

# Supply of Raw Materials, Transport Needs and Economic Potential in Northern Europe

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## Foreword

*This report has been produced by ÅF-Infrastructure AB for the Swedish Ministry of Enterprise, Energy and Communicatons.*

*The report and its investigations are based on several sources. We have used official statistics as well as results from a great amount of reports, whereof several are produced by ÅF-Infrastructure AB for different country administrations, etc.*

*ÅF-Infrastructure AB is responsible for the contents of the report.*

*It is our aim that this report will stimulate to a constructive dialogue including both the public sector and the industry sector about development possibilities for the region as well as for Europe as a whole.*

*Tavelsjö, May 26, 2010*

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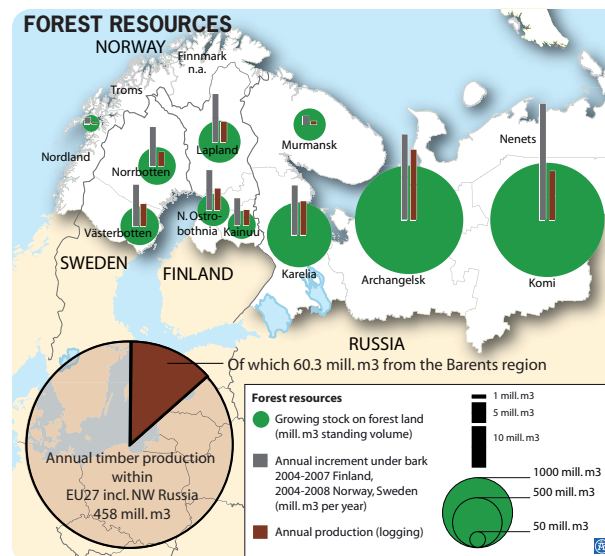
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# Summary

Northern Europe accounts for a significant share of the EU's production of raw materials, such as iron ore and forestry products. For instance, 88% of the EU's total output of iron ore is produced in the Barents region. Gold, silver, copper, chromium, nickel and aluminium are other metals that are extracted in significant amounts in the region. See figure 1. In addition, rock waste, which is created as a by-product of mining operations, is gaining in importance for construction of infrastructure and for the production of concrete. The forest resources of the Barents region are the source of an important share of the EU's total production of paper, timber and other forest-based products. Forestry production in the Arkhangelsk Oblast and the Komi Republic in Russia is very high. See figure 2. Transporting the raw materials extracted in the Barents region to the market in the EU requires the existence of efficient and well-functioning transport systems linking the region to continental Europe and the rest of the world. See figure 3.

The Barents region offers potentials of EU-wide interest:

- extended, efficient extraction of raw materials with additional and strengthened transport infrastructure
- strongly extended extraction of renewable energy
- extended tourism industry based on complementary environments and four seasons
- development of a node for trade flows globally (north-south-east-west)



**METAL MINING AND METAL MANUFACTURE**

- Mining and Quarrying
- processing step
- Manufacture of metals and fabricated metal products
- processing step
- Manufacture of machinery and equipment

**Metal Mines**

- Iron ore
- Sulphide ore (copper, zinc, lead, silver, etc.)
- Gold ore
- Approximate volume unknown
- Planned mine

**AF Infraplan 2010**

The map shows the geographical distribution of metal mines and manufacturing facilities across Sweden and Finland. Major mining hubs are highlighted in red circles, while manufacturing centers are shown as blue squares. The legend indicates different types of ores and their processing stages. Key locations include Kiruna, Malmberget, Aitik, and various smaller mines like Svartträsk and Borlänge in Sweden, and Norilsk Nickel and Kongsberg in Finland.

**Figure 3:** *Ore and metal require well-functioning transport systems.*

**Figure 1:** Mining production in EU27 and the EU's share of the world production.  
Source: SGU, 2007.

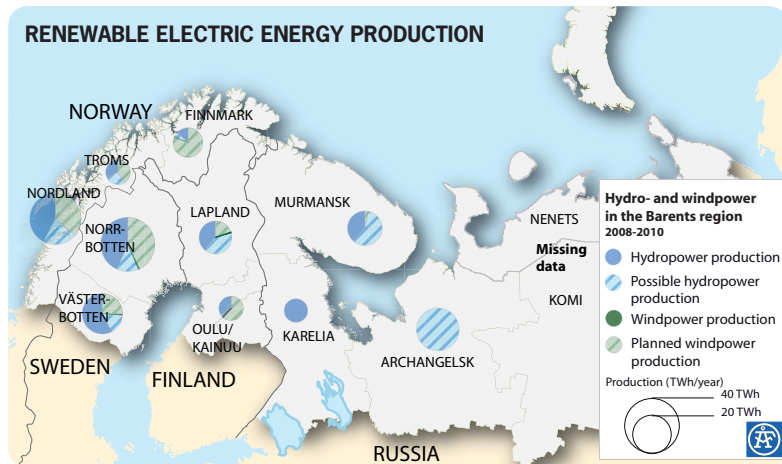


Figure 4: The Barents region produces a lot of renewable electric energy and has additionally a considerable potential.

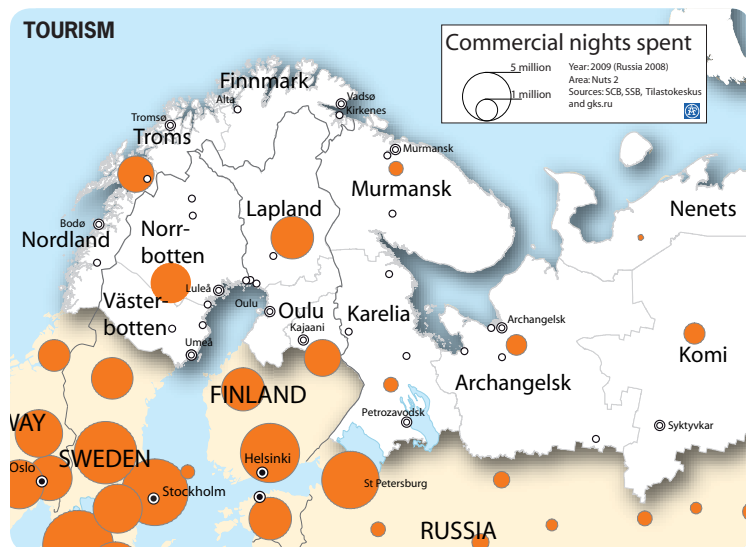


Figure 5: Each year visiting tourists spend some 14 million nights in the Barents region

Figures 2-5: There is further potential for the expansion of extraction of raw materials, generation of renewable energy and development of the tourism industry in the Barents region. Exploiting this potential would be of benefit to all of the EU.

How can the EU draw greater benefit from the natural resources of northern Europe?

A significant impediment to realising the full potential of raw material production in the Barents region is the inadequacy of the existing transport infrastructure. This risks inhibiting the development of European industry.

In addition, further development of passenger transport, in particular by rail, is needed to better integrate the labour markets of the region and improve the access of industry and citizens to facilities for research and higher education. Improving the passenger transport system of the region would also help strengthen the region as a destination for tourists from all around Europe and the rest of the world.

Northern Europe in a global perspective

With economic growth slowly resuming in the EU and the rest of the OECD and with continued strong growth in the emerging Asian markets, global demand for and competition for access to raw materials is expected to rise for the foreseeable future. Given the global nature of the commodities markets this naturally entails that demand will grow also for the raw materials produced in the Barents region.

The Barents region could also gain in importance as a link for transporting goods and raw materials to and from Asia and North America. The proposed "NEW-corridor" would constitute an alternative route for container shipment between North America and China with containers being transferred from rail to ship at the port of Narvik, thus avoiding the congested transport corridors of central Europe. See figure 6.



Figure 6 The Northern East West (N.E.W.) Freight Corridor is an intermodal transport corridor that links the North American east coast to Scandinavia, Russia, China and central Asia, via the port of Narvik and the railway system in the Nordic countries.

Source: N.E.W., UIC (International Union of Railways) 2004

## Transport infrastructure

If the EU is to benefit fully from the significant natural resources of the Barents region, the existence of adequate and relevant transport infrastructure is a necessary prerequisite. Industrial production in the region already accounts for a significant share of the total exports of the countries of northern Europe. Consequently, southbound transport flows both on rail and on sea from the Barents region are almost twice the size of northbound flows to the region. Road transport is of lesser importance to the industry in the region with northbound flows somewhat higher than southbound flows. Due to the bulky and heavy nature of the goods being produced by industry in the region, efficient rail transport is of particular importance for linking the region to outside markets.

As shown in figure 7 below there is no connecting north-south transport corridor between the Nordic Triangle and Northern Axis corridors identified by the EU Commission. Today these two corridors are connected via the Bothnian Corridor which runs through both Sweden and Finland connecting the east-west and north-south trans-national axes in Sweden, Finland, Norway and Russia. This is already today a strategically important trans-national link carrying large flows of freight transport. The Bothnian Corridor also fulfils an important function in



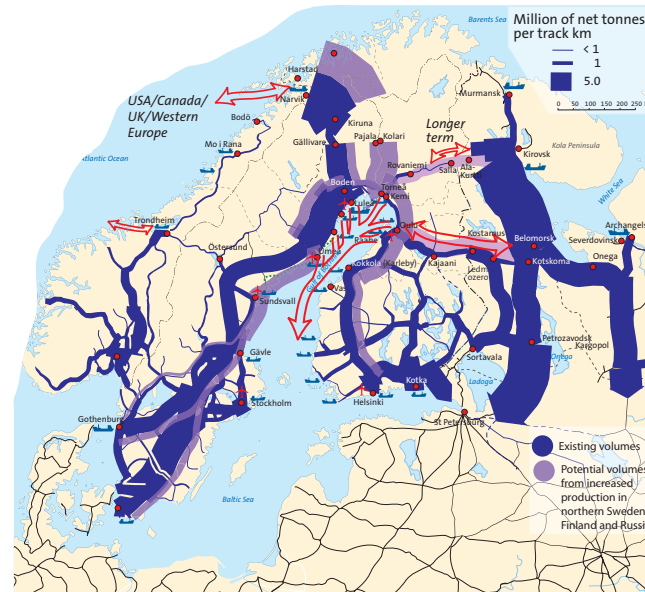
**Figure 7:** Comparing the existing network of EU transport corridors (above) with current transport flows (right) demonstrates the need for a strategic north-south corridor in Northern Europe. Source: Bothnian Corridor/ÅF Infraplan

connecting the east-west transport corridors between Finland-Sundsvall-Östersund-Tromsø and between Vaasa, Umeå and Mo i Rana.

Figure 8 shows existing and potential flows of rail freight transport in northern Europe. This highlights the need for efficient capacity for railway connections running in a north-south direction in this region. In addition to its importance for freight transport, the Bothnian Corridor also has a vital role to play in integrating the labour markets of the region, enhancing the supply of skilled labour and improving the access of industry to research centres. It could also serve as a way of further developing climate friendly forms of tourism in the region.

The capacity of the Malmbanan line is planned to be enhanced in order to accommodate increasing freight and passenger traffic. The planned new mines in Sweden and Finland will need an optimal transport system. Planning and negotiations are under way.

Furthermore, there is a need to strengthen the capacity between Kajaani and Vartiuss in order to cope with an increase in border-crossing traffic. The signal system on the Ledmozero-Kotkoma line which connects the Finnish and Russian railway systems needs to be upgraded, and there are significant bottlenecks on Belomorsk-Archangelsk route which need to be removed.



**Figure 8:** Freight volumes on the railway system in the Nordic countries and Northwestern Russia. Current and potential volumes. Source: ÅF Infraplan

In addition, ports and land-based connections need to be developed in order to cope with the increasing use of inter-modal transports which form an essential part of many of the transport chains in the region. Intermodal terminals have been and are currently being constructed. More efficient terminals need to be built and existing terminals need to be made more efficient in order to create a more sustainable transport system.

The rail gauge used in Russia and Finland is 1,520 mm but 1,435 mm in Sweden and most of Europe. This obstacle to efficient international rail transport in the region needs to be overcome by the development of new technologies able to cope with the harsh climate.

## Joint comprehensive action is needed to meet the present challenges

The challenges outlined above are gradually being addressed within the framework of the national infrastructure plans of the countries in the region. However, if the region and the rest of Europe and the world are to benefit fully from the abundance of natural resources available in the Barents region, there is a need for a joint, comprehensive effort to tackle the infrastructure challenges which are currently faced. This will strengthen the economic growth both in the region and for Europe as a whole.



**Figure 9:** Complementary corridors are needed to make the EU benefit from the growing production of raw materials and value added products in the Barents region. Source: Bothnian Corridor/ÅF Infraplan

# 1 Introduction

## 1.1 Background

Northern Europe and the Barents region are unusually rich in natural resources and raw materials and contribute significantly to the EU's raw materials supply. Sustainable growth based on the resources in northern Europe calls for strategic actions in the transportation systems.

### A basis for competitiveness and growth in the EU

The EU has highlighted the role of natural resources for European growth and competitiveness in a number of strategic documents. The manufacturing industry is highly dependent on a functioning commodity supply. This is manifested in the European Commission's proposed sector actions regarding the competitiveness of European metal and forest based industries. In both these cases, the availability of raw material is emphasised as a critical matter of highest priority.

The construction, chemicals, automotive, aerospace, machinery and equipment sectors, which provide a total value added of more than 1,300 billion Euro and employment for some 30 million people, all depend on access to raw materials.<sup>3</sup>

The EU as a whole has limited raw material deposits. However, the exploration and extraction of raw materials is facing increased competition from alternate land uses and a highly regulated environment, as well as technological limitations in access to mineral deposits. Most of the deposits are however situated in the northernmost part of Europe, where the competition for land use is comparatively limited. The EU is today highly dependent on imports of strategically important raw materials which are increasingly affected by global market distortions<sup>4</sup>.

The forest-based industries, with a production value of approximately 370 billion Euro, and value added of around 120 billion Euro account for more than 3 million jobs in almost 350,000 enterprises. Many parts of these industries play an essential role in maintaining a sustainable employment in rural areas.<sup>5</sup>

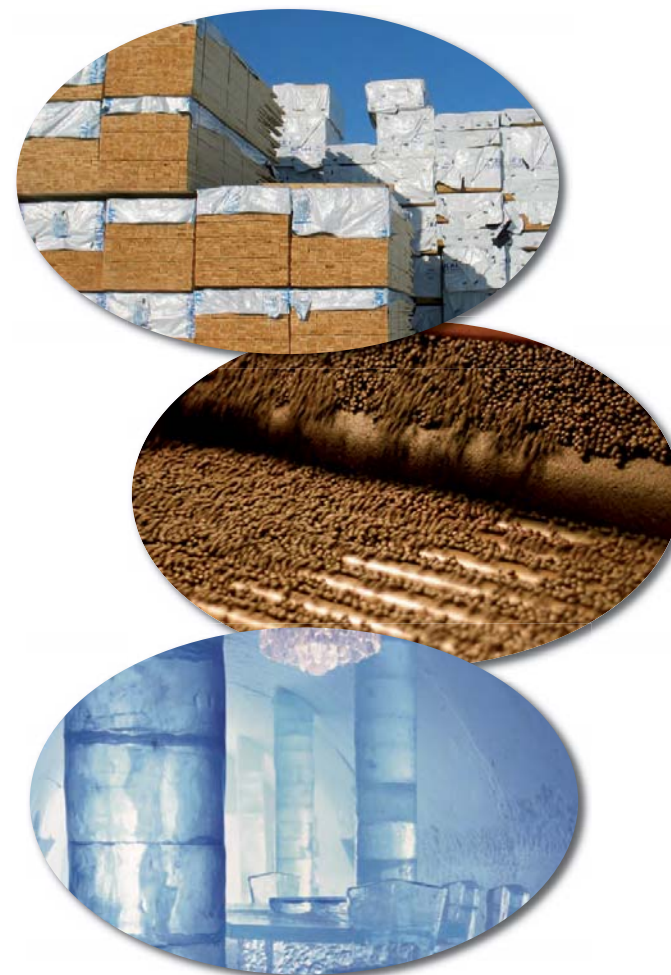
Forest-based industries in the EU are generally competitive and perform well both technically and economically. The pulp and paper, woodworking and printing sectors are world leaders in many areas. However, these sectors are facing a number of challenges, in particular regarding access to raw materials, the need to reduce greenhouse gas emissions, innovation, trade and information of forest-based products. There is overcapacity in pulp and paper industries of the Barents region and the shortcomings of the transportation systems might lead to elimination of producing plants. This in turn entails that the availability of raw materials cannot be exploited.

All in all, the rich natural resources in the Barents region can play a significant role in reducing the European demand of raw materials.

## 1.2 The focus of the report

The focus of the report is on the importance of raw material resources in the Barents region for economic development of Europe. A high proportion of the raw materials are consumed in central Europe and the UK. Therefore the report also needs to focus on the transport systems.

The report is partly based on the summary of ÅF Infraplan's previous and ongoing studies but also on other existing sources.



<sup>3</sup> COM (2008) 699 FINAL

<sup>4</sup> These include export taxes and quotas, along with subsidies, price-fixing, dual pricing systems, and restrictive investment rules. Over 450 export restrictions on more than 400 different raw materials (e.g. metals, wood, chemicals, hides and skins) have been identified. COM (2008) 699 FINAL

<sup>5</sup> COM(2008) 113 final

## 2 Northern Europe and the Barents region

### 2.1 Geography

The Barents region includes the northernmost parts of Sweden, Finland, Norway and northwest Russia (see figure 2.1:1):

- Norrbotten and Västerbotten counties in Sweden
- Lapland, Kainuu and Oulu regions in Finland
- Nordland, Troms and Finnmark counties in Norway
- Murmansk Oblast, Republic of Karelia, Arkhangelsk Oblast, Nenets autonomous district and Republic of Komi in Russia
- The area is surrounded by the Norwegian Sea, the Barents Sea, the White Sea and the Gulf of Bothnia

Around 5.4 million people inhabit the Barents region<sup>6</sup>. Its area has the size of France, Spain, Portugal and Germany together.

The main part of the Barents region belongs to the temperate conifer zone, whereas the Scandinavian mountain range, the northern parts of the Kola Peninsula, the Nenets Area and Novaya Zemlja are parts of the Arctic tundra. The location mainly north of the Arctic Circle gives a midsummer period of exotic midnight sun and a cold midwinter period with dark polar nights lit up by the white snow.

This Euro-Arctic region is characterised by its harsh climate and long distances. However, no other part of Europe and indeed few places on earth, are equally rich in forests, minerals, fish, potentials for the production of renewable energy, oil and gas. The varied nature and the four-season climate contribute to a diverse foundation for tourism.

Besides natural resources the Barents region has a skilled labour force and constitutes a meeting platform between the European Union, the Russian Federation and Norway.

Northern Norway is characterized by a dramatic landscape, with deep fjords and high mountains. The Scandinavian mountain range is more undulating on the Swedish side. Between the mountain range and the populated coast of the Gulf of Bothnia there is a wide unpopulated forest landscape with sparsely popu-



**Figure 2.1:1** *The Barents region – an overview.*  
Source: ÅF Infraplan

lated river valleys. Northwest Sweden, as well as northern Finland, is very sparsely populated and has a varied landscape with mires, mountains and large areas of forests.

The Russian part of the Barents region covers approximately two thirds of the area and equally accounts for two thirds of the population. The population is heavily urbanized but much of the rural areas have been depopulated. The arctic tundra extends across the northern parts, while the southern parts are covered by a forest landscape.

The sea regions of northern Europe have great significance for the fishing industry, oil and gas extraction, transportation and the production of renewable energy.

Area: 1,755,800 km<sup>2</sup>

Population: 5,400,000<sup>5</sup>

Main natural resources:

- Metals and minerals
- Forest and forest based products
- Energy
- Varied nature and climate as base for tourism

<sup>6</sup> SCB, SSB, Finstat, Rosstat

## Northern Europe's relationship to the EU and global markets

Sweden and Finland account for approximately 5 percent of the dispatches of goods traded intra EU27. The share has been constant during the period 2001-2008. Russia and Norway belong to the EU's main trading partners outside EU27, with shares of EU import corresponding to 11 and 6 percent respectively. The Russian share of import from outside EU27 has more than doubled over the past decade while Norway's share has increased by 50 percent. Sweden and Finland account for relatively large shares of the total internal EU dispatches of raw material (8 percent in 2008) while 40 percent of the external EU imports of energy products comes from Norway and Russia.<sup>7</sup> Significant shares of the raw material and energy products are generated in the Barents region.

The global financial crisis affected most of the world from mid-2008. The crisis marked a break in the positive trend of global economic growth with declining freight volumes being one of the consequences. The global financial system is being stabilised and the global economic growth is slowly resuming, and freight volumes are expected to increase again.

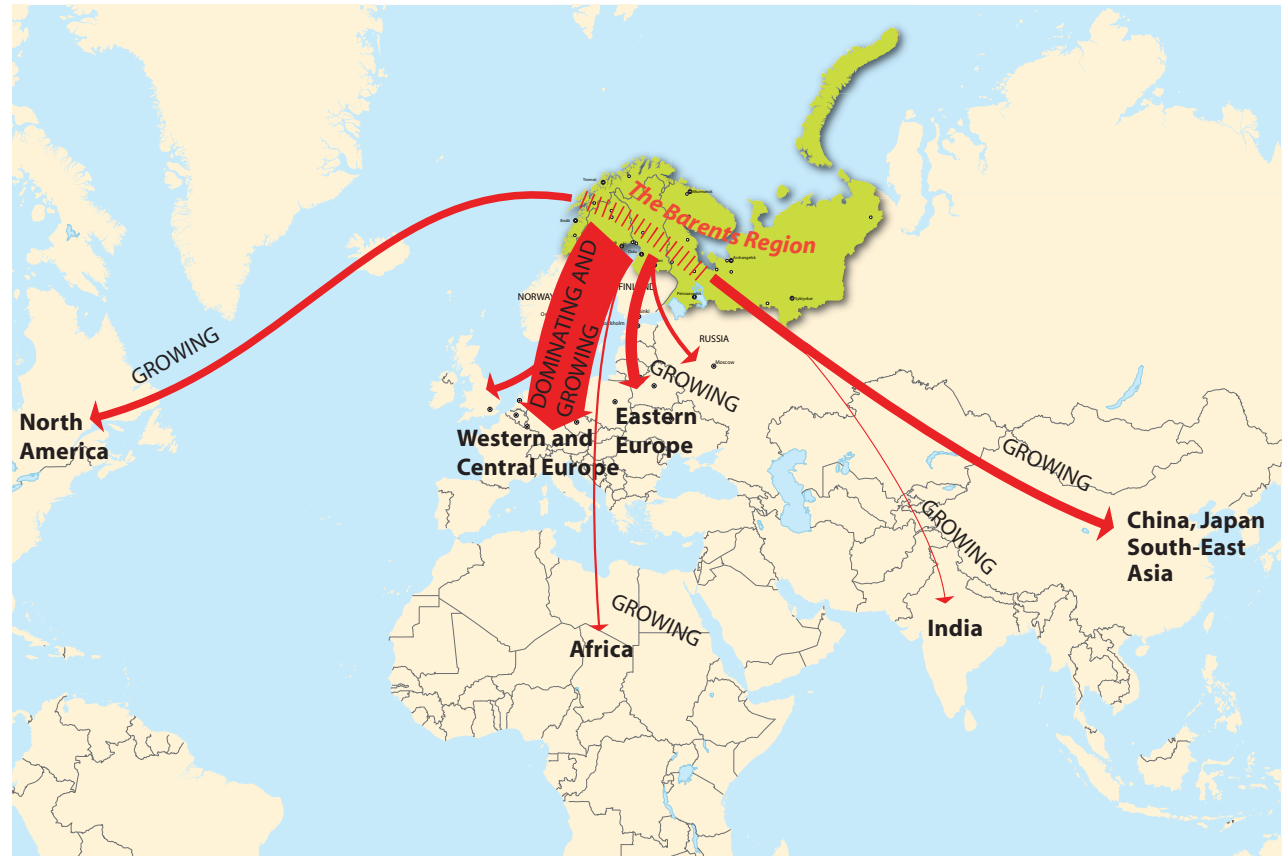
China, for instance, managed the crisis fairly well having entered the crisis with solid economic fundamentals and thus having been able to implement a major economic stimulus package. The Chinese GDP growth rate fell but was nevertheless very strong at 8.7 percent in 2009.

Despite the crisis, global economic growth has increased markedly over the past decade. The main cause being the strong growth in the large populous countries in the Far East (China and India).

These emerging economies require vast investments in industry and infrastructure, which in turn require raw materials. Furthermore, household consumption is increasing strongly in these countries, which also contributes to a general trend of rising commodity prices.

Renewed growth in the OECD and the EU countries, combined with strong growth in Asia and parts of Africa, will therefore result in increased competition for raw materials. (See figure 2.1:2)

<sup>7</sup> Eurostat Statistical Yearbook 2008.



Greater demand for the natural resources and raw materials of the Barents region is therefore to be expected along with higher prices for forest and mineral resources.

Northern Europe is also interesting for transnational transport of goods between east and west. The NEW-corridor<sup>8</sup> is an alternative route for container shipments between North America, via Narvik and Haparanda to China. With this route, the narrow and time-consuming transport systems in central Europe and North America's east coast could become less important.

**Figure 2.1:2** Main trade flows from northern Europe. Northern Europe is an important part of EU and the surrounding world. A dominating part of exports from the region goes to central and western Europe. Export flows to the Far East and some parts of Africa are relatively smaller, but has shown vast growth rates over the past decade.

Source: AF Infraplan.

<sup>8</sup> Container traffic between north America and Asia, via northern Europe has been carried out in an Interreg II-project The Northern East West Freight Corridor Crossing Haparanda/Tornio and UIC-project East-West Transports Northern Alternative

## 2.2 Population

A total of 5.4 million (year 2009) people inhabit the Barents region.<sup>9</sup>

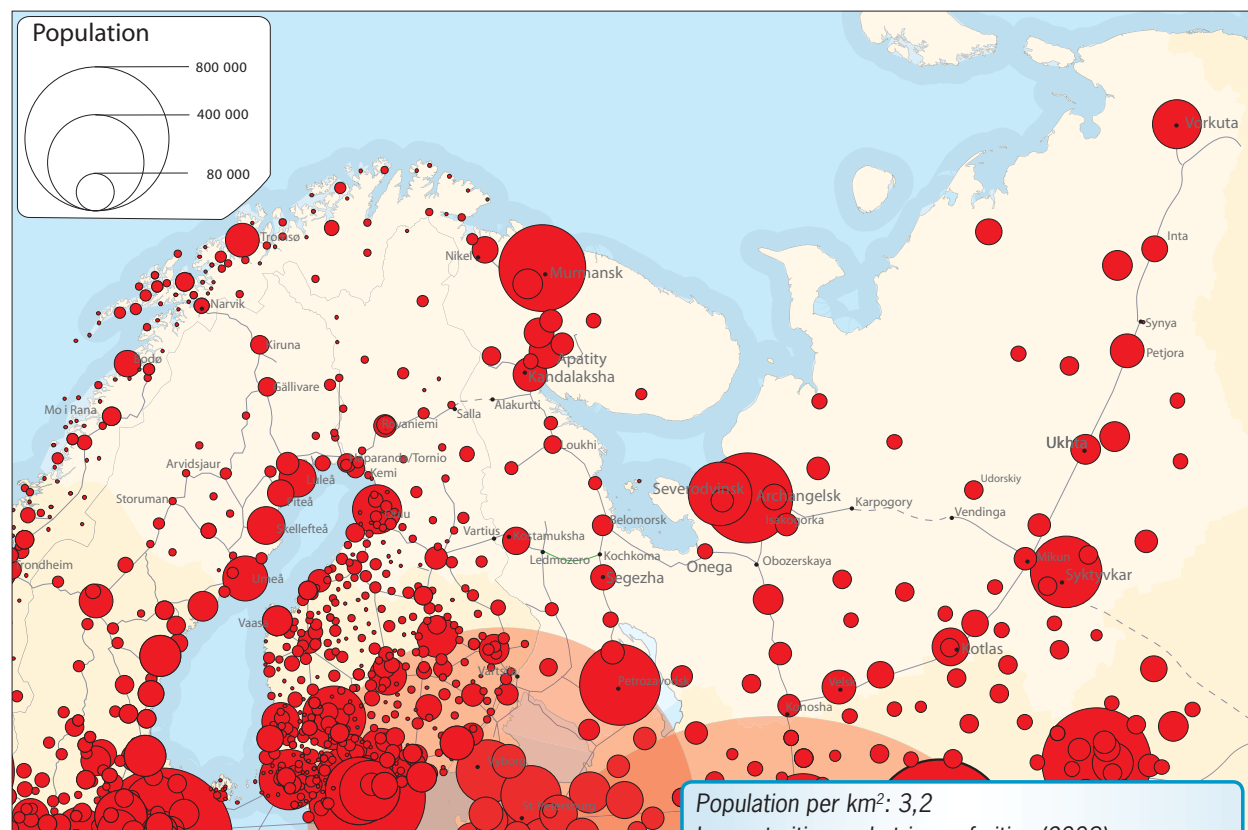
The population is sparse in many parts of the Barents region. There are, however, also relatively densely populated areas, especially along the coast of the Gulf of Bothnia, in Murmansk, Arkhangelsk, Petrozavodsk, Syktyvkar and other regional centres. A continued urbanization is expected.

The Russian part of the Barents region has, as a result of the economic and administrative transformation, lost a large proportion of its population, about 1 percent per year over the past ten years. The changes are more balanced in the Nordic part of the Barents region, but in the areas outside of the regional centres and education centres the population is declining. Even important commodity and industrial centres experience population decline. In the Norwegian part of the Barents region, however, the trend is positive even in many small municipalities.

The past 50 years have witnessed excessive emigration from the Barents region in particular by young people. Improved and balanced population growth however is important for ensuring a sustainable natural resource supply for the EU as a whole.

Regions	Population 2009	Change 2000-2009
Nordland fylke	236,000	-1,6 %
Troms fylke	156,000	+2,9 %
Finnmark fylke	73,000	-2,1 %
Västerbottens län	259,000	+1,4 %
Norrbottnens län	249,000	-2,8 %
Oulu region	475,000	+3,6 %
Lapland region	184,000	-4,2 %
Republic of Karelia	684,000	-6,9 %
Republik of Komi	951,000	-10,1 %
Arkhangelsk Oblast	1,255,000	-9,7 %
Murmansk oblast	836,000	-11,1 %
Nenets Aut. Okrug	42,000	+3,3 %
<b>TOTAL</b>	<b>5,400,000</b>	<b>-6,0 %</b>

<sup>9</sup> SCB, Finstat, NSB och Rosstat



**Figur 2.2:1 Localities and population in the Barents region**  
Source: ÅF Infraplan

There are three main arctic and sub-arctic indigenous peoples inhabiting the Barents region; the Sami (60 000), the Nenets (7 000) and the Vepsians (6 000). The indigenous peoples have their own languages, own cultures and own traditions for trade and society. The Komi people have the status as an indigenous people within the Republic of Komi, but they are not recognized as “indigenous people” according to federal legislation. Karelians and Pomors are other minorities living in the region<sup>10</sup>.

<sup>10</sup> Action Plan for Indigenous Peoples in the Barents Euro-Arctic Region

Population per km<sup>2</sup>: 3,2  
Largest cities and strings of cities (2008):

- Arkhangelsk: 348,000 inhabitants
- Severodvinsk: 189,000 inhabitants
- Murmansk: 389,000 inhabitants
- Mining town region on Kola peninsula: 241,000 inhabitants
- Petrozavodsk: 271,000 inhabitants
- Syktyvkar: 233,000 inhabitants
- Swedish Bothnian coast: 365,000 inhabitants
- Finnish Bothnian coast: 294,000 inhabitants
- Norwegian coast Bodø-Tromsø: 276,000 inhabitants

## 2.3 Industrial structure

### Nordic areas

The industrial structure in the Nordic part of northern Europe is dominated by the base industries. The processing rates are higher in the Nordic parts than in the Russian parts of the region.<sup>11</sup>

Northern Finland has large shares in the wood, paper and metal industries. Mining extraction is increasing. Tourism has increased dramatically in recent decades and has further potential for expansion.

The industry in northern Sweden consists to a large degree of mining, metallurgy, mechanical industry, forest-based industries (wood, paper and pulp), hydro power and specialized services. Northern Sweden also has a significant tourism industry with further potential for expansion.

The industry in northern Norway is dominated by the extraction of oil and gas (especially at Hammerfest), hydro power, fishing and fish processing industry. In the Helgeland area in southern Nordland county, there are also major steel, aluminium, and chemical industries. Tourism is also significant for northern Norway (particularly around the Lofoten islands).

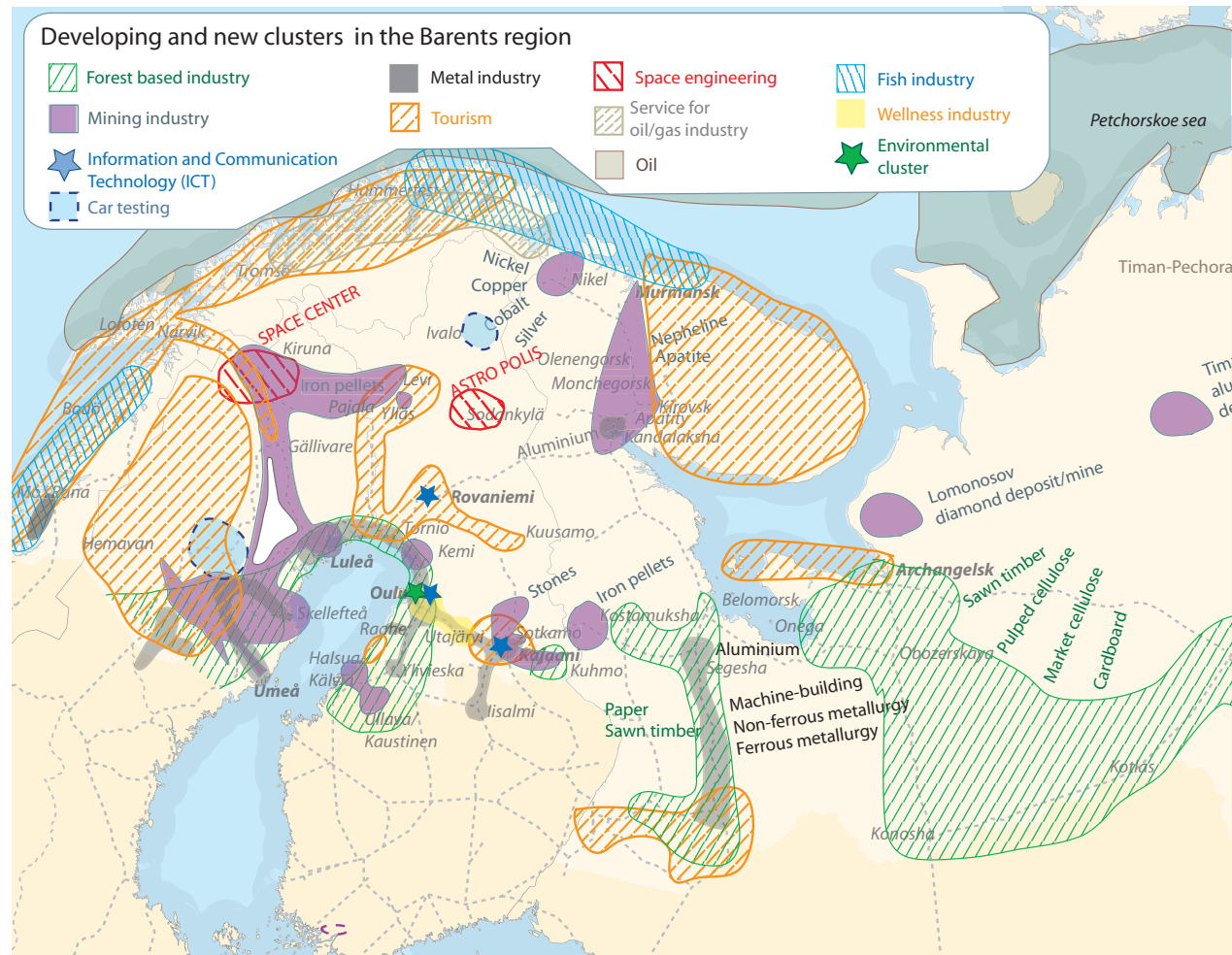
### Russian areas

The Murmansk Oblast (Kola Peninsula and the area immediately south of it) has large resources of ores, minerals, oil, gas and industries related to metallurgy, energy, food and chemistry. Some parts of the Kola Peninsula also have excellent fishing waters, and increasing tourism.

The Republic of Karelia's economy is dominated by forest, paper and energy industries, iron ore mining, extraction of minerals and food production.

The industry in Arkhangelsk Oblast is dominated by forestry, sawmill and pulp industries. Arkhangelsk Oblast has a large and increasing export surplus.

In the Republic of Komi industry is dominated by oil, gas, coal and forestry.



**Figure 2.3:1 Industrial regions in the Barents region. Developing and new industrial clusters by branch.**  
Source: STBR, ÅF Infraplan

Industrial investments of over 100 billion Euro are planned over the next ten years, of which 20 billion Euro in Norrbotten county in Sweden. For example, the Swedish mining company LKAB invests 0.5 billion Euro per year in Norrbotten county.

<sup>11</sup> STBR Barents Railway Network, 2005

## 2.4 Labour markets

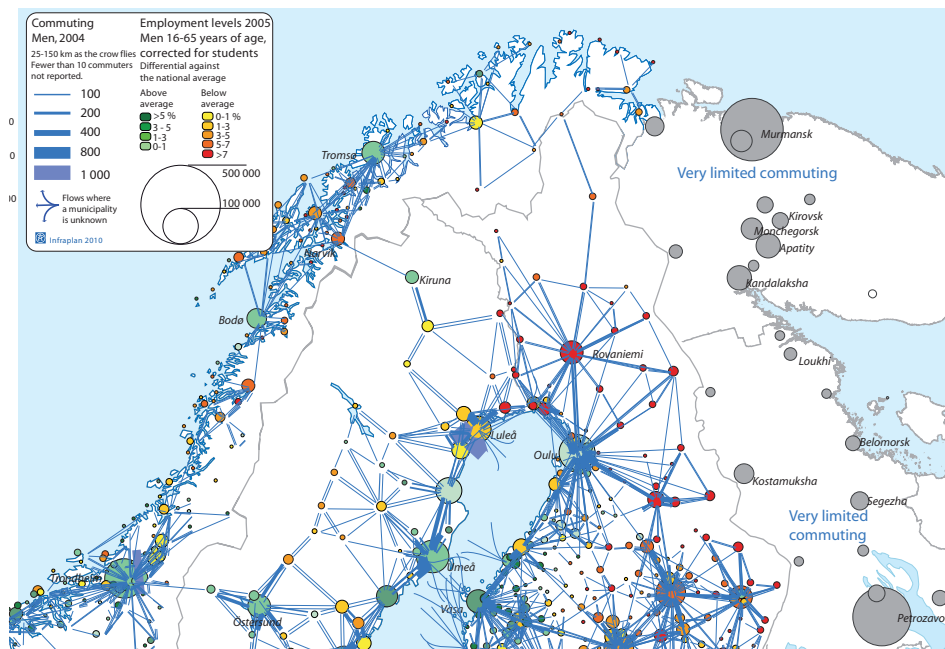
The labour markets within the Scandinavian parts of the Barents region are characterized by specific patterns. Regional centres (most often also functioning as centres for higher education) have high employment levels, in particular for women. Due to less diversified labour markets, peripheral industrial municipalities often have lower employment levels, in particular for women. Municipalities with special niches, for example car test industry, also have high employment levels.

Commuting is a very important balancing mechanism which both provides better use of labour and a balanced demographic structure.

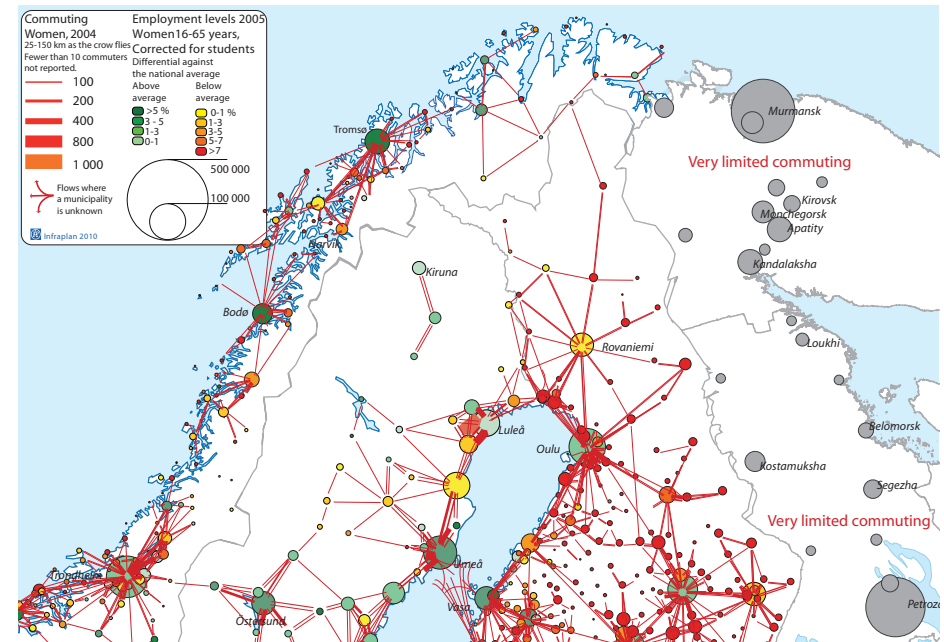
The labour market regions within each country are still very to a large extent separated by national borders. The “motors” of the labour market regions are the regional and educational centres, as these have the most diversified labour markets.

The important raw material municipalities, however, often are very isolated. This is an important challenge to handle, when working to achieve a sustainable raw material supply for the whole of the EU.

Employment statistics for Russia is not available. But in comparison to the rest of the Barents region the employment levels are relatively lower and more imbalanced partly because of major changes in administrative and economic conditions. Furthermore, the commuting flows are very low, presumably because of the low quality of commuting possibilities offered by the road and railway systems. Daily commuting is only possible between closely situated towns, see figure 2.4:1 and 2.4:2.



**Figure 2.4:1** Level of employment and commuting pattern of men.  
Source: SCB, processed by ÅF Infraplan.



**Figure 2.4:2** Level of employment and commuting pattern of women.  
Source: SCB, processed by ÅF Infraplan.

## 2.5 Higher education and research

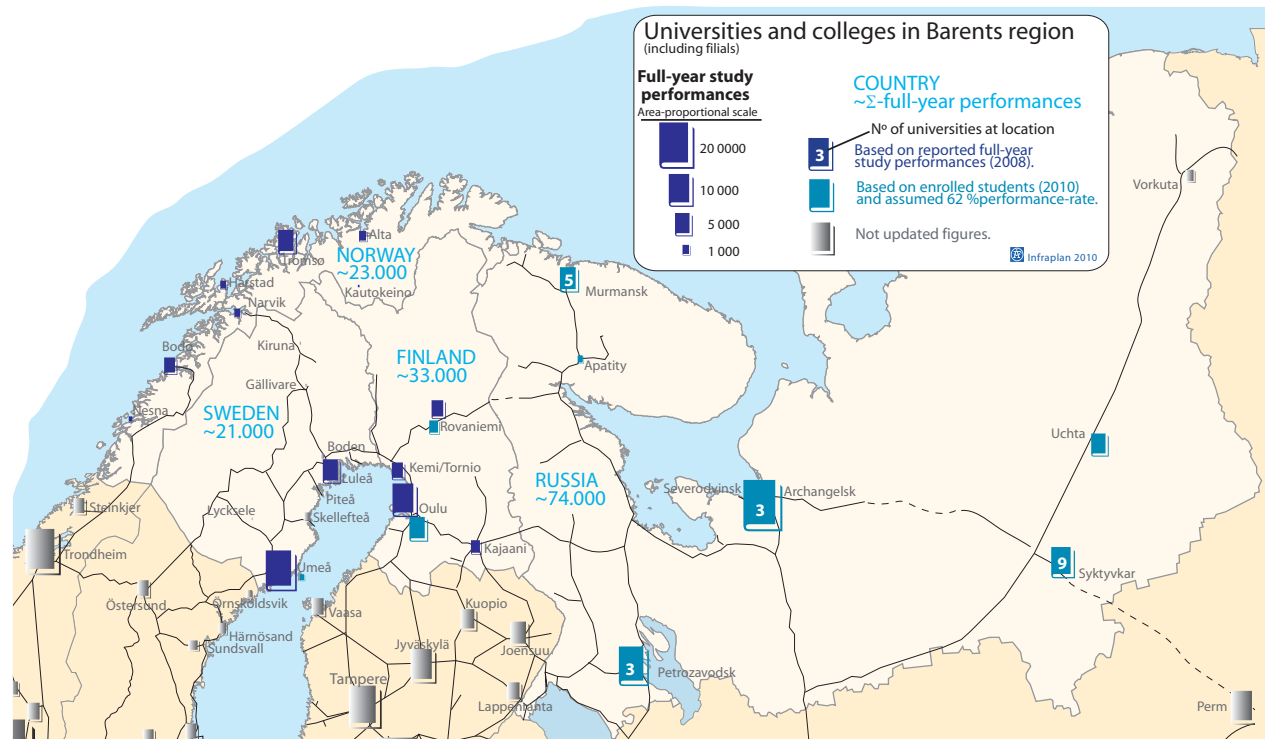
The Barents region is rich in natural resources and high in economic value. The nature is ecologically sensitive and regenerates slowly. Utilization of resources requires environmentally friendly processes in industry as well as innovative measures in environmental protection and restoration.

Industrial competitiveness of the EU requires a continuous development of new products, more efficient production processes and effective marketing. The systems of higher education and research play crucial roles in this process.

Concerns of the environment and climate increases the demands on research to enhance industrial efficiency and develop and improve sources of renewable energy. The relationship between industrial production, environment and climate, as well as the use of natural resources are very strong.

One excellent example of utilizing these specific conditions and a cross-border educational cooperation, is the Barents Environmental Engineering Master's Programme at the University of Oulu. A two-year multi-disciplinary education based on environmental, process, and civil engineering, including subjects ranging from socio-economic issues and legislation to ethics and ecology. The programme is developed and carried out in international cooperation including an exchange period at one of the participating universities; University of Lapland in Finland, Narvik University College in Norway, Archangelsk State Technical University, Murmansk State Technical University and Murmansk State Pedagogical University in Russia and Luleå University of Technology in Sweden.

Graduates of the programme enter the job market as experts in environmental engineering, with specialization in the Barents region's environmental conditions and with the skills to understand environmental issues in an international context. Therefore, graduates can work in a wide range of business sectors, local and regional public administration as well as environmental authorities or research institutes, not only within the region, but also for international organisations.



**Figure 2.5:1** The Barents region has a wide range of higher education. Full-year study performances at universities and colleges.

(Full-year study performance is the number of total achieved studying points divided by the number of studying weeks over a year.)

### A research-dense region of great importance

The research institutes are concentrated to certain parts of the Barents region. The innovation climate in the Nordic countries with open and flat organizations is a good breeding ground for the development of processes and products made in cooperation between industry, universities / institutes and public bodies.

In Norway there are at least eight research establishments in the Barents region, most of them situated around Tromsø, focusing among other things on aquaculture and cross-national co-operation.

The Swedish research establishments are wide-spread and within the Barents region mostly closely connected to Umeå University and Luleå University of Technology. Research is focused on mining, metallurgy, forestry and plant-genetics, fuel technology, arctic/environmental issues, wood technology and space.

Finland has approximately 40 establishments, with 28 of them situated in Rovaniemi. The research is focused on forestry, fishery/aquaculture, wild-life, arctic, geology, nuclear safety, meteorology, chemistry, space and environment.

Murmansk in Russia hosts at least 12 establishments focusing on forestry, fishery, mining, geoscience, seismology, oil/gas and environment. The other Russian districts in the Barents region host another 8 establishments.