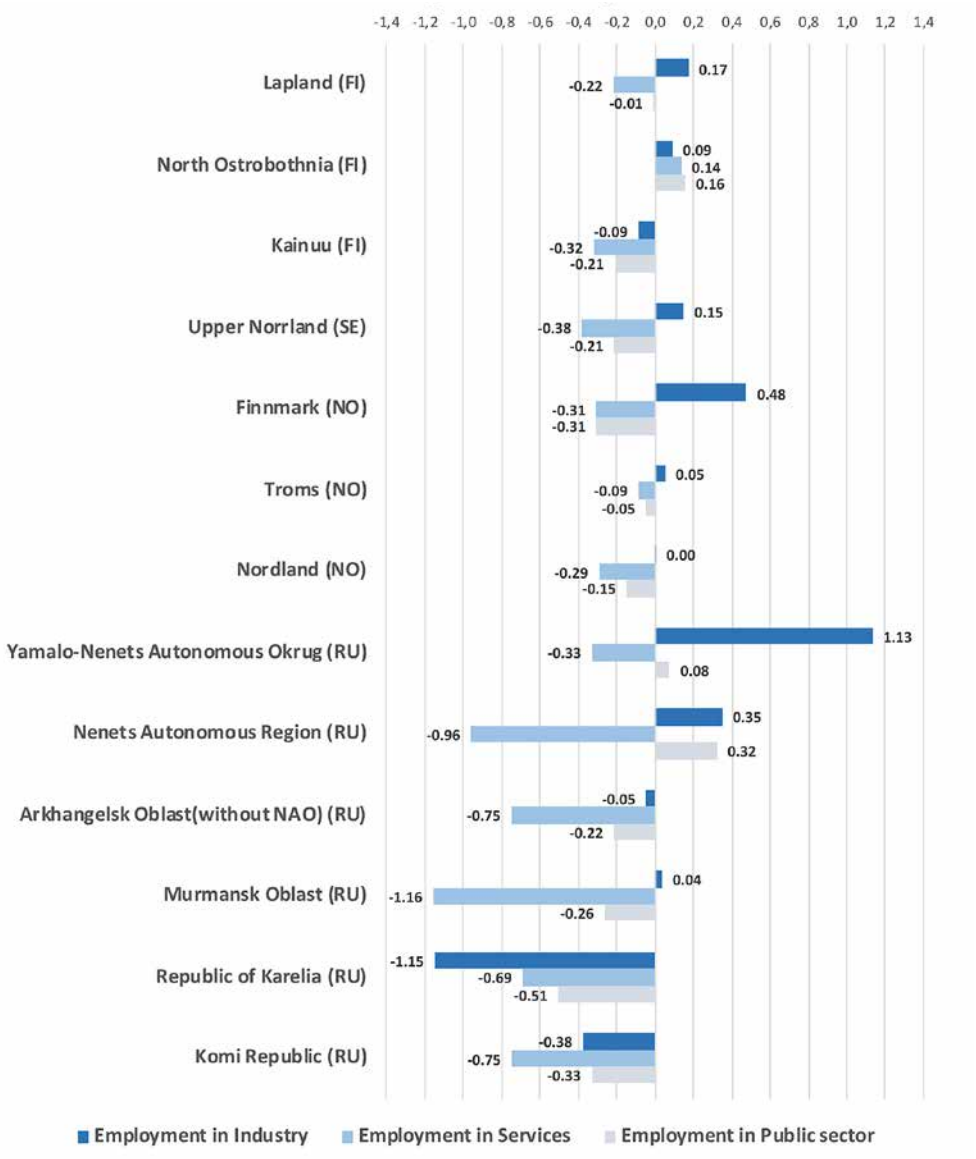
Employment growth below national averages together with high economic growth in production industries leads us to ask: do the Arctic (BIN) regions have the right industrial mix? Industrial mix is a combination of employment in

Figure 4.2 Difference between regional and national employment change rate (average annual change 2008-2019, %) - industry, services, and the public (welfare) sector

This figure shows differences between regional and national changes in employment per year (annual average for 2008-2019) measured as % of total employment. Three main sectors are considered: industry, services, the public sector.

Regions relying on industries related to natural resources have a compensatory effect of their industry mix. For example, Yamal, Nenets have a premium in the industrial activities but are disadvantaged in terms of services. All BIN regions except North Ostrobothnia have negative differences in services comparing to the respective national economies. North Ostrobothnia has positive regional difference in each sector, which is indication of favourable industrial mix.

Data sources: Rosstat, Statistics Norway, Statistics Finland, Statistics Sweden



industry, services, and the public sector. By studying employment rate trends, we can evaluate the adequacy of the industrial mix. The favorable industrial mix constitutes the ability of the region to generate employment at a rate equal or higher than the national average. In contrast, an unfavourable industrial mix may lead to a shortage of jobs associated with weak population development and lost employment opportunities in the Arctic.

To measure effect of industrial mix on employment in the BIN areas, we consider long-term trends from 2008 to 2019. In this period the BIN regions and their respective countries experienced various "points of shock" and challenges: the global financial crisis of 2008 was followed by a drop in oil prices in 2009, Crimea-related Western sanctions on Russia in 2014 followed by a currency crisis in the Russian economy, historically low oil prices in 2016, a restructuring of the traditional mining industry, etc. The ability to regain or even generate new growth in employment along with "shocks" is an important indicator of resilience. This ability can be ensured by the regional industrial mix or by unique regional resources (if available), or both. To evaluate regional advantages associated with either regional resource or industrial mix, we compare regional employment trends with the trends of the respective national economies. As shown in Figure 4.2 below, sometimes availability of regional resources (e.g., natural resources) presents a challenge and becomes a condition for a reduction or even a lack of overall regional premium. Regional premium is the excess number of new jobs compared to the national average.

To evaluate the effect of industrial mix we focus on three major economy sectors: industry, services, and the public (welfare) sector. We suggest that in the regions where regional difference is positive in one industry (e.g., mining and manufacturing, as in many BIN regions) but negative in services and the public sector, regional premium is a consequence of regional access to natural resources.

A positive regional difference does not always mean extra growth in employment. It may be associated with slower job loss than for the country as a whole. For example, although North Ostrobothnia has negative development in employment in industry (-0.3% per year), it is less dramatic than the rate for Finland as a whole (-0.38% per year). Therefore the region has a positive regional difference.

At the same time, negative regional difference does not always amount solely to job loss - positive growth may still occur, but more slowly than at national level. For example, in Nordland annual change in employment in services is 0.03%, which is positive. But for Norway as a whole it is 0.32%. In practice this means that Nordland with a regional difference of -0.29% could have 343 more jobs in services each year if its regional economy developed at the same pace as the national economy.

The big picture appearing in Figure 4.2 is that in half of the BIN area regional advantage in the industry sector employment is counterbalanced with disadvantage in services or public sector, or often both (Yamal-Nenets, Nenets, Troms, Finnmark, Upper Norrland, Lapland). The regions of Arkhangelsk, Komi, and Karelia have negative regional premium for each of the three sectors. Murmansk has a tiny premium in industry sector employment(+0,04%), but a big disadvantage in services and public sector (-1.16% and -0.26% respectively). Nordland has close to zero premium in the industry sector and negative premium in services and the public sector (-0.29% and – 0.15%). As noted, North Ostrobothnia has the most balanced industrial mix.

Another important observation from Figure 4.2 is that all BIN regions except North Ostrobothnia have a negative difference in services (compared to the respective national economies). In the Nordic BIN, during the last ten years, the deficit of the whole 16,780 service jobs was accumulated. Deficit refers to jobs which could be generated if regional employment developed at the same rate as on the national level. On the Russian BIN side, it is much worse than deficit - it is pure loss. During the last tenyears about 97,590 service jobs have disappeared. Please refer to the table in Attachment A for a more detailed illustration of employment trends and industrial mix in the BIN regions in real numbers.

It appears that 13 out of 14 BIN regions do not have an industry structure which can generate long-term growth in employment. In these regions less development of value creation in services creates a workforce disadvantage. Service employees find work elsewhere. Another explanation could be a possible knowledge gap. The next section looks into this.

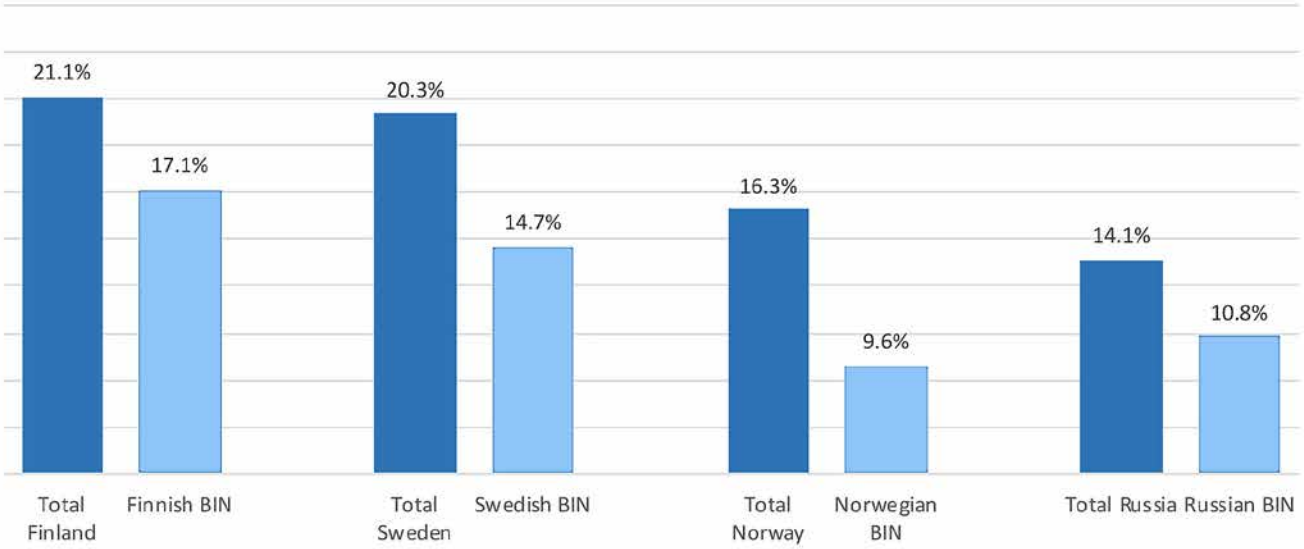
4.3 Knowledge gap as reason for lack of regional premium?

We live in the post-industrial age, where information and knowledge are increasingly valued more than physical means of production, natural resources, and capital. Wealth is accumulated at the sites where managers and technicians carry out research and development, and less where corporations or manufactured goods originate[12]. Knowledge-based businesses are able to operate on markets far beyond their regions of origin. Conversely, a low level of knowledge-intensive services and R&D activity causes many businesses to be dependent on natural resources extracted in the regions, technology

[12] Reich, R. B. (1992). The Work of Nations: Preparing Ourselves for 21st Century Capitalism. *Challenge, 34* (2), 60-64.

Photo: Oulu University

Figure 4.3 Share of jobs in knowledge intensive services of total employment (%), 2019 (Finland 2018)



By knowledge intensive services we refer to services in real estate, professional, scientific and technical companies; administrative and support service companies; Information and communication; Financial and insurance activities. A higher education degree is normally required in this part of the service sector.

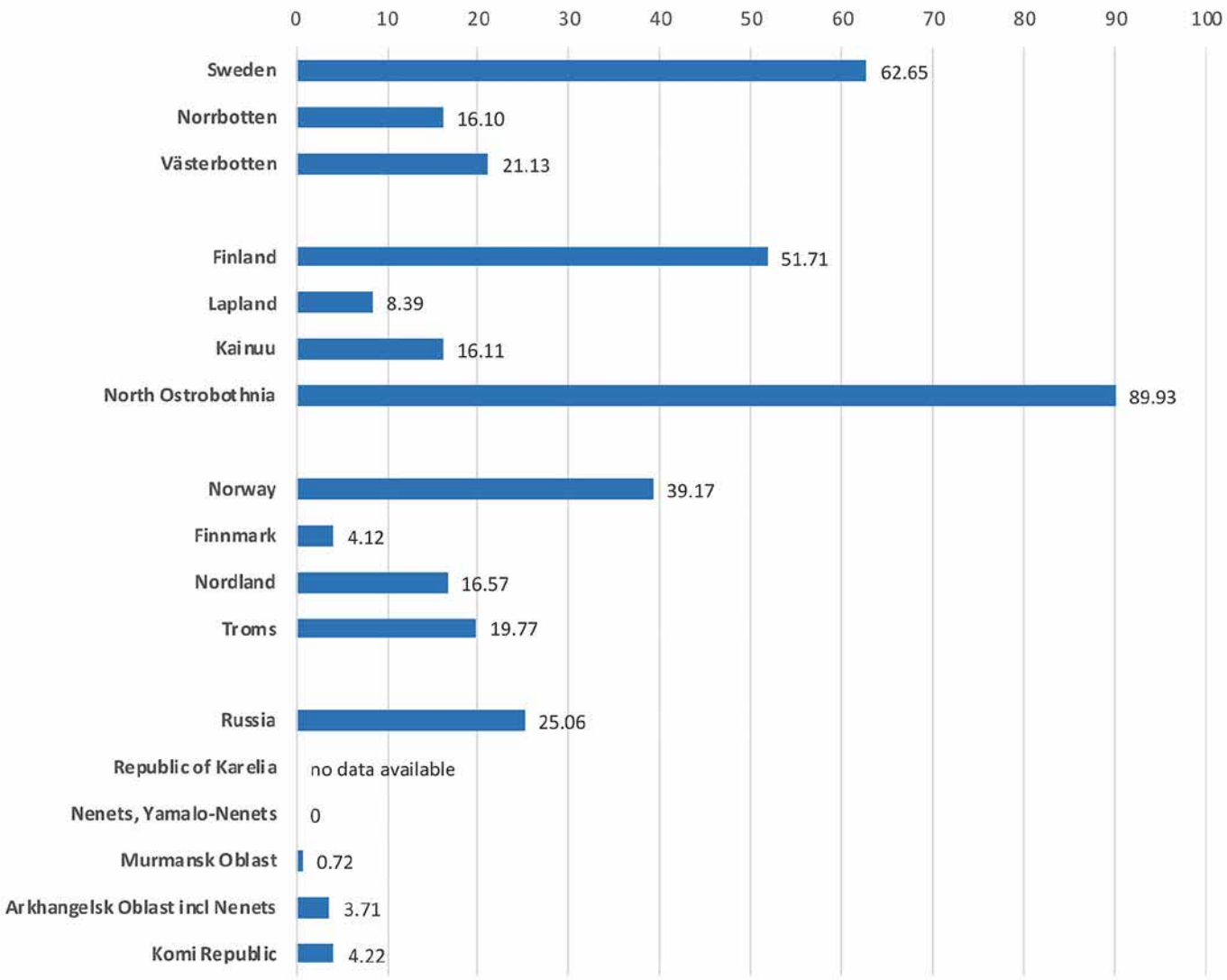
Data sources: Statistics Norway, Statistics Finland, Statistics Sweden, Rosstat.

developed and owned elsewhere and on means of production physically located in the regions. This seems typical for the BIN area. As we have shown, lack of regional premium in employment is essential in the services sector. We next consider knowledge-intensive services. It is shown that all national BIN areas have a lower share of knowledge-intensive services in total employment compared to the respective countries as a whole. North Finland has the highest level of employees in knowledge-intensive industries at 17.1 % followed by North Sweden at 14.7 %. North Norway has 9.6 %, just over half the level found in North Finland and 6.7 % less than the national average, the weakest of all BIN regions. North Russia has 108 % knowledge workers and is thus closest to the national average. The Arctic regions apparently need more workers in knowledge-intensive industries. Altogether, the BIN regions lack about 106,000 jobs in this sector[13]. Another important indicator of knowledge economy development is number of R&D staff employed in the business sector. According to the UNESCO Institute for Statistics[14], R&D spending by the business sector is an underlying factor for country-level success. In case of lower level of R&D activity in the private business sector, even if compensated with heavy public R&D spending, an advanced innovation system can hardly be created.

[13] This number is a sum of workforce deficit in the knowledge intensive services for each BIN region. The deficits are calculated for each region by comparing share of knowledge intensive services in regional employment to corresponding national share.

[14] http://uis.unesco.org/apps/visualisations/research-and-development-spending/

Figure 4.4 Number of R&D workers in business sector per 10,000 capita



The figure shows the number of person-year R&D staff in the business sector per 10,000 inhabitants (annual average for 2017-2019). R&D staff encompasses all personnel directly involved in research and development, including administrative personnel, persons in supporting functions, both inside and outside the R&D department.

Data sources: Statistics Norway, Statistics Finland, Statistics Sweden, Rosstat.

Figure 4.4 shows that all BIN regions except North Ostrobothnia have far fewer R&D staff per 10,000 employees in the business sector than their respective countries on average. The example of North Ostrobothnia is remarkable as it has an R & D human resources concentration almost twice higher than Finland on average, and probably explains why the region has an employment premium in service industries. The success of North Ostrobothnia is associated with the combined effect of Nokia's

strategic involvement in this region since the early 1990s followed by the development of a cluster of ICT companies and with the University of Oulu having a pronounced technological profile and business development educators. Oulu region is competitive on a global scale as it has a concentration of business R&D personnel comparable to that in the metropolitan areas of Stockholm, Helsinki-Uusimaa, and even the capital region of South Korea (the world's highest R&D spender in terms of % of GDP and involvement of business).

The regions of Västerbotten, Norrbotten, Troms, Lapland and Kainuu and also Nordland have a very low density of business R&D staff compared to total employment. The regions of Komi, Finnmark, Murmansk, Arkhangelsk, Nenets, and Yamal-Nenets are practically devoid of R&D human resources in the entrepreneurial business sector (in the case of Russia, the majority of the R&D staff are employed by the state and university sector, not by the private sector).

4.4 Summary and Reflections

Business appears to thrive across the BIN area, indicating increased demand for products and resources from the Arctic. At the same time businesses seem to prefer moving towards operations requiring fewer employees and exploring automation and robotics. Gross value added has more than doubled in ten years in the Russian BIN regions and risen almost 40 % higher in Scandinavian BIN regions. Both are well above the national level. Yet change in regional employment in the BIN area is a different story. In the Nordic BIN there is modest positive employment growth below the national levels. On the Russian side employment change in many regions has been negative, in contrast to positive economic growth.

Economic development depends on Arctic businesses' ability to increase value creation and employment in the same pace as in the nation as a whole. Falling behind in one or both aspects indicates less resilience capacity. The mechanism of a positive relationship between economic growth and employment is found in three out of fourteen BIN regions.

When comparing development across industries, lack of growth in employment is clearly associated with the industrial mix. The Nordic BIN regions have regional premium in the industry sector, but lack it in the service sector (except North Ostrobothnia). Specifically deficit of jobs in knowledge-intensive services causes a dependency on services produced outside the Arctic and significantly reduces economic capacity due to less demand for workers. Availability of fewer service sector jobs converts into weaker population development, since these jobs are created outside the Arctic regions. Such negative spirals can lead to companies refraining from building more business or limiting further processing in the Arctic regions.

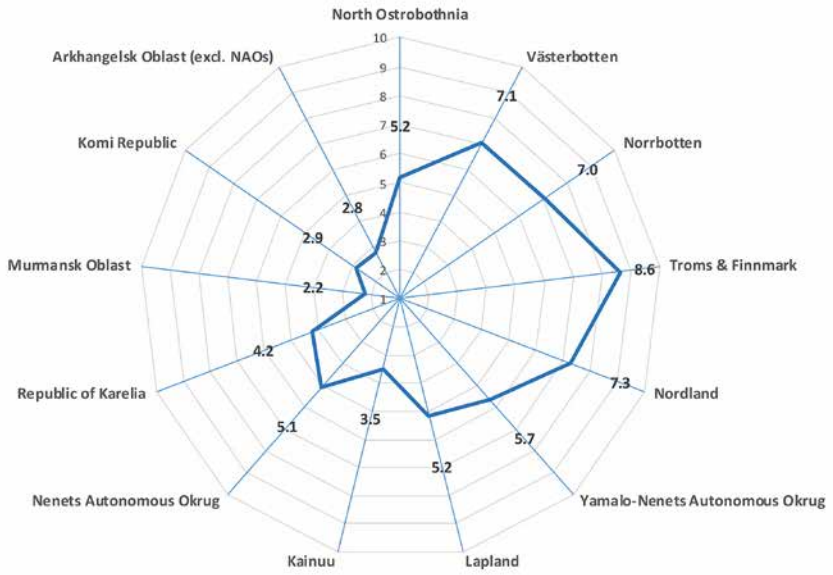
The BIN regions will all need and benefit from national strategies directly increasing their resilience capacity. Persistence is no longer sufficient for creating resilient regions. They also need the capacity to change in the form of adaption and/or transformation. This capacity to change is closely connected to a region's stock of R&D personnel, stock of people with higher education and development skills, and that region's connection to international markets through exports. Few workers within knowledge intensive sector limits the integration of the regions into the knowledge-based economy, consolidating historical path dependency on natural resources and a larger public sector.

This path dependency is difficult to change. R&D investments are mostly made by larger high-tech companies (previously like Nokia in Northern Finland). R&D workplaces are often created in clusters of innovative SMEs. It appears that most of the BIN area is not prioritized for R&D investments and lacks critical mass of innovative businesses.

Resilience capacity index

Summing up our observations, this section presents a resilience capacity index. We have selected eight critical indicators among those discussed in the preceding sections on demographic, community, societal, economic, and knowledge capacities. Further, these indicators were sorted into three groups: Persistence, Adaptability, Transformation. These groups correspond to the three types of regional strategies presented in Figure 1.1. The three figures below (5.1a, 5.1b, 5.1c) present the Perseverance, Adaptability, and Transformation capacities for each BIN region. Capacity

Figure 5.1a Persistence Capacity (Index 1 to 10 scale)

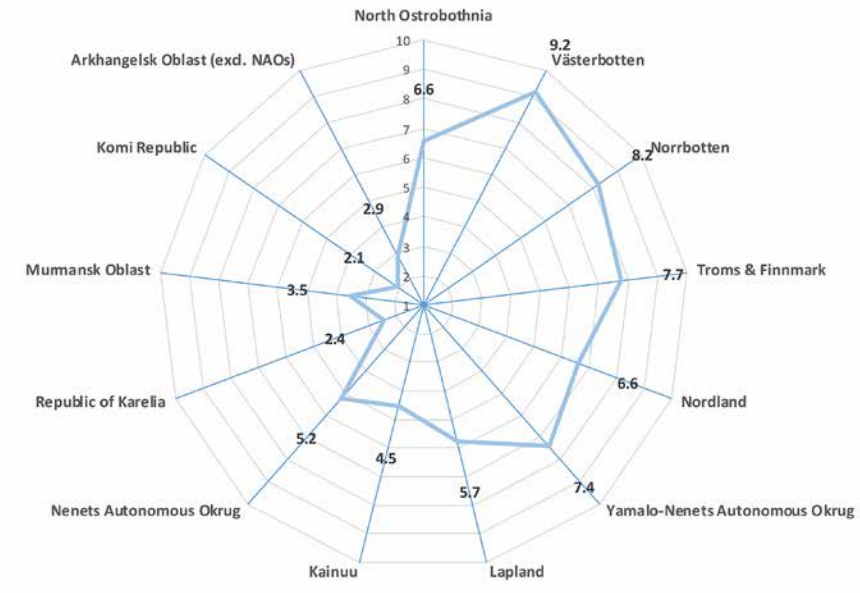


Persistence capacity index is based on the indicators of societal structure and access to resources:

- Community stability (% of people living in municipalities with population growth)
- Long-term economic growth (GVA trend)
- Out of Poverty (% of population at risk of poverty)

Regions in Northern Norway have the greatest persistence capacity followed by Northern Sweden. Yamalo-Nenets and Nenets in Russia, and Lapland and North Ostrobothnia in Finland have moderate persistence capacity. Persistence capacity in Kainuu (Finland), Arkhangelsk, Komi, Murmansk, Karelia (Russia) is low.

Figure 5.1b Adaptation Capacity (Index 1 to 10 scale)

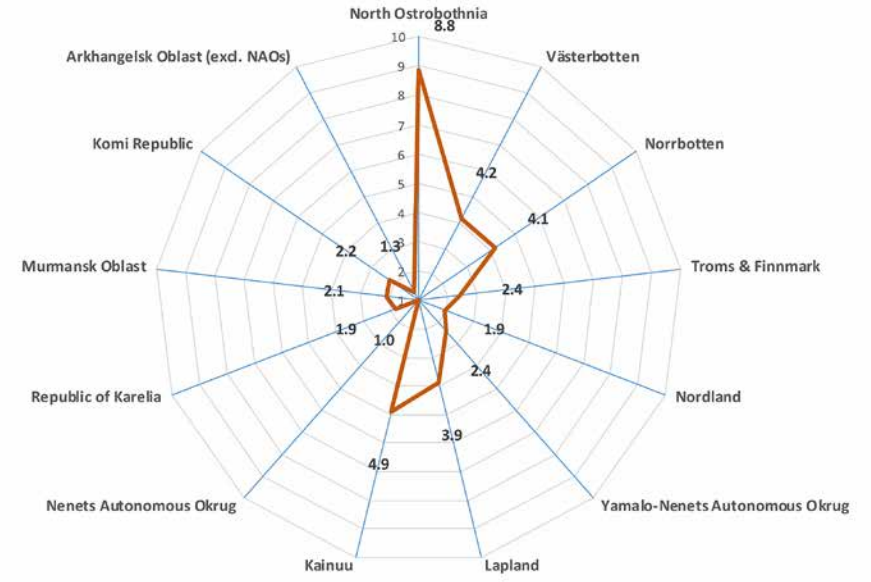


Adaptability capacity index is based on the indicators of opportunities for people:

- Attractiveness (net migration trend)
- Job creation (long-term development in employment)
- Education (level of educational attainment)

Northern Sweden has the highest adaptability capacity followed by Northern Norway, Yamalo-Nenets in Russia, and North Ostrobothnia in Finland. Yamalo-Nenets and Nenets in Russia, and Lapland and North Ostrobothnia in Finland. Adaptability capacity in Lapland and Kainuu (Finland) and Nenets (Russia)ares moderate, but for Arkhangelsk, Komi, Murmansk, Karelia (Russia) it is low.

Figure 5.1c Transformation Capacity (index 1 to 10 scale)



Transformative capacity is about knowledge and innovation, and is based on:

- % of knowledge intensive services employees in total employment
- R&D in business (staff per 10000 capita)

Oulu region in North Ostrobothnia is a remarkable example of high transformative capacity. The rest of the BIN area has some way to go, while the Nordic BIN area has higher capacity than the Russian BIN regions.

indexes are calculated on a scale 1 to 10,, where 1 indicates the least desirable outcome and 10 the most desirable outcome. Please refer to Attachment B for a more detailed overview of the resilience capacity indicators and index calculation.

Call for action

We have argued that for a region to become resilient, it needs to persist, adapt, and transform to create a positive future trajectory for the region. We observe that the resilience capacity in the Russian BIN area is low, (except for higher scores for Yamalo-Nenets) especially when considering the capacity to transform. For the Nordic BIN area, the resilience capacity is generally higher. However, apart from North Ostrobothnia, there is also a need for a much stronger focus on building a capacity for transformation in these regions.

We have seen throughout this report that despite the abundance of natural and environmental resources in the Arctic, there are considerable challenges related to its most important resource, its people i.e., the human and social resources of the Arctic. The major challenge is that the demographics of the Arctic is on a dangerous path: the young, and especially young females, are leaving, the educational level is far below the average of the Arctic nations, leaving behind an older population, and a diminishing, less educated working population. There is a deficit of knowledge-intensive jobs and the number of R&D workers is low. The human resources are diminishing, along with the quality of them. Although value creationin the Arctic has mostly been on a continuous growth path, this has not provided a sufficient growth path in relation to its human and social capacity.

We need to search for new ways and policies to facilitate change in the Arctic economy and society. Although we argue for the simultaneous existence of persistence, adaptability, and transformation, our understanding of the status of the Arctic is that the focus on persistence has been excessive, with less focus on possibility-driven adaptability and on transformation. This also includes more transformative governance, instead of only trying to persist or adapt to mostly externally driven changes, with a focus on factors that challenge the status quo.

To build a stronger Arctic and to proactively act upon global and regional change patterns, to take advantage of existing and new opportunities – to be able to adapt and transform – there is a need for a stronger focus on innovation and entrepreneurship. To succeed, there is a need to seek out mechanisms that, for example, provide a higher proportion of R&D workers in the Arctic, and in parallel, increase the educational level of the region. We need to increase the regions attractiveness for young, and especially young, educated people, not only for those already living there, but also from other parts of the world. Otherwise, the small and decreasing proportion of knowledge-based services, a deficit of R&D workers, and a deficit in R&D investments will make the region less attractive to highly educated people.

There is a need to create a development path where more of the value created in the Arctic stays in the Arctic. To do this, we need to change the industrial mix toward an increase in jobs in the service sector, and especially in knowledge-based services. This entails searching for mechanisms to increase investments in R&D. One possibility couldbe related to the development of new technologies and Arctic clusters on the edge of circular economy, ICT and robotization.

Strengthening the larger cities will probably create positive ripple effects for the surrounding municipalities in the region, but also serve as engines for a broader, positive, overall regional development.

We also need to strengthen the knowledge institutions of the Arctic and build more Arctic knowledge, relevant to a positive development path. Of all Arctic research 93% is related to natural sciences, and only 7% to social sciences. Although we recently a slight shift toward a stronger focus on research within social sciences and humanities has been discernible[15], there remains a long way to go to close the gap. Hence, for a better understanding of a sustainable and resilient development of the Arctic, much more social sciences research is needed. We also need to create new models for creating and coordinating stakeholders, which also involves energizing those stakeholders that have been left out in several development processes – e.g., the young people.

In Attachment A we present a detailed illustration of employment trends and industrial mix in the BIN regions in real numbers. In Attachment B we present an overall resilience capacity rank for the BIN regions based on selected key indicators. This calculation shows that the BIN area includes more and less resilient regions, however, at present none of them are completely resilient.

[15] Biresselioglu, M. E.; Demir, M. H; Solak, B; Kayacan, A., and Altinci, S (2020). Investigating trends in Arctic research: The increasing role of social sciences and Humanities. Science of the Total Environment, 729 (2020) 139027

Attachment A - Employment trends and effects of industrial mix in the BIN regions (based on calculations of long-term trends in employment 2008-2019)

Northern Norway (Nordland, Troms and Finnmark)	Northern Norway lacks momentum due to lower employment growth in services and the public sector than in Norway as a whole. In total, to be able to develop apace with the national economy, Northern Norway would need each year 531 more jobs within services and 328 more jobs in the public sector. When it comes to industry, Northern Norway generates 226 extra jobs each year due to higher employment growth than in Norway as a whole.
Upper Norrland (Norrbotten, Västerbotten)	Upper Norrland in Northern Sweden faces a similar structural challenge to Northern Norway. Due to lower growth in employment in services and the public sector than in Sweden as a whole, the region lacks 933 jobs in services and 523 in the public sector each year. In the span of 10 years this results in a deficit of 14,560 jobs. In the industry sector, due to positive employment growth in the region compared to negative development nationally, Upper Norrland generates 274 extra jobs per year and secures 90 jobs per year which otherwise could be lost.
Lapland (Finland)	Lapland would need 151 new jobs in services and 5 new jobs in the public sector each year to be able to develop apace with the national economy of Finland. Development in industry sector employment has been negative in Lapland but less dramatically so than for Finland as a whole. Therefore, Lapland has some regional advantage which helps it to protect 119 jobs per year which otherwise could be lost.
Kainuu (Finland)	Kainuu loses 25 industry, 27 services, and 29 public sector jobs each year due to negative difference with the national employment change rates. Even if these negative trends were eliminated to 0% growth/decline, the region would still need to generate extra 63 services and 30 public sector jobs to catch up with the national development level.
North Ostrobothnia (Finland)	North Ostrobothnia is the only BIN region with a balanced industrial mix. The region generates extra 215 jobs in services and 248 in services per year as a result of its industrial mix. In the industry sector, employment development in the region has been negative but less dramatic than for Finland as a whole. In real numbers this means that the region is able to prevent a loss of 140 industry jobs per year (compared with the national economy trend).
Yamalo-Nenets Autonomous Okrug Russia)	Huge regional premium in terms of growth of industry jobs in Yamal-Nenets is counterbalanced with both shortage of and negative development in the number of service sector jobs. Access to oil and gas and infrastructural investments in the region is a driving force for the creation of extra 1,068 industry jobs and 287 jobs in the public sector each year (compared to the general trend of employment development in Russia). The region on the other hand loses 167 service jobs per year. If this loss had not taken place, the rate of employment development in services would be 0%. Then the region would still need 1,084 new jobs each year to reach the national level. However, we assume this would not be necessary or even possible. Specifically, growth in the sphere of knowledge-intensive services would be beneficial.
Nenets Autonomous Region (Russia)	Employment trends in Nenets are somewhat similar to those in Yamal-Nenets, yet in terms of population Nenets is much smaller. The two have the development of oil and gas in common. Nenets generates extra 22 industry and 55 public sector jobs per year as a result of its resource advantage over many other Russian regions. In addition, the regional economy prevents loss of 90 industry and 48 public sector jobs per year. The region loses 217 service jobs per year.
Murmansk Oblast	The situation in the Murmansk region in the services sector is rather dramatic. It loses 3,544 service and 1,069 public sector jobs per year. Only 144 extra jobs in industry are generated as a result of better employment growth than for Russia as a whole. There is neither a resource nor an industrial mix advantage over Russia as a whole. Since the negative employment trend in the regional industry sector is less dramatic than for Russia as a whole, one can say that Murmansk region somehow prevents extra loss of 144 industry jobs.
Arkhangelsk, Komi and Karelia (Russia)	These three regions experience the most negative development trends in terms of employment and industrial mix. While Russia as a whole has positive employment growth in services, these three regions altogether lose 5,830 services jobs per year. Even if these had not been lost, 3,689 more jobs in services would be needed to catch up with the national trend. Development in employment in public sector and industry has been negative for Russia, but in our three regions it was even worse. There is an extra loss of 5,325 jobs in industry per year, and a further loss of 4,152 jobs in the public sector per year.

Attachment B – Indicators for resilience capacity index

To calculate resilience capacity index we selected eight indicators (table below). The indicators were sorted into three groups associated with transformative, adaptive, and persevering resilience capacities. The indicators values were normalized on a scale 1 to 10 and sub-indexes for each of the three capacities were calculated. We assumed equal weights for the indicators. When we calculated sub-indexes (adaptability, persistence, transformation) we used the average value of their corresponding normalized indicators. Values for the respective countries of the BIN regions were also considered when we normalized the indicators. This is an experimental calculation which should be considered only as a first step towards the study of ways to measure socio-economic resilience in the Arctic. However, this allows us to see differences between more and less resilient regions and trace the foundations of their resilience capacities. In the table below we apply green, yellow, and red markers to highlight resilience levels of the BIN regions.

GREEN - relatively high level

RED – relatively low level

YELLOW – average level.

Indicators included in the calculation of the resilience capacity index and their absolute values.

	ADAPTABILITY			PERSISTENCE			TRANSFORMATION	
	ATTRACTIVITY	JOB CREATION	EDUCATION	COMMUNITY STABILITY	LONG-TERM ECONOMIC GROWTH	RISK OF POVERTY	KNOWLEDGE BASED SERVICES	INNOVATION
	Net Population Change due to migration, per 1000 Population - Annual Average	**Change in total employment, anuual average for 2008-2019 (Long-term**	**% of people with higher education (2019; Russia - 2015)**	**% of people living in municipalities with stable or growing population (2012-**	**Annual change in GVA, %, average for 2008-2018 (deflated national currency)**	**% of people at risk of poverty, average 2017-2019**	**Knowledge based services, % share of total employment (2018/19)**	**R&D staff per 10 000 capita, average 2017-19**
NORWAY	6,0	0,9	28,3	N/A	1,1	11,2	16,3	39,2
Troms & Finnmark	2,1	0,8	26,7	86,7	4,1	9,9	10,3	15,4
Nordland	1,6	0,6	22,4	63,3	2,7	10,0	8,8	16,7
SWEDEN	7,2	1,2	29,2	N/A	2,0	15,0	20,3	62,6
Västerbotten	6,3	1,0	30,2	99,1	1,6	14,7	14,4	21,1
Norrbotten	7,9	0,7	24,8	91,9	1,6	13,7	15,1	16,1
FINLAND	2,6	-0,1	27,1	N/A	0,2	13,1	21,1	51,7
North Ostrobothnia	0,0	0,3	24,4	67,0	-0,7	14,6	17,8	89,9
Lapland	-1,4	-0,1	23,1	43,1	0,9	14,2	15,4	8,4
Kainuu	-4,4	-0,7	21,7	0,0	0,3	14,9	17,2	16,1
RUSSIA	1,8	-0,1	23,1	N/A	0,9	25,1	14,1	25,1
Nenets Autonomous Okrug	-1,8	-0,5	22,2	57,0	4,9	25,9	8,6	0,0
Yamalo-Nenets Autonomous Okrug	-6,4	0,8	32,0	55,1	6,5	26,2	12,4	0,0
Republic of Karelia	-2,0	-2,5	16,3	50,7	0,8	20,2	10,9	N/A
Murmansk Oblast	-7,3	-1,7	22,9	0,0	0,0	21,0	11,5	0,7
Arkhangelsk Oblast (excl. NAOs)	-6,9	-1,1	16,9	7,0	1,4	22,4	8,9	3,7
Komi Republic	-11,0	-1,7	18,4	34,7	0,0	23,2	11,3	4,2

Photo: iStock

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 fifth issue of the "Business Index North" analytical report and focuses on the BIN area, including the northern regions of Norway, Sweden, Finland, and Russia. In future issues of the report, we hope to include Alaska and the Northern Territories of Canada, Iceland, and Greenland.
The BIN project is implemented through an international network of universities, research organizations, businesses, and public sector institutions. The main implementing partner is the High North Center for Business and Governance at Nord University Business School. Nordland County Council and the Norwegian Ministry of Foreign Affairs provide basic funding for the BIN project.

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