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**The Northern Sea Route and Possible
Regional Consequences**

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Sub-programme III: Trade and Commercial Shipping Aspects.

Project III.07.2: The Northern Sea Route and Possible Regional Consequences.

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FOREWORD - INSROP WORKING PAPER

INSROP is a five-year multidisciplinary and multilateral research programme, the main phase of which commenced in June 1993. The three principal cooperating partners are **Central Marine Research & Design Institute (CNIIMF)**, St. Petersburg, Russia; **Ship and Ocean Foundation (SOF)**, Tokyo, Japan; and **Fridtjof Nansen Institute (FNI)**, Lysaker, Norway. The INSROP Secretariat is shared between CNIIMF and FNI and is located at FNI.

INSROP is split into four main projects: 1) Natural Conditions and Ice Navigation; 2) Environmental Factors; 3) Trade and Commercial Shipping Aspects of the NSR; and 4) Political, Legal and Strategic Factors. The aim of INSROP is to build up a knowledge base adequate to provide a foundation for long-term planning and decision-making by state agencies as well as private companies etc., for purposes of promoting rational decisionmaking concerning the use of the Northern Sea Route for transit and regional development.

INSROP is a direct result of the normalization of the international situation and the Murmansk initiatives of the former Soviet Union in 1987, when the readiness of the USSR to open the NSR for international shipping was officially declared. The Murmansk Initiatives enabled the continuation, expansion and intensification of traditional collaboration between the states in the Arctic, including safety and efficiency of shipping. Russia, being the successor state to the USSR, supports the Murmansk Initiatives. The initiatives stimulated contact and cooperation between CNIIMF and FNI in 1988 and resulted in a pilot study of the NSR in 1991. In 1992 SOF entered INSROP as a third partner on an equal basis with CNIIMF and FNI.

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Preface:

This is the final report of the INSROP-project III.02.1, "The Northern Sea Route and possible regional consequences". The main purpose of the report is to give a qualitative and quantitative description of a region which encompasses the northern parts of Norway, Sweden, Finland and Russia, and to describe and analyze four economic base industries in the region. The analysis of the interdependence between supply of transportation through the NSR and the competitiveness of the four industries and the future development of them has been started, but not completed in this report. In 1995 work on the industrial analysis will be carried on, and the results will be presented in separate reports.

Four research institutes have been involved in preparing this report: Acta Consult, FINNUT and NORUT Social Science Research on the Nordic side and Kola Science Centre on the Russian side.

We will hereby thank all contributors of data to the report, both in Norway, Sweden, Finland and Russia. Furthermore we want to thank the coordinator of sub-programme III for useful, methodological input.

We hope the report can be of some use in the further work concerning the Northern Sea Route.

Tromsøe, 13.3.1995

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COMPREHENSION

The geographical focus in this report is the northernmost part of Norway, Sweden and Finland and Russia north from the Kola peninsula to Taimyr. This area is in the report called the analysis-region, and covers 3,300m². The Russian part of it covers around 90%, and runs along the western part of The Northern Sea Route (NSR). The region has in total about 6.5 mill. inhabitants, of which 85% live in the Russian part. It is very rich in natural resources, both renewable, such as fish and timber, and non-renewable, such as oil/gas, metals and minerals. The main economic base activities are also to a large extent connected to exploiting and processing of natural resources.

Total employment in the region is about 3 mill, of which the Russian part represents 85%. Of the total employment of about 1 mill. are employed in exploration, processing and manufacturing. Around 400,000 work in the primary sectors, which here include fisheries, reindeer-herding and agriculture, except for forestry. A little less than 800,000 produce services, both private and public. The remaining 800,000 are employed in construction, trade and communications. The figures are very rough estimates, and reflect the situation in 1991. Since that time the situation has changed, especially in the Russian part of the region.

Industrial employment (exploration, processing and manufacturing) in the Nordic countries constitutes between 12-18%, whereas in Russia it is close to 35%. Of the total industrial employment the Russian part of the analysis-region stands for over 90%. For services the situation is the opposite, with employment shares around 40-50% in the Nordic part and only a little more than 20% in the Russian part. In the primary sectors employment is higher in Russia than in the Nordic countries, and in the remaining sectors (trade, construction and communications) the shares are relative equal.

In Northern Norway food processing takes about 35% of the total industrial employment, and fish processing is the most important industry in the three counties Nordland, Troms and Finnmark. In Northern Finland wood processing takes over 40% of the industrial employment, and production of pulp and paper are here the most important business sectors. In Northern Sweden the division of labour on industrial sectors is more even, with wood processing and engineering industries as the largest. But mining is also significant. In the Russian part there are large differences between the counties. In Murmansk and Taimyr (Norilsk) the mining and mineral and metal processing industries are most important. In Arkhangel and Karelia forestry and wood processing dominate. In Yamal-Nenets oil and gas exploration is most important. This sector is also large in Komi. In all the western counties the engineering industry is important. This sector produces among other things military equipment and equipment used as input in the other industries.

Common for the whole region is the dependency on transportation. Transportation is crucial both for bringing out output from the economic base industries and bringing in input to the industries and consumer goods to the inhabitants. Today the most important transport routes go in a north-south direction, within each country. The east-west connections between the countries in the region are very poorly developed. In Russia railways and ships are the most important means of transportation, both for input, output and consumer goods. Murmansk is the only ice-free harbour and is used both to ship out exports to Europe and equipment and consumer goods to the eastern part of the Russian North, and to receive input and consumer

goods from abroad and the eastern parts of the Russian North. In this connection the NSR is also used. In the northern parts of Finland and Sweden most of the transport goes by railway and trucks. Both for bringing industrial input and consumer goods in, and industrial output out of the counties. There are no ice-free harbours here, but during the summer harbours in the Gulf of Bothnia are used to ship out industrial output from the processing industries. In Northern Norway ships and trucks are the most important means of transport, both for bringing in input and consumer goods and bringing out the industrial output. There are several larger harbours along the coast. Swedish metal processing companies also use harbours in Norway for their export.

Sea transportation of any significans in the region is found in Northern Norway and Northwest-Russia. In Northern Norway the transport company Nor-Cargo is the largest and most important supplier of seaborne goods transport. Some of the local publicly owned sea transport companies also have a significant share. They run most of the vessels called Hurtigruta, a local steamer which operates in liner traffic along the Norwegian coast. This is, however, most relevant for persons and minor goods transport. In addition there are some smaller companies which offer sea transport.

In Northwest-Russia there are three companies that cover most of the demand for seaborne transportation in the Arctic seas. These are Murmansk Shipping Company (MSC), Northern Shipping Company (NSC) and Northern River Shipping Company (NRSC). Of these the two first are the largest and most important. They have a total of nearly 200 vessels, of these several ice-breakers. Both companies have experience in operating along the NSR. Whereas MSC has mainly operated the route which carries ore from Norilsk to Murmansk, NSC have mainly operated a route which brings timber from Igarka to Arkhangel and export routes to Europe.

Both Northern Norway and Northwest Russia are large producers of fish and fish products. Until recently the Russian and Norwegian fishery sectors were totally separated. The Russian fleets fished in distant seas, delivered all their catches to Russian industry, and the products were consumed in domestic markets. The Norwegian fleets fished in neighbouring seas, delivered all their catches to the Norwegian industry, and most of the products were exported to European markets. Since the end of the 1980s the situation has changed. The Russian and Norwegian fleets fish in the same neighbouring seas, much of the Russian catches has been delivered to Norwegian industry, and foreign investors are entering the regional industry.

This is a situation that calls for regional cooperation and strategies to develop a strong and integrated regional industry within the fishery sector. If this succeeds the analysis-region could become an important exporter of fish based products to the world market. Since the European Common Market has established import barriers on processed fish, distant markets in the Far East could be further developed. New cargo transport could then be generated along the Northern Sea Route. In the worst case the region might end up solely as an exporter of fish as raw material to the European industry. A continuation of the situation as it is today will easily give such a result.

The analysis-region is rich in minerals, and especially on the Russian side mineral extraction and processing are important industries. For about 60 years nickel ore has been transported from Norilsk to Murmansk. This route was operated the year around, in the winter time under extreme temperatures and heavy ice conditions. In 1994 this transport was ended, and it will

probably not be reopened in the near future. Today the ore comes from local mines in the Kola peninsula. At present the export of different metals and minerals, like iron ore and apatite, from Murmansk and Kandalaksha generate sea transport along the western part of the Northern Sea Route.

After the transport of nickel ore from Norilsk to Murmansk was stopped, the most important sea transport in the Kara Sea and along the Yenisei river is the roundwood and sawn timber that is shipped out to the export markets, and the commodities and foodstuff that is transported to the Siberian settlements during the summer season. Large volumes of timber and timber based products are also transported by ship along the western part of the Northern Sea Route from the White Sea area. Altogether, the analysis-region has enormous timber resources. However, the future development of the regional timberbased industry will probably, just like the fish industry prospects, depend on cooperation between the national industries within the analysis-region. If the region succeeds in developing a strong cluster of timber based industry, export might be expanded both in the European markets, and eastwards to the Far East markets.

The most promising industrial sector, with regard to increased transportation along the Northern Sea Route seems to be the petroleum sector. Large deposits of oil and gas are located on the Russian and Norwegian continental shelves, and onshore in the eastern part of the analysis-region. In a medium time perspective production from several new fields on the Yamal peninsula, in the Nenets area, in the Pechora Sea and outside Nordland county are expected to start. This will cause a significant transport activity along the Northern Sea Route, both in the construction period and in the production phase. How extensive the seaborne petroleum transport is going to be will depend on the construction of new pipeline systems. In a longterm perspective transport of crude oil and gas might be the most important regionally generated transport along the Northern Sea Route.

PART 1 INTRODUCTION

1 BACKGROUND

When discussing a further development of the Northern Sea Route (NSR), it can sometimes be relevant to differentiate between the two different ways of using the route; transit operations through the route and local use for shorter or longer distances along the route. Which of these that has the largest potential and the best chances of being financed in the future is today difficult to say. It is also difficult to say which will be the main contributor to the use of the route in the future, and what will be the relationship between transit operations and local use of the route. Will the most efficient way be to keep the two ways of using the route strictly separated or will it be more efficient and profitable to operate the route in a combination of transit and local use?

Transit use of the route started only recently and has until today been very limited, whereas internal use is more extensive. This is mainly transport of raw material along parts of the route. There is also a demand for transportation of products from the regions along the route. This existing transport and the transport demand along the route will be a good basis for deducing and analyzing the potential for local transport demands on the NSR.

In a short to medium perspective the local use of the route can contribute both to making the route known among the big industries and transporters in Europe, the Far East and North-America and to providing experiences from the use of the route. Depending on which way is the most efficient to operate the route, the local industries can be important co-suppliers of cargo to the transit ships when they have idle capacity. Experiences from the existing use of the route can also say something about which cargo the NSR is most suited for.

The development of the route, including both local use and transit operations, will justify establishing sea-transport related services in the main ports along the route. Examples of such services are navigation and piloting, and the main ports will be Kirkenes as the last western port and Murmansk as the last major port before the start of the route. It is also likely to believe that the more the local industries use the route, the greater the demand for local services connected to the route. This gives a positive correlation between the local use of the NSR and the development of sea-transport related services along the route.

Extensive development of services in the main ports along the route, such as Murmansk in the western end, will contribute to improving the total infrastructure connected to the NSR, which in turn will make the route more attractive as a transport alternative for transit as well. This again can provide a foundation for extending the basic services and for developing new and more advanced sea-transport related services. This will have implications also for the more local shipping in the region, and for transport and transport-related services as a means to develop the economy. The potential for developing such sea-transport related services will not be discussed in this report.

In this project we will concentrate on the geographical area which runs from Nordland county in Norway northeast along the coast to the Taimyr peninsula in Russia. From a mainland point of view this includes the whole Barents-region and in addition the Russian autonomous

republic Komi and the autonomous areas (okrugs) Yamal-Nenets and Taimyr. This covers the western part of the NSR. This area is called "the analysis-region". The analysis-region consists of the following sub-regions:

the counties of Nordland, Troms and Finnmark in Northern Norway, Norrbotten in Northern Sweden, Lappland in Northern Finland, Murmansk, Arkhangel, Karelia, Komi, Yamal-Nenets and Taimyr in Northern Russia.

Project III.01.2 in sub-programme 3 of INSR0P will analyze the economic development along the eastern part of the route as a consequence of development of the NSR. The reason for including the Nordic counties in this project, although they are not situated along the NSR, is first because of the possibilities of closer economic integration between the northern parts of Finland, Norway and Sweden and Northwest Russia due to the establishment of the Barents region. Secondly, the similarities in the economic structure of these areas and their common dependence on transport.

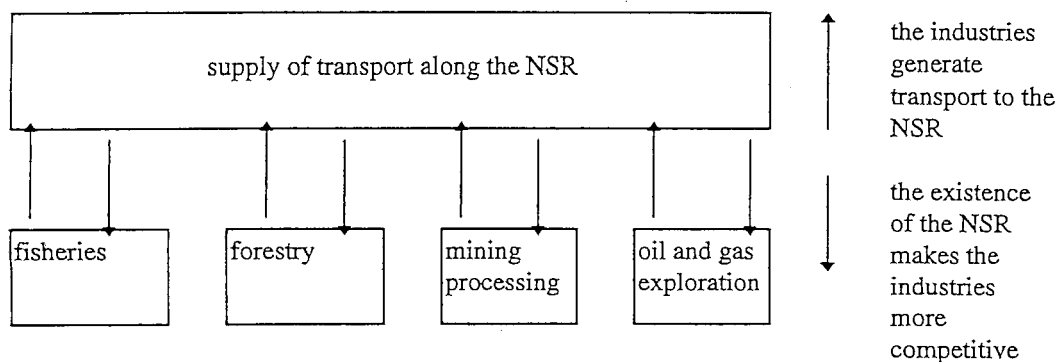
2 AIM OF STUDY

The industrial activity on the mainland along the NSR provides a demand for sea transport and sea transport-related services, and is the basis for most of the transport along the NSR today.

The main concern in this project is the interrelationship between the supply of sea transport along the NSR and the economic activity on the mainland. In this connection economic activity is limited to include the main industries in the analysis-region, and sea transport related services in the same region. The main industries are all very dependent on transport. The supply of transportation is a factor that will be positively correlated with the competitiveness of these industries. In this respect a further development of the NSR can contribute to growth of these industries. On the other hand, a positive development of the industries in the region, meaning an increase in production, will also increase the demand for transport. Such an increase can partly be directed to the NSR and thereby strengthen the footing of the route. This will also be true for sea transport related services, such as navigation, piloting, supply of fuel, shipyard services. A well-developed infrastructure along the route, in the form of a couple of well-equipped smaller ports, continuous piloting and navigation will make it more attractive both for the local industries and for transit operations, and thereby provide a good basis for the development of the route. On the other hand, a further development of transport through and along the NSR will demand more shipping-related services. As mentioned in chapter 1 we will not examine in detail the potential for developing sea-transport related services connected to the NSR in this report.

In brief the basis for and content of this project can be explained as shown in figure 2.1. The figure shows the interrelationship between the route and the regional base industries.

Figure 2.1 Basis for and content of the project



In this report emphasis has been placed on the present situation. Future developments are briefly discussed in the industrial analyses. The report, seen as a whole has been divided into four parts. Part one is a general introduction to the subject and presentation of theories and assumptions used in the industrial analysis. In the second part we make a qualitative and quantitative presentation of the analysis-region. This includes subjects like population,

employment, resources, income and regional policy. It also includes a presentation of the most important transport in the region and the size and structure of the transportation sector. In part three, industrial analyses for four main industries in the region are presented. These analyses include presentations of the industrial demand for, and use of transport today, and attempt to predict the future demand for transport, based on different scenarios for the development in the industries. Part four gives an overview over the analyzed industries in the region, seen in context, also drawing some conclusions.

3 METHODOLOGY

3.1 Basic assumptions and limitations

To operationalize this project, it has been necessary to make some limitations for geography, which part of the economy that should be included, and time aspect.

Geographical limitation

The main geographical focus in this analysis will be the Barents region, and in addition the autonom republic of Komi and the autonomous areas (okrugs) of Yamal-Nenets and Taimyr, all in Russia. This constitutes the western part of the Northern Sea Route. The regional use of the route goes to a large extent between the port of Dudinka on the Yenisei River westwards to the port of Murmansk, and from ports along the Lena River and other Siberian rivers and eastwards through the Beering Strait. By including the two autonomous areas Yamal-Nenets and Taimyr in the analysis-region, the important transport of ore from Norilsk to the nickel-plants in Murmansk county will be included. In these two areas there are also large deposits of onshore gas and oil (Yamal-Nenetsky) and metals and minerals (Taimyr).

Parts of the economy

As will be shown in chapter 5, both the supply and demand side of the economy are very dependent on transportation. On the supply side the main industries in the region which are based on extraction and processing of natural resources are very export-oriented, their largest markets are located in Europe and the Far East. On the other hand these industries are also to a certain degree dependent on import of raw materials. Regarding the demand side of the economy, the region is dependent on import of all sort of consumer goods. The self-supply of food and other goods are very low.

It will be too comprehensive in this context to study all these aspects concerning the connection between local economic activity and the need for transportation. In this project we will therefore focus mainly on the supply side of the economy. This means that we will not consider the import of consumer goods, and related transport-demand in our analyses. Further, we will only study the four most important export industries. These industries are; fisheries, including both catching and processing, forestry and wood processing, oil and gas extraction, mining and metal/mineral processing. These industries account for the largest part of the transportflows directed towards the NSR in the region.

Time aspect

One of our main aims is to analyze the existing cargo from the main industries in the region. We will also in the industrial analysis briefly discuss the future potential for development of the industries, and the subsequent demand for transportation. When this potential will be released is of minor importance. To limit such a discussion and make it relevant to the present situation, we will mainly use a short to medium time aspect. In this connection that means from 5 to 10 years ahead.

Regional versus industrial analysis

In the description and analysis of the industries we have chosen type of industry as the analysisvariable. This may seem obvious, but is not trivial. Another choice could have been

the geographical or political division of the region. Due to big differences in political and economic system between the Nordic and Russian part of the region, it could have been interesting and relevant to analyse the economic and industrial development in the different areas in the region, either of each of the four countries or of the Nordic countries as compared to Russia. The problem with such a method is that it is more difficult to point out relations within the same industry in different regions. Regional analyses could also be a more general analysis of regional development instead of an analysis of the development within the main industries. On the other hand, a regional analysis could consider the relationship between different economic activities in each area. Such a relationship is important to be aware of in predictions of developments in only a few sectors.

There will be arguments both for regional and industrial analysis. We have considered that the industrial approach is the most relevant method, considering the purpose of the project. In the description and analysis of the industries it may be relevant to focus on different variables or use different methods or data for the Nordic countries and Russia. In this matter we will be very pragmatic, and will not make similarity between data, methods and variables in the two parts of the region a main point.

Other limitations

Other specifications that should be made to clarify different aspects of the project relate to sea-transport versus land transport and existing versus new industries.

In chapter five and in the industrial analyses in chapter 7-10 we will make a description of the main transportflows connected to the four major export industries in the region. This description will include both land- and sea transport. We will however not engage in a detailed discussion about land transport versus sea transport as the best transport alternative today and in the future. We will only discuss which goods will be suitable for transport on the NSR, and mention other transportalternatives. Related to the existing transport-alternatives we will also describe the services and infrastructure which have been developed in connection with the transport operations.

The development of potential new industries related to the four main industries will not be taken into consideration. We will focus on the mentioned four industries, analyse their structure today and discuss future prospects. We will not discuss whether any of these industries will branch out.

3.2. Analytical framework

Our analysis of the development of the industries in the region will focus on the four main industries. These analyses will be both empirical and analytical. The empirical description will mainly cover the situation as it is today, but will also briefly present the developments during the last 5-10 years. Based on interviews with leading persons in each industry, we will also present their views on the prospects for the industry for the next 5-10 years. The description will be both quantitative and qualitative.

In the analyses the main structures and trends of the industries will be discussed. Another main focus will be the relationship between the level of production and demand for transportation.

As criteria for the selection of variables, on the basis of which we describe and analyze the industries, we have used two economic theories. The first one is the theory on which the input-output models are created. Such models are in extensive use in large parts of Europe, both at a national and regional level. Input-output models are consistent models for analyzing total impacts in the economy of marginal changes in the activity in one industry. The model shows the interdependence between the different industries of an economy. For us it is important to point out such dependences in the economy for two reasons. First because an increase in the production in one industry will increase the demand for supplies. If the suppliers are located along the NSR, this can mean an increase in the transport-demand which can be directed towards the route. Second, because it has to be a part of the predictions whether an industry will be able to get sufficient supplies to increase production. We have in this project no ambitions of using an input-output model to measure changes in total production, and thereby also changes in the demand for transport. We also have no ambitions of trying to quantify the relationships between output and the demand for input.

Further, we have used the «diamond-model», developed by the American economist Michael E. Porter. More than a model, this is an empirically based systematisation of factors which contribute to the competitiveness of an industry. The factors are divided into four main groups, each group containing several subfactors. Special values of these factors will either strengthen or weaken the competitiveness of the industry. We have included some of the subfactors in the description of the industries. For our purposes and because the industries are all related to the use of natural resources all factors would not be relevant to include in the description, or in the later predictions. So, for the input-output model, we do not make use of the complete theory, just extract the most relevant parts of it.

Analyzing the development in demand for sea transport will be of a more purely empirical character. To limit this part of the project, we have decided to only take into consideration demand directed towards existing sea-transport, and not the need for additional transport. The argument for doing this is that we only use a short to medium perspective, and assume that within such a short timespan the demand for more extended and advanced transportation will not have developed or become realized. Implicitly this means that the use of the route will remain rather limited during our analysis-timespan. From collected data we will first make a description of the supply of sea transport that exists in the region today. For obvious reasons it is only the Russian and Norwegian part of the region that is relevant in this connection.

PART 2 REGIONAL CHARACTERISTICS

4 SOCIO-ECONOMIC ASPECTS

4.1 Geographical description of the analysis-region

The region which we focus on in this project consists of the following politically defined administrative unities;

- the counties of Nordland, Troms and Finnmark in Norway
- the county of Norrbotten in Sweden
- the county of Lappland in Finland
- the counties of Murmansk and Arkhangel, the republics of Karelia and Komi and the autonomous areas of Yamal-Nenets and Taimyr in Russia.

These individual administrative will hereafter be called sub-regions, all of which are situated in the northernmost parts of their respective countries. Map 1 gives an overview of the sub-regions, including population (in 1000 persons) and main transport routes.

The region covers an area of more than 3,300 km², of which around 3,000 km², or more than 90%, belongs to Russia. Most of the area is situated north of the Arctic circle. In the Russian part of the region large areas also have permafrost, there are also sporadic areas in Finnmark with permafrost, but these are not marked on map 1.

The most important ports in the region are Dudinka, Murmansk and Arkhangel in Russia, Luleaa in Sweden, Kemi in Finland, Kirkenes, Narvik, Tromsø, Bodø and Mo in Norway. The main river in connection with transport is the Yenisei on the Taimyr peninsula in Russia. Other rivers in the region are of less importance for the most significant transport flows. These ports and towns, with corresponding population in 1000 persons, are marked on map 2.

4.2 Population

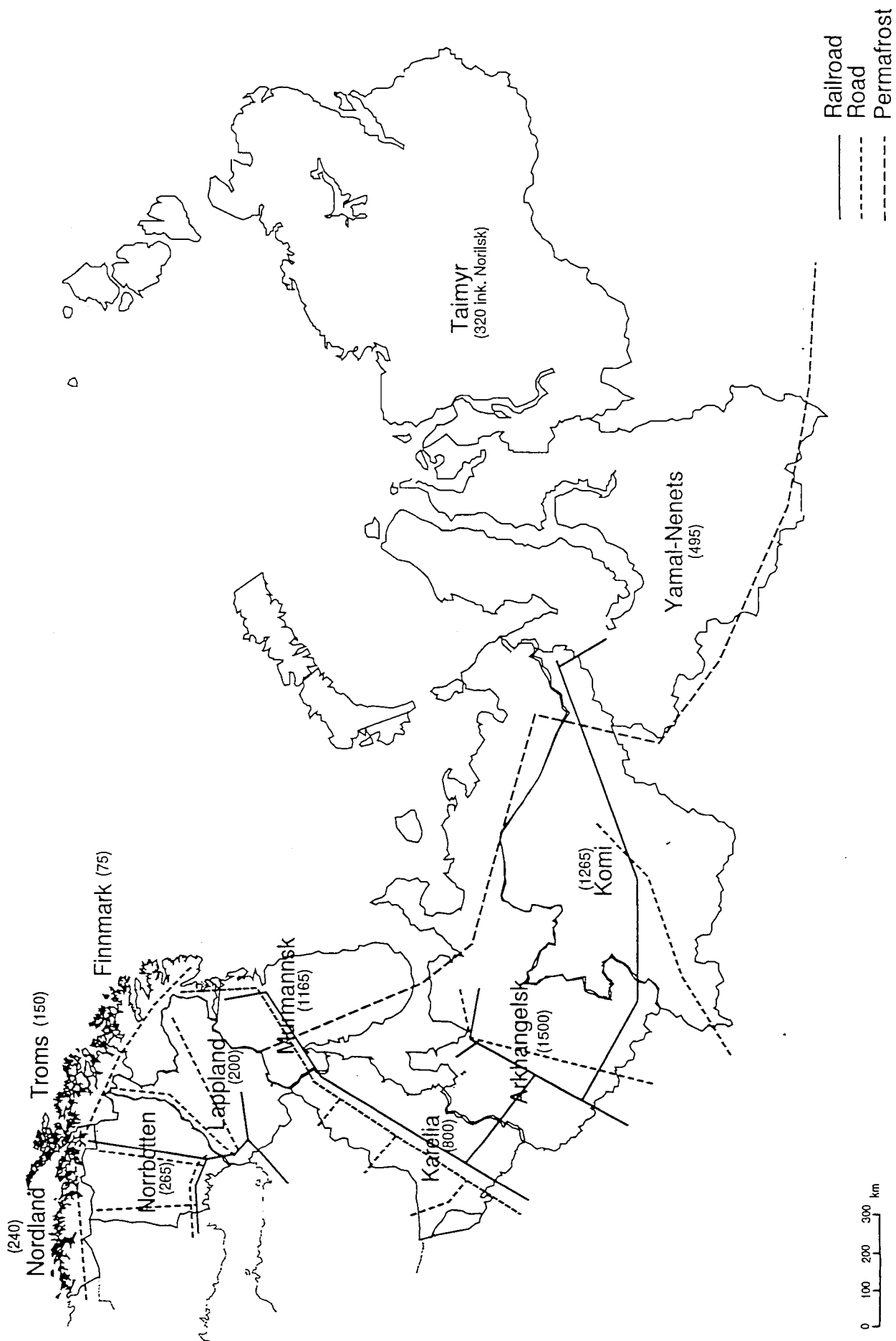
The total population in the region is approximately 6.5 mill. This is divided between the different countries in the region as shown in table 4.1. On map 1 the figures in brackets (in 1,000 persons) show how the population is distributed by sub-region.

Table 4.1 Distribution of population as to country, in 1000, and %, 1991

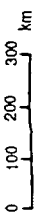
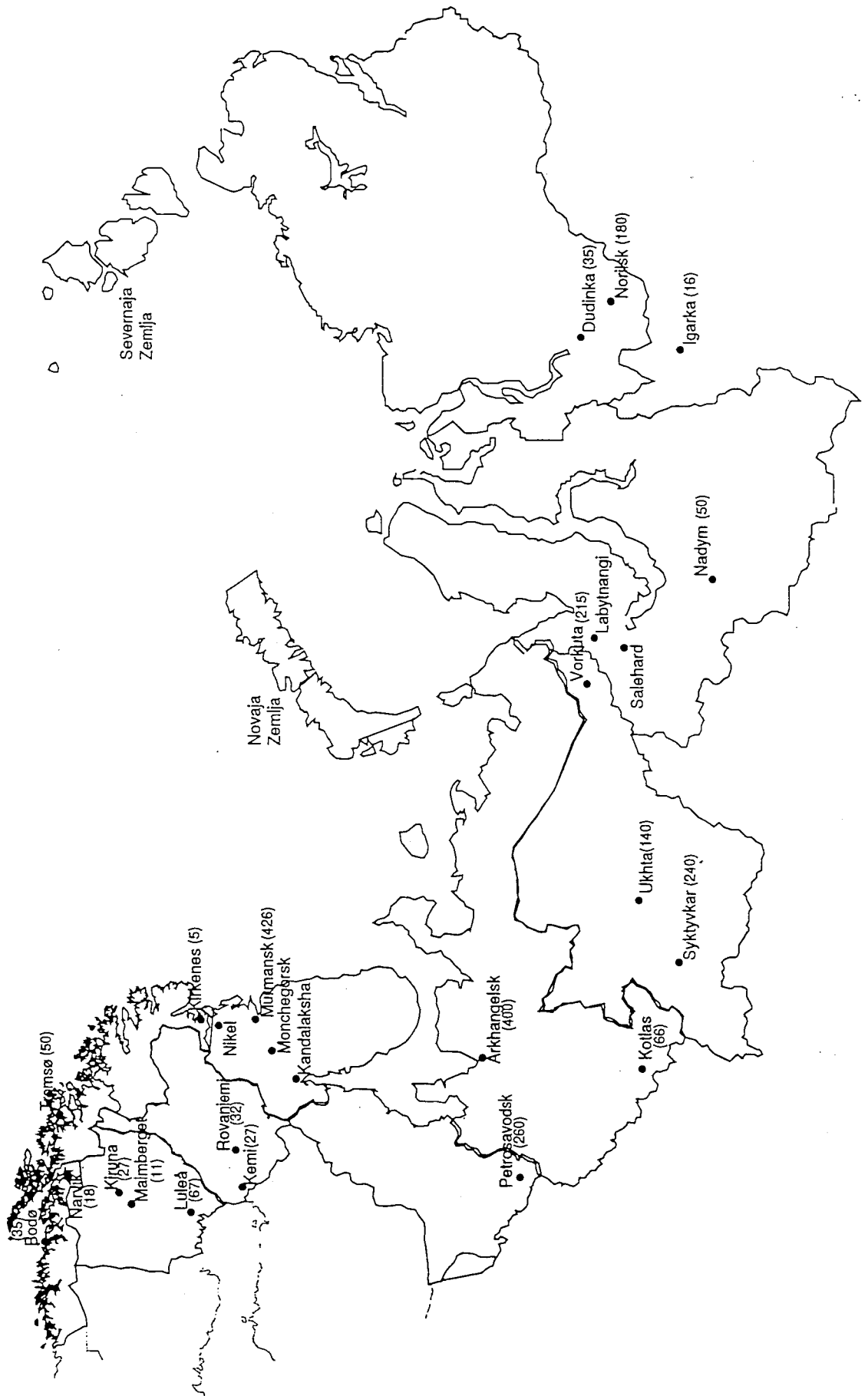
Region	N-Finland	N-Norway	N-Sweden	Russian part	Total
1000 persons	200	460	265	5565	6490
%	3	7	4	86	100

Source: National Bureau of Statistics, Sweden 1992

MAP 1



MAP 2



Around 85% of the population in the region is situated in the Russian part. Arkhangel, Komi and Murmansk have most inhabitants, all with more than one million. Taimyr, which is the largest geographical sub-region, has the least inhabitants, with only 50,000. This does not include Norilsk city and satellites, because this town administratively belongs to Krasnoyarsk kray, and in some respects is managed directly from Moscow. This is due to the great importance of production in this city for the national economy. Altogether Norilsk has around 270,000 inhabitants, including the satellites. Finmark county in Norway has the smallest population, with only 75,000 inhabitants. Nordland, Norrbotten and Lappland all have between 200,000-265,000 inhabitants.

The towns in the Nordic part of the region are small compared to the largest cities in the Russian part. The largest Nordic town, Luleaa in Norrbotten, Sweden, has close to 70,000 and Tromsø, the "capital" of Northern-Norway, has 55,000. In the Russian part there are some cities with more than 100,000 inhabitants. The most important of these are Murmansk (425'), Arkhangel (400'), Norilsk, Petrosavodsk (260') and Vorkuta (110').

The region seen as a whole is very sparsely populated, on average there are about 2 inhabitants pr. km². Murmansk county, with 8 persons pr. km² has the highest population density and the Taimyr area, exclusiv Norilsk, has only 0.6 persons pr. km². In the Nordic part the population density is about 2-4 persons pr. km², lowest in the Finnish part (2) and highest in the Norwegian part (4).

The distribution of the population as to rural and urban areas varies between the different sub-regions. In Lappland and the three Norwegian counties about one third of the population live in rural areas, whereas two thirds live in urban areas. In Norrbotten and Northwest-Russia these percentages are respectively 20% and 80%. In the most sparsely populated Russian sub-regions the urban percentage is even higher.

4.3 Economic structure

Distribution of resources

The region, seen as a whole, is rich in natural resources, both renewable and non-renewable. The main resources, from an industrial point of view, are fish, timber, gas, iron-ore, nickel-ore, and minerals like quartz and nepheline. The minerals are mainly used in the porcelain industry in Central-Europe. Quartz is also used as input in the ferro-industry in Norway. Parts of the region also have rich access to water resources, from which hydroelectric power is produced. Nordland county, for example, is the Norwegian county with the highest nominal production of hydroelectric power.

The resources are unevenly distributed in the region. The richest fish resources are found in the Barents Sea and along the Norwegian coast. The Barents Sea is today one of the most productive seas in the world, and, unlike most other seas, has a growth in stocks of the commercially most important species (Sakshaug 1992). In 1994 the catch quota for cod in the Barents Sea was over 300,000 tons for both Norway and Russia. In 1993 the two countries was catching respectively 450,000 and 350,000 tonn capelin (Royal Norwegian Ministry of Fisheries). Fisheries, including catching and processing, is the main economic base activity in the three counties of Northern Norway. It is also an important economic base activity in the

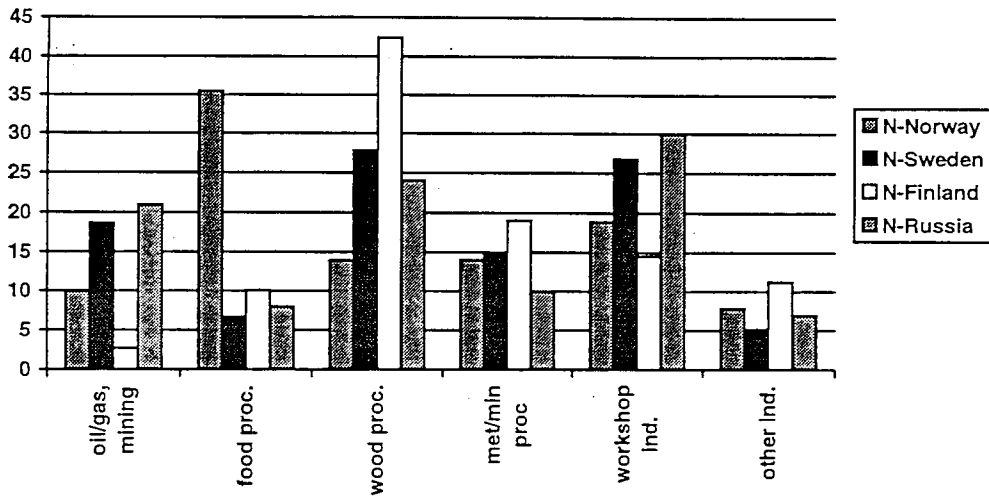
county of Murmansk. The inland climate in the counties of Norrbotten, Lappland, Arkhangel and the republic of Karelia provides good conditions for forestry. In these sub-regions there are large belts of commercially exploitable forest, forming the basis of the production of timber and processed products like pulp and paper, the most important economic base activities in Lappland, Karelia and Arkhangel. The largest onshore gasdeposits in the region have been found in Yamal-Nenets and Komi. In 1965-1970 the worlds largest gasreseves were found in Yamal-Nenets, containing more than 10,000 billions m³. From 1977 to 1992 the production of gas in Yamal-Nenets has increased from 65 billion m³ to 550 billion m³ (Kyndlev and Tulinius 1994).

The largest deposits of ores are found in the area around Norilsk in Taimyr. Ore are estimated to suffice for several year's production. Though the most important ore is nickel, here are also deposits of cobalt, copper and even silver and gold. At the beginning of the 1990's 18% of the world's production of nickel was based on ores from Norilsk. For cobalt the share was 7% (Kyndlev and Tulinius 1994). In Murmansk there are large deposits of iron-ore. In addition there are large deposists of minerals, the most important being apatite and nepheline. Altogether there have been located more than 45 different minerals, not all of them commercially exploitable (Castberg 1992). This makes Murmansk county one of the areas with the most concentrated mining- and metalindustrial activity in the world. In Norrbotten and Finnmark there are also commercially exploitable desposits of iron ore, which makes mining and metal-processing an economic base activity in these sub-regions. The production of ironore has increased during the 1980's in Norrbotten, reaching 20 mill. tons in 1989 (presentation from the company LKAB in Kiruna). In Finnmark production has decreased in the last part of the 1980's. In Finnmark there are also commercially exploitable deposits of nepheline. This, however, does not make the nepheline production an economic base activity in the county. In Lappland there is extraction and processing of chromium. This takes place in the area round Tornio, in the southern part of the county, close to the border to Sweden. In this area the production of hydroelectric power is also high, which has a certain connection with the industrial activity. There is also a mutually dependent relationship between the very high production of hydroelectrical power in Nordland and the development of industries in the county. Here we find production of aluminium and fertilizers, both demanding large quantities of energy. These industries constitute economic base activities in Nordland.

Economic base industries

The sub-regions, seen from an industrial point of view, have many common features. Economic activities in all the sub-regions in the region are based on the extraction and processing of natural resources. Figure 4.1 shows the relative number of persons working in the the different industries in the various sub-regions. The number is taken relatively to the total industrial employment in the part of the region. The figure does not say anything about the production volume in the industries. Neither does it say anything about the actual size of the industries.

Figure 4.1 Employment in various industries, %, 1991.



*«other industries" includes industries not covered by the mentioned groups. The most important industries here are production of textiles and chemical industry

Source: National Bureau of Statistics, Sweden 1992, Kyndlev and Tulinius 1994, collected primary data 1994

In Northern Finland the main industrial activity is wood processing and the production of pulp and paper. These industries constitute more than 40% of the total industrial employment. In Northern Norway food processing constitutes 35% of the total industrial employment, with fish processing as the main activity. In Northern Sweden wood processing and engineering industry are the largest industries. Mining also has a significant share of the industrial employment.

In the Russian part of the region, seen as a whole, the engineering industry dominates, with about 30% of the industrial employment. This industry is present in all the Russian sub-regions, but is of largest significance in Arkhangel. This is due to the extensive military industry, with the production of submarines in Severodvinsk as one example. This industry also includes the manufacture of equipment to other industries, for example mining, metal processing, food processing and equipment for construction. Of the natural resource based industries, wood processing and oil/gas extraction/mining dominate. The former has 25% of the industrial employment and the latter about 20%. The wood processing industry is mainly situated in Arkhangel, Karelia and to a smaller degree in Komi. Oil and gas extraction is the main industry in Yamal and Komi, whereas mining is the most important industry in Murmansk and Norilsk (Taimyr). In these sub-regions one also find most of the metal and mineral processing, which constitute about 10% of the industrial employment. In Arkhangel and Karelia one also find metal and mineral processing industry of a certain significance. Food processing accounts for about 8% of the industrial employment, and includes mainly the fish processing industry in Murmansk. For all the sub-regions wood processing is the largest industry, with one third of the industrial employment. Engineering industry is the second largest with about one fourth. Food processing, which mainly consists of fish processing, takes 15% of the industrial employment, metal/mineral processing and extraction/mining about 10% each.

The percentage of the employment to each industry in the different countries in the region does not give a good impression of the actual size of the industries in the region. Due to big differences in productivity between Russia and the Nordic countries, the best measure for the size of the industries would be production. Total production data are however difficult to obtain in the Russian part of the region. Therefore we had to use employment data also to show the actual size of the different industries. In table 4.2 industrial employment is compared to total employment for each country in the region.

Table 4.2 Total and industrial employment in various parts of the region, in 1000s and %, 1991.

Region	N-Finland	N-Norway	N-Sweden	Russian part	Total
tot.empl.	90	225	135	2640	3090
ind. empl.	13	29	23	935	1000
ind.empl. in % of tot. empl. in each sub-reg.	14	12	17	35	32
ind. empl. in % of tot. ind. empl. in the reg.	1	3	2	94	100

Source: National Bureau of Statistics, Sweden 1992, Kyndlev and Tulinius 1994, collected primary data 1994

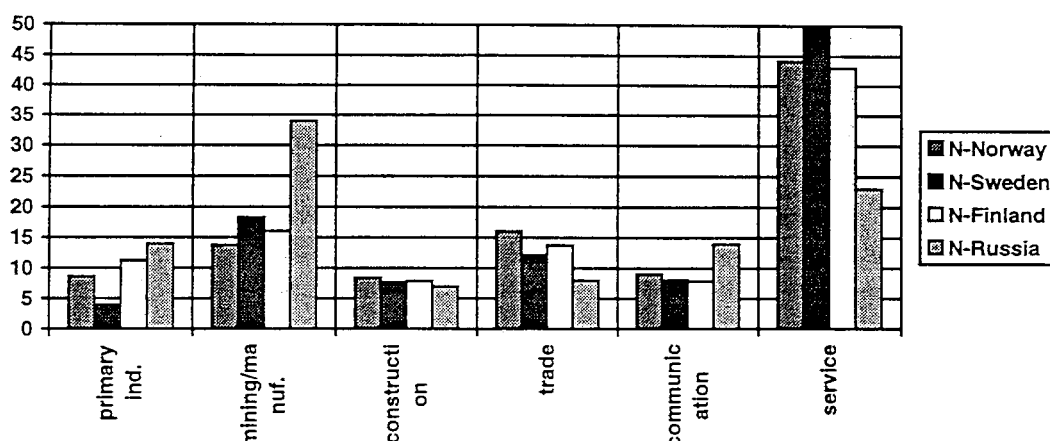
The total industrial employment in the region is estimated to be about 1 mill. Of this over 90% is employed in the Russian part of the region. In the Nordic countries industry's share of total employment varies from 12% in the Norwegian counties to 17% in Norrbotten in Sweden. In Russia industrial employment is more than twice as large.

Regarding actual figures, production of manufactured goods, which is relatively large in all the countries, employs close to 300,000 persons in the region. A little less than 250,000 persons are employed in forestry and wood processing. About 200,000 are employed in mining and oil/gas extraction, whereas 100,000 are employed in metal/mineral processing. Around 90,000 persons are employed in food processing.

Total employment

Total employment in the region is about 3 mill, of which Russia has more than 85%. Table 4.2 showed the differences between the Nordic countries and Russia regarding industrial employment very clearly. This difference will also be stated in figure 4.2, which gives an overview over the total employment divided as to sector for each country in the region. The relative figures are the percentages of the total employment in each part of the region. The group "service" also include employees not specified in other trades.

Figure 4.2 Employment divided as to sector, %, 1991.



Source: National Bureau of Statistics, Sweden 1992, Kyndlev and Tulinius 1994, collected primary data 1994

Though the industries based on extraction and processing of raw materials are the economic base activities in the region, the main activity in terms of employment in the Nordic sub-regions is the production of services. This category includes public administration and services and private and commercial services. In the Nordic sub-regions service constitutes nearly half of the total employment. In this category the public sector counts for most of the employment. It is a characteristic feature in the Nordic countries in general, and in the Nordic sub-regions in particular, that the percentage of total employment in public sector is relatively high. In the Russian part of the region mining/manufacturing, which also includes oil and gas extraction, are the most important activities, with one third of the total employment. Here service constitutes less than one fourth of the total employment. Other differences are that the percentage in the primary sector is lower in Sweden than in the other countries. One reason for this is that there is no fishing and very little agriculture production in Norrbotten county. The activity in the primary sector in Russia is connected to the fisheries in Murmansk and the traditional reindeer herding of the indigenous people. These activities are to a large degree to be found in Komi, Yamal, Taimyr and Nenets in Arkhangel. In Russia the employment in trade is lower and in transport higher compared to the Nordic sub-regions.

4.4 Income and purchasing power

Nordic North

The Nordic countries as such have a high level of income and a good standard of living. There are several ways to measure income and to compare it with sufficient parameters across borders or across regions. Compared to other European countries and especially to Russia, the Nordic countries are among those with the highest nominal income. But taxes are also among the highest in Europe, and quite a large part of the income goes straight back to the state or local budget. This leaves a net income (income after taxes) in the Nordic countries at about average European level.

Though the northern part of the Nordic countries has a harsh climate and difficult working conditions for those in the primary and secondary sector, the income is under the average of

each country. Table 4.3 shows the average net income in the Nordic sub-regions compared to national average.

Table 4.3 Average net income, % of country average, 1990

Region	Average net income	Income in % of country average
Nordland	73.000 NOK	95
Troms	74.000 NOK	96
Finnmark	75.150 NOK	98
Lappland	78.200 FM	86
Norrbottn	154.200 SKR (gross inc.)	97

Source: Official statistics from the National Bureau of Statistics in the three countries

The figures point out that net income in the sub-regions in all the Nordic countries is lower than the national average. The largest discrepancy has been found in Lappland of Finland. Income has certainly not been used as an incentive to attract wage earners to move to the north or, for those who already are there, to stay.

The Nordic sub-regions are not very production-intensive, which can be seen from statistical data about regional production per capita. Finnmark county is on the national bottom with only 72 on the index. Norrbotten is on 103, and the only Nordic sub-region above the national average. This is probably because of the relatively heavy industrialization that contributes to the national economy.

Table 4.4 Regional production per capita and disposable income, 1990
Index 100 = national average

Region	Regional production per capita	Disposable income
Nordland	77	94
Troms	81	97
Finnmark	72	100
Lappland	89	93
Norrbottn	103	98

Source: Official statistics from the National Bureau of Statistics in the three countries

On the personal level, the inhabitants of Finnmark are on the top ranking in disposable income (income after taxes plus transfers) among the Nordic sub-regions. Allocations of governmental funds and subsidies probably account for this advantage of Finnmark.

In general both net income and purchasing power in the northern parts of the Nordic countries are lower than the national average. Combined with a relatively small population, this does not make for any spectacular high demand for consumer goods. On the other hand, close to 100% of the consumer goods have to be imported from the south, and distributed on relative large areas. This provides a certain basis for transportation of consumer goods to, from and within the the sub-regions.

Russian North

The situation in the Russian north is quite different. The general economic situation in Russia, with inflation and prices out of control, has led to a marginal income for most Russians. During the communist period, income was sufficient to make a reasonable living.

This situation has changed dramatically, and many Russians find themselves under the minimum living standard, if only based on ordinary wages.

Wage earners in the northern part of Russia have always been privileged compared to the average income level in the country. Higher wages and bonuses were used as an incentive to attract workers to the north. The sparsely populated area became the centre of huge industrial cities and activities related to military production. Such work has usually been well paid, and the big industrial enterprises have required employees with a higher technical education. As an example can be mentioned the city of Severodvinsk in Arkhangel county. This city has the highest density of well educated engineers in all Russia. Wages are better in such industries, but in general, education-intensive work is not rewarded as highly as in the Nordic countries. Hard physical work has traditionally been paid better than "brain-work".

The wage differences are hard to measure because of the rapid inflation. But, most wage earners in Northern Russia still have a higher income than the average Russian. The north Russian income was twice as high as the average Russian income in 1991, but probably at the same level as in Moscow and St.Petersburg.

Table 4.5 Average monthly income, 1991

Region	Average monthly income
Russian Federation	530 R
Northern regions	1000 R
Arkhangel oblast	810 R
Murmansk oblast	860 R

Source: Kyndlev and Tulinius 1994

On the other hand the costs of living in the north are much higher than in the central part of Russia. First of all, food is more expensive.

Table 4.6 shows the relationship between an average monthly income and the costs of a basket of 19 basic food commodities in December 1991 and November 1992 for some Russian economic zones.

Table 4.6 Monthly income and costs of a basket of food, rubles

Major economic region	1991		1992	
	December Income	Cost of basket	November Income	Cost of basket
North	962	167	7798	4020
Northwest	929	163	4843	3860
Central	956	168	6184	3278
Volga-Vyatka	722	143	4860	2912
Central Chernozem	708	156	4732	2661
Volga	728	148	5379	2563
North Caucasus	719	161	4393	3150
Urals	732	166	6315	3206
West Siberia	857	209	8150	3490
East Siberia	820	160	7542	3289
Far East	1020	188	9084	4803

Source: Compiled from Izvestia, February 13, 1993

The figures show that the northwestern, northern and central parts of Russia have lost some of their relative attractiveness when it comes to disposable income, whereas eastern and northeastern parts have increased their attractiveness most. The effect of the reforms on incomes has in other words been positive to the northeastern regions (West Siberia, East Siberia and Far east, and negative to the northwestern regions. Among other significant factors contributing to the differences in incomes are population structure (proportion of pensioners/workforce) and economic structure in each region.

Another interesting feature is the relationship between income and costs of basic products as food. A basket of basic products costs in 1991 approximately 1/5 to 1/4 of a monthly salary. A year after, inhabitants have to use more than half the salary to buy the same basket. The northern and northwest regions have the highest expenditures. Expenses for basic products in the north diminish the advantage of a higher income.

The general economic problems have affected the industrial enterprises and their ability to pay workers properly. The former state-owned factories have several problems related to the transformation to a market economy. Many of these factors are parts of a production chain that has been broken. Some have experienced that there is no longer a market for their products, and this has reduced the income and profitability of many enterprises. Most factories have been turned into joint stock companies, but investments are sparse and little new capital has been invested in the enterprises. Some are completely dependent on subsidies from the state budget to keep the production running, and are practically bankrupt. Enterprises often send the employees on unpaid leaves, or they have introduced a reduced working-week. As a consequence, many workers get their wages too late or not at all. It is hard to make a living without savings or other sources of income. The most important factor for wage-earners is at present not to have the highest income, but to receive their income at all.

The economic collapse has led to a huge wage difference between traditional employees and new businessmen. There are opportunities to make a good living for those who take advantage of the turbulent situation. Speculation and mafia-related activities are some of the most profitable. Ordinary wage earners without possibilities to make use of such advantages, find themselves in a difficult situation.

Purchasing power is rather low in the Russian north compared to the Nordic north, but the fact that the inhabitants of Russian north are numerous (5.5 million), generates a larger demand for products. Consumer goods from abroad are easy to sell on a market that has been deprived of "luxury". The demand will increase when the economic situation improves, and is already increasing among groups of «newly-wealthy». Positive results of market reforms, gives prospects for more trade and transport across borders in the north.

Attempts have been made to compare income in Norway and North-West Russia. The rouble is now partly convertible, and it is possible to use the exchange rate to measure differences in income level. Approximately 5 % of the population in North-West Russia is on the same or better average income level as Norway. Purchasing power can be used as a measure to find out how much the salary is worth. The question is how much (as a part of the salary) a Russian and a Norwegian must pay for the same product, for example a Norwegian must pay half a month's salary to buy a washing machine. A Russian must pay 7 monthly salaries to

buy the same washing machine. A further investigation of other consumer goods, shows that the average purchasing power is 15 times higher in Norway than in Northwest Russia. In conclusion, purchasing power is much lower in the Russian north than in the Nordic north. But the fact that there are more inhabitants in the Russian north makes the area more interesting in generating demand for goods and consequently also transport of goods.

5 TRADE AND TRANSPORTATION

5.1 Why is transport important to the region?

The economic base activities in the region seen as a whole are very export-oriented, all exporting between 90-100% of total production. The main markets for these products are situated far from the region, the most important in Central Europe, other important markets are in the Far East and North America. With such long distances to the markets, transport is a critical factor for the profitability of the industries.

The region has a very low degree of self-sufficiency, both regarding input to the economic base activities and consumer goods, which also makes it dependent on imports. To receive input and consumer goods there is a need for well developed and stable transport-connections. The dependency on import of input to the industries also makes transport a critical factor for the profitability of the economic base activities.

In general the economy of the region is extremely open. The openness has increased after the reforms in the former Soviet economic system, which implies a change towards more market orientation. The Russian industries are now encouraged to increase their export. The incentives to export their products has increased for enterprises in Murmansk because, according to a decree of March 21. 1992, they are now allowed to keep a larger share of the foreign currency incomes (Cheredeev 1992).

The natural resources extracted in the region are only to a small degree processed there. Most of them are exported as input to the large industrial complexes in Europe, whereas some are exported to the Far East and North America. A great deal of the equipment and other industrial purchases come from the southern parts of the countries in the region, and are therefore not national imports, only imports to the region. This is especially true today, but also formerly in the Russian part. However, due to greater export there has been a change toward more imports from foreign countries among the industries in the Russian part of the region. This import is financed through the export of products from Russian companies. Sometimes this trade can be defined as a kind of barter-trade, with Russian exporters purchasing consumer goods and equipment, and pay for them with their products. Other times only parts of the export-revenues are used to buy consumer goods and equipment in the import-country. In the Nordic part, much of the equipment comes from the southern parts of these countries. There are however also imported goods, mainly from Central Europe.

Altogether this gives a permanent demand for transport, both in to and from the region. The changes in the Russian economic system have so far increased this demand for transport. A further development towards a more market oriented system will probably give a further increase in the transport demand, both to and from the region.

5.2 Transport routes

In this chapter we will focus on the main onshore and offshore transport routes into and out of the region. The main internal transport routes for the regional industries will also be

mentioned. The main focus will be on transport of goods, not of persons. This implies that we will not take into consideration air transport, because though important as internal transport it is mainly used by persons, only to a small degree for goods. This leave us with the following three kinds of transport-supply; train (railroad), truck (road) and boat (sea). Map 1 shows the main roads and railroads in the region, and map 2 shows the most important ports.

The Russian part of the region is the most heterogenous with respect to supply of transport. In Murmansk, the central part of Arkhangel and Karelia there is a railroad system, connecting the most important cities and industrial sites. This is a part of the national railroad system between Moscow-St.Petersburg and the northwestern part of the country. The road system also mainly connect the main cities and towns in these sub-regions. The roads cover larger parts of the areas compared to the railroad. However, the standard of the roads varies, and is rather low in the northern part of Murmansk. Murmansk, Arkhangel and Karelia also have access to sea-transport. The city of Murmansk has the largest and most important port in the Russian part of the region. This is the only port in the north of Russia that is operational the whole year. Kandalaksya in Murmansk county and the cities of Arkhangel and Belomorsk, Karelia, also have large and important ports. Because the White Sea freezes every winter these are not operable the whole year.

The republic of Komi has a rather well developed railroad system, connecting the most important cities. The roads mainly connect the cities and towns, and cover a larger area than the railroad. Komi is the only sub-region without access to the sea, and consequently no ports.

Going eastward to the Nenets region in Arkhangel county, Yamal-Nenets and Taimyr, the supply of transport is more limited, only covering smaller parts of the sub-regions. In Yamal-Nenets a railroad is beeing built to connect the largest gas-production fields to the Northern Railroad. The roads in this area are only of local significance, and air transport is the most frequently used form of transport. There have been built many smaller airports in the area in connection with the development of the gas-fields. The rivers Ob, Nadym, Taz and Pur are used as waterway transport routes. The three latter mostly for local use. In general the rivers are very important to the local transport-system, and most of the towns in the region are situated along these rivers. About 60% of all freight is shipped out on the waterways (Kyndlev and Tulinius 1994). In Taimyr there is a 90 km long railroad connecting Norilsk city with the port of Dudinka. The river Yenisei is here the most important transport route. The rivers Heta, Hatanga and Popigaj are important local waterway transport routes to the towns which are situated along them. As in Yamal-Nenets, the roads are only of local significance.

In the Nordic part of the region the supply of transport is more evenly distributed, and covers larger parts. In Lappland there is a railroad from the southern part of Finland (Helsinki) to Kemi. In Kemi the main track continues to Rovaniemi, Kemijervi and ending in the town of Salla. A minor track goes to the Swedish border, and continues around 180 km. northward along the border. In addition there is a well developed road system, with main roads of normal standards, and several minor roads. Each town and community has access to road and road transportation. The main roads only go in a north-south direction, however, with the border to Norway as the northern stop and the southern parts of Finland as the southern stop. Kemi and Tornio have the only ports in the county, and this is of a certain significance to the export from the region. These ports are, due to ice, not operational the whole year.

In Norrbotten the railroad coming from the southern part of Sweden goes to Boden (sidetrack to Luleaa) and continues to the Finnish border. In Boden there is also a railroad going north, through the industrial sites Malmberget and Kiruna, ending in the Norwegian port of Narvik. The road system is well developed, and each town and community has access to road transportation. The main roads are of normal standard, and go in a north-south direction. There are ports both in Luleaa and Piteaa. The port in Luleaa is of great importance to the export from the region, while the one in Piteaa is for more local use. The ports are, due to ice, not operational the whole year.

In Northern Norway only the county of Nordland has a railroad. It comes from the southern part of the country and ends in Bodoe. The Swedish railroad from Kiruna and Malmberget ends in Narvik. This leaves trucks and ships as the most important means of transport in the three counties seen as a whole. The road system is rather well developed. The main roads run in a north-south direction through each county, and is of a normal standard. Most of the towns and communities are connected to this road by minor roads. Due to the many inhabited islands along the coast, sea-transport is very well developed. The main sea transport route, Hurtigruta, goes from Bergen on the southwestern coast of Norway to Kirkenes. In the three northernmost counties it has 27 stops along the route. In addition there are a lot of local fast-boat routes. Most of the towns located along the coast have harbours. The main ports in the three counties are Mo, Bodoe, Narvik, Tromso, Hammerfest and Kirkenes.

5.3 The industrial flows of transport

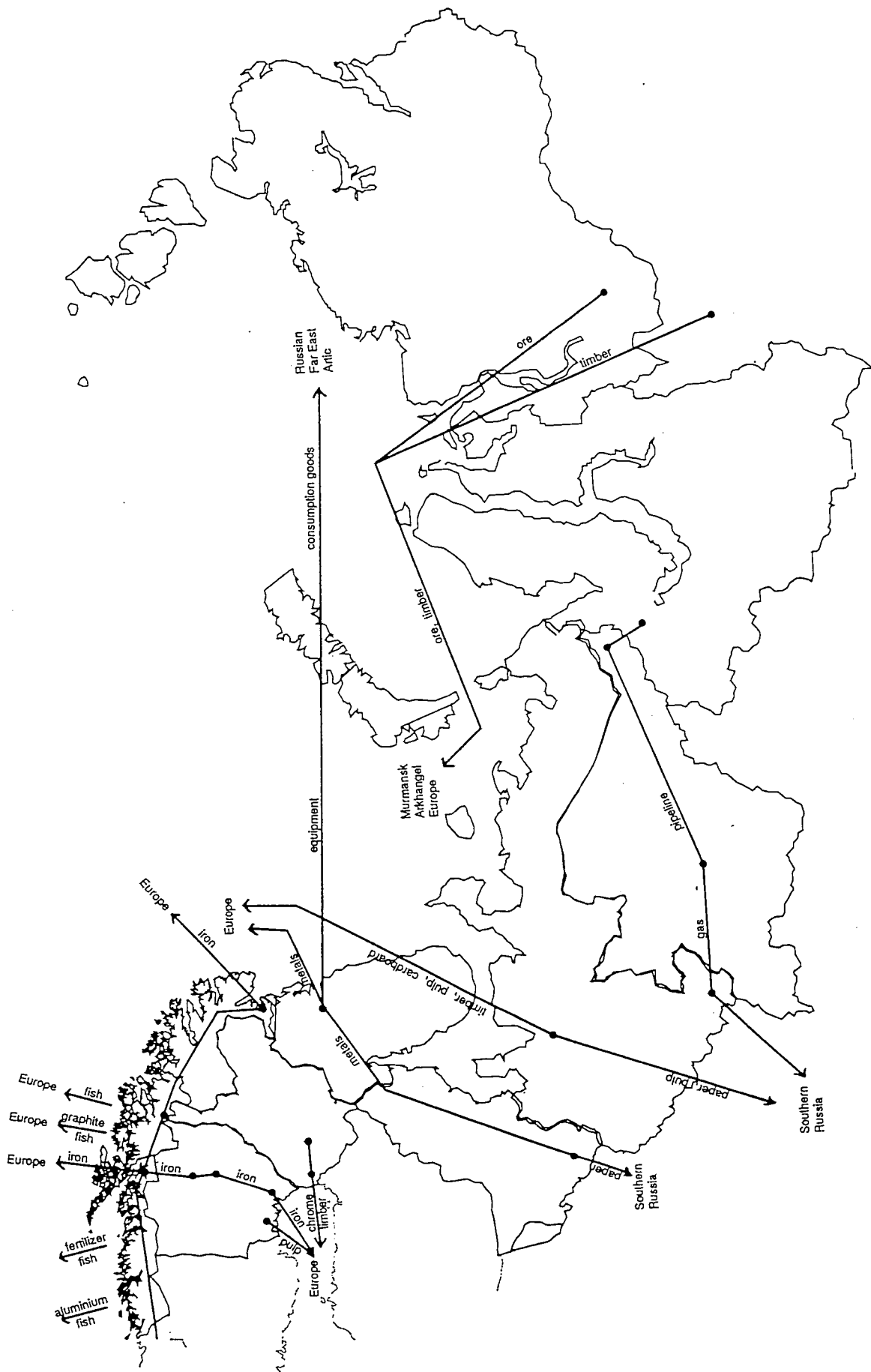
This chapter will describe the most important flows of transport in the region, which are mainly connected to the economic base activities, but we will also take into consideration other important flows of transport in and out of the region. Map 3 shows the products which are transported in to, out of and along the most important transport routes in the Nordic and Russian part.

In the Russian part of the region there were three important flows of transport along the NSR. These were;

- ores and semiproducts from Norilsk to Murmansk
- industrial equipment and other industrial input and consumer goods from Murmansk and Arkhangel to the Russian Far East Arctic
- timber from Igarka to Europe

On the Kola peninsula in Murmansk county there are large processing plants for different metals, among them iron and nickel. The deposits in the mines on Kola became during the 1960s insufficient to supply the plants with raw-material. At this time there were discovered large deposits of nickel in the area around Norilsk. Instead of building another large processing plant in Norilsk, it was decided to use the processing capacity in the Kola-plants, transporting the ores and semiproducts of the ores from Norilsk to Kola. The first transport of ore from Norilsk to Kola along the NSR was in 1939. The ore was transported from Norilsk to Dudinka by train, from Dudinka to Murmansk by ship, and from Murmansk to the nickel-plants on the Kola peninsula by train. In the end of the 1960's the permanent transportation of ores and semiproducts was started from Norilsk to Kola. From 1978 this transport was carried out all the year around (The Geonomics Institute 1994). In 1990 the transport amounted to

MAP 3



about 1 mill. tons, and thereafter it has decreased every year until 1994, when it was terminated (Barents Nytt June 1994). The reduction in transport volume is caused by reductions in the production in the plants on Kola and the large transport-expenses. Under the former Soviet economic plan-system it was decided that the ore should be transported from Norilsk to Kola instead of being processed in Norilsk, regardless of what would be the most profitable. In the future, economic calculations and profitability will probably be more important factors in decisions concerning the industrial structure in Russia. The transport of ores from Norilsk to Murmansk will therefore probably not be started again, at least not in the previous manner. Thus we will not discuss this transportation in more detail.

Some of the industrial equipment and consumer goods from western parts of Russia to the eastern parts of Siberia and Eastern Arctic regions are sent by train from the European central and southern parts of Russia to Murmansk, Kandalaksja or Arkhangel. Here it is shipped out from the ports and transported along the NSR. The destinations for this cargo usually are situated along the rivers in Siberia. On average this has amounted to about 450,000 tons pr year (Arkhangel Port administration 1994). Due to the limitations of the content in this report, mentioned in chapter 3, we will not make a more detailed description of this use of the NSR.

Large amounts of timber are transported along the River Yenisei and either to Arkhangel for further processing or to Europe as raw material. This transportation has taken place for several years, and is from a commercial point of view interesting for transportation along the NSR. This will be further discussed in chapter 9.

The main export flows from the Russian part of the region consists of the following products;

- timber
- gas
- ore-concentrates

Timber is transported from Igarka. First on the River Yenisei, then along the NSR, and at last by boat to the main markets in Europe. Timber from Arkhangel county is also exported to Europe. In 1993 the export of timber from Igarka, along the Yenisei and the NSR to Europe amounted to about 300.000m³ (Ramsland 1994). During the industrially best years the export of timber from Arkhangel was 2,5 mill. m³. In recent years the export has however only been around 1.2 mill. m³ (Arkhangel Port Administration 1994). Processed wood, like pulp, paper and wood products, which is produced in Arkhangel, is to a smaller degree exported. In general the total export volume of such products lies around 500,000 tons pr. year (Arkhangel Port Administration 1994). Most of these products, however, are transported by train to the southern parts of Russia for internal use. This will be further discussed in chapter 9.

From the mining and metal/mineral-processing industry in Murmansk county *apatite-, iron- and nickel-ore concentrates* are exported to Europe. The products are transported from the plants to Murmansk harbour by train, and shipped out from this port. The total amount of transported ore- and mineral products over Murmansk and Kandalaks harbour was 7-8 mill. tons in 1992 (Murmansk port administration 1994). Manufactured iron-, aluminium- and steel-products are transported by train to the southern parts of Russia. This will be further discussed in chapter 8.

Gas from Yamal-Nenets and Komi is partly transported southward in a pipeline from Pechora to the southern parts of Russia and Central Europe. Some is also transported northward, to be sent by ship along the NSR (RPI). This will be further discussed in chapter 10.

Fisheries, including catching and fish processing, is an important industry in Murmansk county. Fish-products produced in Murmansk, but also Arkhangel and Karelia, have so far mainly been for internal use (Nilssen 1993). In recent years there has been an increasing export of fish, mainly as raw material to Norwegian and European processing plants. This export consists of the fishing fleet going to foreign ports, mainly Norwegian, selling the fresh fish there, and doesn't give any stable transport flows along the NSR (Nilssen 1993). There is, however, an increasing demand for fresh fish in Central Europe and the Far East, mainly Japan. Having access to one of the richest sea areas in the world, the Barents Sea, fish from North-Western Russia can become an important export product. This will be further discussed in chapter 7.

Turning to the Nordic countries the main exports are;

- timber, pulp- and paper products
- fish
- iron-ore semiproducts

Forestry is a large industry both in Norrbotten and Lappland. The timber comes from the inland areas, and is transported by truck or train to Luleaa and Piteaa in Norrbotten, and Rovaniemi and Kemi in Lappland. During the period 1986-1990 5.5 million m³ timber was felled in Norrbotten (National Bureau of Statistics, Sweden 1992), which made the county the second largest timber producer in Sweden. In Lappland the total production of timber in 1992 amounted to \$ 950 million (National Bureau of Statistics, Finland 1994). From the mentioned towns some of the timber is transported directly to the south, by ship, train or truck, whereas some is processed to paper, pulp, paperboard and wooden products in local processing plants. Most of the processed products are transported to the southern parts of the countries, by ship, train or truck, to be exported to Central- and Eastern Europe. In 1992 the total production of processed timber products, like wooden products, pulp, paper etc. was about \$ 950 million in Lappland (National Bureau of Statistics, Finland 1994) and close to \$ 750 million in Norrbotten (National Bureau of Statistics, Sweden 1992).

Fish is Norway's third largest export. In 1993 the total export of fish from Norway amounted to NOK 16.500 million, or close to 1,2 mill. tons (Norwegian Export Council for Fish 1994). Of this about one fourth is farmed salmon and trout. Most of the "wild" fish is caught in the Barents Sea and along the coast of Northern and Central Norway. It is transported by fishing boats to processing plants along the coast. The products go by ship or truck to the main markets in Central Europe. A smaller share, about 18% is exported to Japan and the Far East. This is transported by plane or ship. Better access to transportation could maybe make export to the Far East more attractive to Norwegian fish-producers.

Iron ore is extracted and processed both in Norrbotten, Lappland and Finnmark. The largest mining- and processing companies are LKAB in Norrbotten, with plants in Kiruna and Malmberget, Syd-Varanger in Finnmark, with a plant in Kirkenes, and Outokumpu, with plants in Tornio and Kemi. The main exports from LKAB are pellets and ore, from Syd-Varanger semiproducts (pellets and superslig) and from Outokumpu chromium concentrate

(Kemi), ferrochrome and steel semiproducts (Tornio). Close to 100% of the production which amounts to roughly 20 ton, is exported (primary data from the managers of the companies). Transport is carried out by train and boat. From Kirkenes and Tornio the products are shipped out from integrated harbours, and from Kiruna and Malmberget they are transported by train to Luleaa and Narvik and shipped out. During the winter, when the harbours Kemi, Tornio and Luleaa are frozen, the products go by train to the southern parts of the respective countries, and are shipped out in the south. Table 5.1 shows the volume of iron ore and semiproducts exported from the Nordic part of the region.

Table 5.1 Export of iron-ore and semiproducts from the Nordic part of the region, mill. tons, 1992

Company Shipped out from;	LKAB	Syd Varanger	Outokumpu
- Luleaa	5,15		
- Narvik	13,55		
- Kirkenes		2,0	
- Kemi			1
- Tornio			0,9

Source: Primary data from the manager of the companies and annual reports for 1993

There are also smaller heavy industry companies with export-related production. Most of these are situated along the coast in the three Norwegian counties. Table 5.2 shows the largest export companies, their exports and export volumes.

Table 5.2 Export related heavy industry in the Nordic part of the region, 1993.

Company	Export products	Export volume
North Cape Nefelin	nefelinsyenitt	290.000 tons
Norsk Hydro	fertilizers, nitrate of lime	300 mill. tons
Elkem	ferrosilicon, microsilicon	75.000 tons
Elkem	aluminium	120.000 tons
Fundia Norsk Jernverk	steel profiles for ships equipment	320.000 tons 150.000 60.000 tons
Elkem	graphite	5.000 tons

Source: Primary data from the manager of the companies

All these companies use ships to transport the products to the markets. One of the plants, Fundia Norsk Jernverk, has even used the NSR to transport semi-processed steel products to Japan. This was only a test transport, but experiences were positive. Most plants have integrated harbours where they both receive inputs and ship out the products for export. The main export markets are in Europe, North America and the Far East. This will be further described in chapter 8. 90-100% of the production is exported (primary data).

5.4 Market conditions for sea transport

Main operators

Along the coast of Norway the steamer line "Hurtigruta" operates the year round. With 11 vessels in operation all important harbours are called at daily by two steamers - one heading north and the other south. Two companies (Troms Fylkes Dampskipsselskap and Ofoten og Vesteraalens Dampskipsselskap) dominate this coastal line, which during recent years has become more of a cruise-line than a cargo-line. But also several ordinary cargo lines - for instance Norcarg - operates along the Norwegian coast, with the Norwegian town Kirkenes (close to the Russian border) as turning-point.

As described in section 5.1 large volumes of cargo are exported (and imported) directly from some of the harbours in the region. For these operations freighters are normally chartered on the free international market. Exceptions are winter operations (January-May) in the White Sea, all operations into the Kara Sea and shipments from some Russian harbours - which are also closed for foreign vessels. Only Russian shipping companies have access to these markets.

In the western part of the Russian Arctic waters three Russian companies dominate. From Murmansk on the Kola peninsula the Murmansk Shipping Company (MSC) operates, and from Arkhangel the Northern Shipping Company (NSC) and the Northern River Shipping Company (NRSC) operate. The three companies have played different roles in covering the needs for seaborne transportation in the Arctic seas.

The fleet of the *Murmansk Shipping Company* is characterized by its ability to operate under extreme winter conditions - with heavy ice and temperatures down to -50° C. The company operates about 70 vessels, including 8 atomic icebreakers and several diesel-electric icebreakers. Most of the cargo vessels have the highest ice-classification YL¹. One of the cargo vessels is a 61.000 brt atomic LASH vessel, especially designed for operations in shallow waters (personal interview with the manager of the company). The most important route operated by MSC was the transportation of copper-nickel ore from Dudinka to Murmansk. Until 1993 this route was operated the year around, which in the winter season meant operating in thick sea ice, strong soft water ice on the Yenisei River and extremely low temperatures. As described in chapter 8 more than 1 mill tons of nickel ore was transported along this route every year. MSC has a dedicated fleet and a lot of experience in Arctic operations. During the last few decades the company has sporadically made transit operations through the North-East passage, in the later years with cargo between Central Europe and the Far East. In 1994 a transit tour was carried out as early as May, in order to test the possibility of lengthening the season by starting about two months earlier. MSC has made several cruise-tours to the North Pole with their atomic ice-breakers. The total number of employees in Murmansk Shipping Company is about 7,000.

The fleet of the *Northern Shipping Company* is also designed for operations in ice, but - for most of the vessels - under somewhat easier ice conditions. The company operates about 110 cargo vessels, 4 conventional ice-breakers and a number of small and specialized boats. While 22 NSC vessels have the highest ice classification YL, the rest of the company's cargo

¹ KM Y A, KM Y and KM 1 are the Russian categories for the highest ice classification, corresponding to the categories 1A1 Ica1A* and 1A1 Ice1A in Det Norske Veritas classification system (Kjerstad 1990).

vessels are classified L1 (personal interview with the manager of the company). Most of the vessels are specially designed for transportation of timber or products based on wood. The company handles about 100% of the timber transport from Igarka, located more than 400 nautical miles up the Yenisei river. As will be described in chapter 8 about 600-700,000 tons of timber were in the 1970s shipped out from Igarka during the summer season (July-October). Now the annual volume has dropped to about 300,000 m³. NSC does not operate in the Siberian area in winter and timber is therefore usually not transported from Yenisei during this time of. NSC supplies Siberian settlements with foodstuffs, equipment and other needs. Most of these shipments go to the Yamal peninsula and up the Yenisei river to the Norilsk area, but some times NSC operates as far east as Pevek and Mys Schmidta. According to NSC, the company in 1993 delivered about 200,000 tons of cargo to Siberia. During 3-4 summer months NSC operates a container line between Arkhangel and Dudinka. In this period about 25,000 tons of provisions are transported from Arkhangel to Dudinka. The cargo eastwards is also important to employ free capacity on the timber vessels.

The *Northern River Shipping Company* (NRSC) runs most of the smaller vessels specially designed for operations along the local coast line and the inland water systems connected to rivers like Dvina, Mesen and Onega. NRSC employ about 2,500 people.

Both the MSC and the NSC were converted from state enterprises to privat companies in the beginning of 1993. This means that they now basically have to earn money in open markets. Their monopoly situation is indeed maintained on the timber/ore routes from Yenisei, and the ice-breakers are still owned and operate under state control. On most other markets, however, they now compete on equal terms with other Russian and foreign companies.

As part of the privatization process some activities were transferred from these shipping companies to other institutions. Most important, the MSC/NSC no longer operate commercial and strategically important harbours and shipyards. On the other hand the companies have so far kept the responsibility for sea rescue operations. Both the MSC and the NSC have faced serious economic problems after they started to operate on a commercial basis. The internal markets are considerably reduced, some are vanished. The fleet is old (50% of the NSC fleet is 20 years old or more), and the ice-classed vessels are exceptionally expensive to run. Although the oil price is still fixed politically the relative price on oil has risen significantly over the last years, removing an important competitive advantage in the international markets. (A side-effect of the increased oil price is that the atomic ice-breakers now are relatively more competitive compared to the diesel-electric ice-breakers, due to the fact that the MSC does not pay the real costs of uranium and radioactive wastes). Nevertheless, increased activity on international markets has saved both MSC and NSC from even more serious economic problems. The companies are still integrated organisations, running hospitals, hotels, nursery homes etc., as well as their primary activities.

The future prospects for the MSC and the NSC will probably depend on whether they can keep previously acquired privileges and on their ability to improve efficiency, adapt to world market conditions and attract foreign capital. Today both companies cooperate with Western shipowners. Cooperation between the MSC and the NSC, however, does not seem to be practiced. The two companies regard each other as competitors, but are more interested in fighting for hegemony on the state controlled transport routes in the Russian Arctic, than for success in the open markets.

The competitiveness of seaborne transportation

In the present situation seaborne transportation plays an important role in the the region, although its significance varies within the region, corresponding to differences in industrial structure and the transport alternatives offered.

Northern Norway is characterized by a large fishing industry, based on small enterprises which are geographically spread out, and export of foodstuffs with limited durability to the world markets. Coastal liners visit daily a large number of ports from Kirkenes (close to the Russian border) and southward. The railway reaches as far north as Bodø (connected to the Norwegian railroad system), and Narvik (connected to the Swedish railroad system). Over the last thirty years the road system in Northern Norway has significantly improved, connecting even the smallest settlements to the main arteries with roads of relatively high standard. Dense traffic is no problem in this sparsely populated area and the roads are kept open the year around. Road-based transportation is faster and more flexible than seaborne transportation. Consequently, cargo has gradually been transferred from sea to land - from ship to truck - over the last few decades. On trucks fresh seafood is sent directly from small Norwegian producers to the European market in 36 hours.

The northern parts of Sweden and Finland do not generate any cargo transportation along the Northern Sea Route today, except for the transportation of iron ore from Kiruna in Sweden over the Norwegian port of Narvik. The main industry in this area is based on timber, and the raw material is basically local. Since 1990 timber has been imported from Karelen and Arkhangel, but by road. The end-products from the timber industry in this area are normally exported southwards, either by railway, truck or boat. Whether seaborne transportation through northern ports may be an alternative in the future will partly depend on the construction of new routes (rail or road) from Northern Finland and Northern Sweden to the main ports in the north. Several projects of this kind are suggested, for instance a new track between Finland and Russia crossing the border at Salla, and a new road from Ivalo in Finland to Kirkenes in Norway. Furthermore, it will depend on the development of transit shipments through the NSR to eastern markets like the Japanese and the American.

The structure of Russian industry is different from that of northern Scandinavia. Even though minerals, fish and timber are the main industries in all parts of the region, the Russian type is organized quite differently from the Nordic type. While most Nordic companies are small, Russian enterprises are usually large and integrated - both vertically and horizontally. Some of the Russian settlements still have the character of company towns, where the local enterprise (kombinat) runs almost everything and employs the majority of the people. The transport infrastructure (roads, railroads, harbours) in northern Russia has to a large extent been designed to serve these big enterprises. With large volumes of cargo and stable market relations - due to the previous economic system in the USSR - transport routes were built to meet specific needs.

Furthermore, differences in geography and climate conditions partly explain why the transport system in the northern parts of Russia and Scandinavia differ. While a large number of Scandinavians live in rural areas most Russians live in urban areas, and while Northern Norway is mountainous and has a typical mild coastal climate, most of the Russian north is tundra (with permafrost) or plain woodland with cold winters and warm summers. The Russian landscape is penetrated by an extensive water system of rivers and lakes. Rivers like Ob and Yenisei are navigable thousands of kilometers southward, connecting central Russia

(and the trans-Siberian railway) to the Arctic waters. The waterways have always offered the Russians an easy way of transportation. Roads and railways, however, were expensive to build. Under these circumstances much of the transport in northern Russia became water-based, while the construction of roads and railways was limited - connecting only the larger cities and towns in the area.

Table 5.3 gives an overview of the cargo transport in Arkhangel region, by means of transport. It shows that most of the production still takes place in state-owned enterprises. Railway and ship are the most used means of transport.

Table 5.3 Cargo transport in Arkhangel region, 1992, 1000 tons, %

Production volumes:		
private companies	1931	4%
state-owned enterprises	45836	96%
of which is transported by;		
- railway	16494	36%
- ship	16906	37%
- road	12390	27%
- air	46	0%

Source: FORMAP 1993

In the Russian North seaborne transportation is still very much competitive. In fact it often represents the only alternative. Roads are few and the railroad connects only the most vital destinations. In the present situation, where the old patterns of trade break up and the cargo flows in new directions, the old transport routes prove to be insufficient. Because of recent price distortions, following new government policies, the relative competitiveness of alternative means of transport is altered in favour of seaborne transportation. In spite of a short summer season with sailing conditions in open water, seaborne transportation now plays an important role when Russian industry is turning to new markets. In general seaborne transportation will in a short and medium term perspective be fundamental for a successful economic transformation in the area.

However, in the Russian part of the region, seaborne transportation may also prove to be competitive in the longer run. Since it is often a question of large volumes of cargo with time factor being of limited importance, transportation on vessels has a competitive advantage. In an open economy in balance with market determined prices, it is likely that seaborne transportation will remain important, even when the landbased alternatives are further developed. On the other hand, to stimulate the creation of new enterprises and to meet the need for flexible and small volume transports in a market economy, the Russian road system has to be extensively developed and improved.

The competitiveness of seaborne transportation will of course vary, depending on the type of cargo in question. A general evaluation of its competitiveness will therefore be only slightly informative. In part 3 the issue is studied in more detail. After the collapse of the previously USSR the Russian access to several (18 out of 37) previously domestic harbours, serving the

European markets has become external². An important question therefore concerns the short-run capacity of strategic harbours like Arkhangel and Murmansk now that some of the main cargo flows between central Russia and the world markets are relocated to these northern ports. However, this question will be analysed in a separate INSROP sub-project.

² In 1988 80% of the cargo-flow through harbours in the European USSR was passing Baltic harbours, which have now become foreign to Russia (Bedriftskompetanse/Barlindhaug 1994).

6 REGIONAL ECONOMIC POLICY

6.1 Northwest Russia

The Russian state guarantees the residents and enterprises of the Far Northern Areas economic compensation for difficult working and production conditions. This is a strong incentive from the centre to the regions for keeping settlements and production at a certain level. Additional guarantees and compensation may be provided from the administrative-territorial entities located in the Far Northern Areas and funds from enterprises, institutions and organizations. The advantages can be divided into enterprise and personal stimulus.

Enterprise level

The economic policy in Russia is under significant transformation. This is most evident for the relationship between industrial enterprises in the regions and financial centres in Moscow. Privatization moves on, but has so far limited positive effects for industrial enterprises and their workers. Investors see little profit in putting money into the "big black hole". A pessimistic, but quite realistic description of most industrial enterprises in the north is; old equipment, a limited market for the products or no buyers for the prices they claim, low efficiency among workers, labour- and energy intensive production, expensive market prices for energy. As a result, it is hard to sell stocks to private interests. In most big industrial enterprises transformed to joint-stock companies, the majority of the stocks are owned by the state.

Another feature of the industrial structure in the north is the extensive military industry. There are historical and geographical reasons for locating these enterprises to the north. They were near the bases from which the army and navy forces operated. The industry maintained employment and settlement near the border of NATO forces. Disarmament and a new political relationship with NATO has led to reduced demand for military production. The Russian state can no longer support this industry financially, and a substantial part of the enterprises have to go through a conversion to civil production.

Some advantages has been maintained for all enterprises in the north of Russia. According to the law, they shall be exempted from paying taxes of their profits which is to be channelled toward both productive and non-productive investment. Enterprises producing and selling farm and livestock products shall be exempted from paying taxes.

Companies are in need of capital to make investments in new production methods and equipment. There are few possibilities for governmental support, and private banks will hardly risk investing in nearly bankrupt enterprises. All in all, there are few national financial incentives for helping the industry to continue and develop to a market economy.

Individual level

Income has previously been mentioned in chapter 4.4.2, and is perhaps the most important factor in the regional economical policy at the personal level. Workers have some social benefits from working in the Far Northern Areas. The benefits are meant to compensate for the disadvantages of living and working in the north. To mention some;

- * Extra bonuses for people under 30 years residing in the Far Northern Territories for at least 4 years
- * Extra holidays
- * Annual paid leave
- * Every two years a holiday ticket paid by the employer
- * Longer maternity leave
- * Higher student scholarship
- * 36-hour working week for women
- * Five years lower retirement age; 55 for men, 50 for women

Political and legal problems as a challenge

The benefits received by enterprises in the north are marginal compared to the restrictions that the government and related ministries place on the production and export of the products. New laws are adopted every day, and it is hard to keep a business going in such an unstable situation. Restrictions are generally the same for enterprises all over Russia with some regional differences decided by regional authorities. The transformation to a market economy does not entitle companies to export their products at competitive prizes. Most natural resources are defined as strategic raw materials with export restrictions. The reason for restrictions is the need for these raw materials in the domestic market and production. The enterprises find it more profitable to sell abroad for hard currency, though the domestic market price has risen on most products.

From July 1, 1994 the earlier strict system of quota-setting and licensing is abolished. The system will only be applied to goods exported under Russia's international commitments. Export of strategic goods can only be effected by enterprises and organizations registered at the Ministry of Foreign Economic Relations as "special exporter". Enterprises that are not registered must conclude contracts with registered exporters.

The registered exporter decide on the prices (which are often dependent on the international market prices) though some enterprises want to sell for a more competitive price. This fact, in addition to heavy taxes on exports, makes it hard to sell a product of generally lower quality at a high price in the international market. These problems can prevent a further growth of exports of raw materials from the Russian North.

Regional authorities can help their enterprises by creating a better climate for foreign investments. Such a possibility depends on several factors. Among these are:

- * The political status of the region
- * Support in Moscow (good personal contacts)
- * Popular support of the regional administration
- * Lack of internal conflicts in the region

6.2 Nordic north

The Swedish, Norwegian and Finnish governments transfer large amounts of money to their northern counties each year. These regions are hit by larger fluctuations in employment than the country average, and transfers are mostly channelled through labour market scheme and economic incentives to the companies in the region to increase employment. We will

concentrate on regional policy in this chapter, though it is strongly related to general labour market policy.

Enterprise level

Northern Norway (Nordland, Troms and Finnmark counties) has for a long time been on the priority list of the Norwegian government, and a lot of development funds channelled through different institutions.

Northern Norway is defined as an initiative zone with a special focus on initiating and developing trade and industry. Allocations from the Ministry of the Interior and Ministry of Commerce are distributed through the SND.

The Norwegian Industrial and Regional Development Fund (SND) is the main financial contributor to enterprises in Northern-Norway. The Fund offers loans, guarantees, grants and venture capital with special support to less developed communities. There are also some heavy industrial societies (like Sør-Varanger and Mo) which are going through a conversion process trying to develop new processes and products. Employees must be re-educated for other types of work. The county administration (Department of business development) distributes money from SND and the Ministry of the Interior. The administration handles applications from enterprises requesting financial support and gives advice to central authorities when they are to give their approval. The administration shall also inform enterprises about the different funds offering financial support.

Enterprises in Northern Norway have in addition a special advantage concerning employer's social security contributions. Employers in northern Troms and Finnmark pay no such contributions. Southern Troms and Nordland have a reduced fee of 5.3 %. In the main industrial and densest populated areas in the country it is about 14%.

Financial support to enterprises in Lapland is distributed through central institutions. There are three main financial contributions:

- * The Development Fund (KERA) is an independent joint stock-company, a development fund giving loans to enterprises.
- * The Commercial and Industrial department gives guarantees and grants to enterprises.
- * Grants from the Ministry of the Interior are distributed through the County administration.

The county administration (Lapin Laanis) is mostly engaged in planning, and very limited funds are channelled through the administration. A new regional law was adopted in January 1994, and the planning responsibility is now transferred to a union of municipalities called the Regional Council. This Council does not yet function in Lapland.

Lapland county is also defined as a development zone. Unemployment has affected Lapland to a bigger extent than other parts of Finland, and in 1993 about 16 % of the national budget went to Lapland with only 4 % of the population.

The main purpose of Swedish regional policy is to give financial support to compensate sparsely populated areas for the extra costs of living. Enterprises in Norrbottnen county have two main sources of financial support:

* The Labour Market Department allocates economic resources directly for regional development. Population density is the most important factor for allocating funds. The Swedish government has chosen a few areas for special support, and Norrbotten is among those receiving the largest transfers.

* The County administration allocates approximately 40 % of the resources from the Labour Market Department for regional development.

Four northern counties gets more than half of these funds. Financial support may be used in the following fields:

- development contributions to material and immaterial investments
- support for commercial services in sparsely populated areas
- development of regional projects

The Swedish government allocates funds for regional infrastructure programmes. Enterprises in Norrbotten are among those receiving large transfers to cover transport costs. They can also find support from the following stateowned financial institutions:

* NUTEK finance projects with high technical and financial risks

- loans on condition
- capital grants for technical development of products

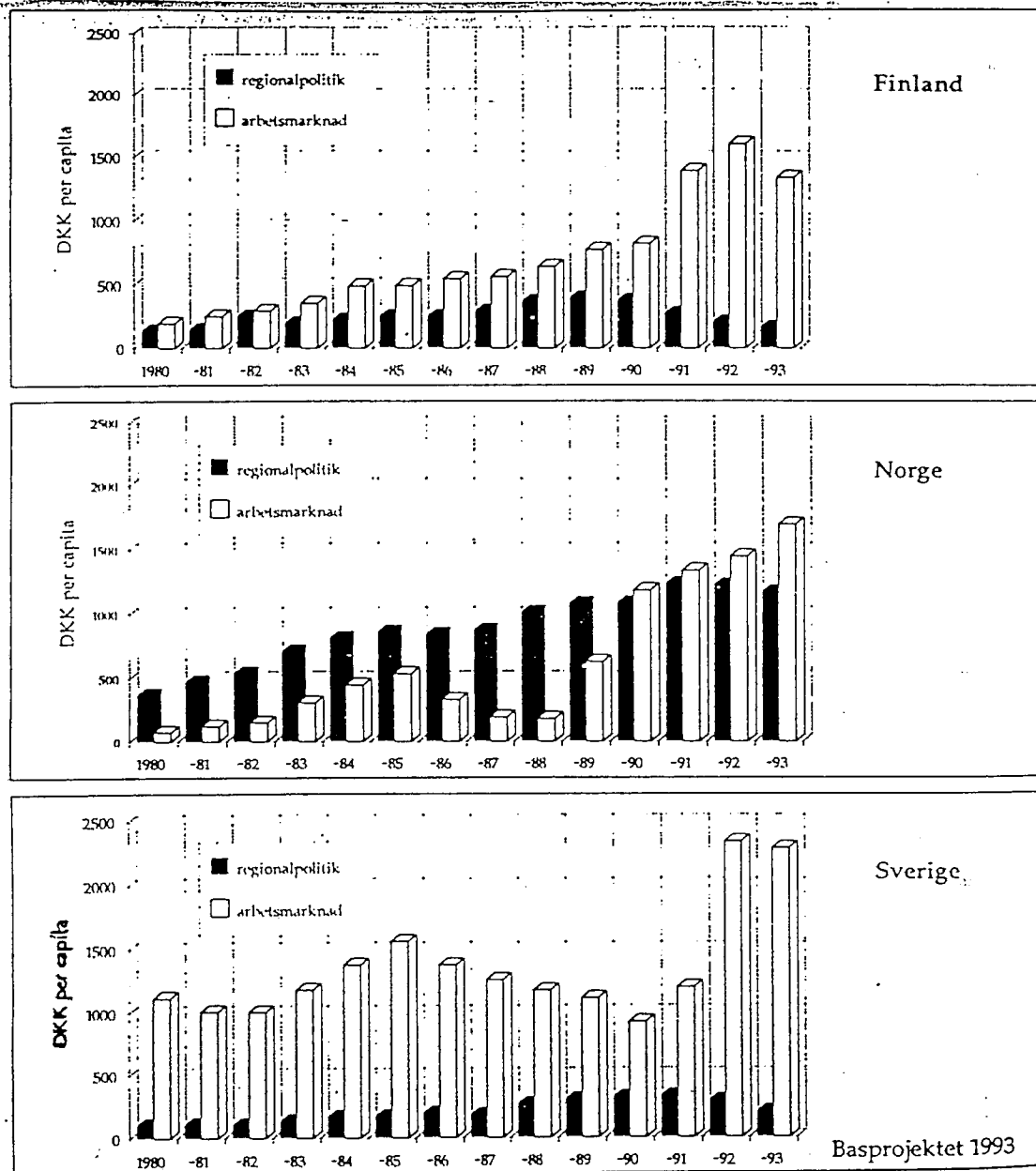
* The Industry Foundation

- grants to new enterprises
- supports development of new products and markets in small industries.

Reduced employer contributions was used for all enterprises in Norrbotten in the 1980s. This is now reduced to only a few industries in the northern part of Sweden.

Sweden in particular, but also Finland mostly transfer labour market funds to the regions, while support to regional development in general is comparatively lower. The Norwegian government allocates significant amounts to regional development. Until recent years, when unemployment has risen dramatically, the regional development resources have been the dominating transfers to the rural regions in general and the Northern part of Norway in particular. Table 6.1 gives an overview over the distribution of transfers to the regions, in regional development transfers and labour market support, and how this has developed since 1980.

Table 6.1 Labour market support and regional development transfers to the regions in Finland, Norway and Sweden, 1980-1993, DKK* pr. capita.



* Danish Kroner, not corrected for inflation

The figure shows a nominal increase in transfers in all the countries. In Sweden the regional development transfers have been low compared to the labour market support in the whole period. On the other hand, Sweden has generally had the highest level on per capita transfers to the regions. Norway has also had a relatively high transfer level, mostly on account of a widespread use of regional development transfers. Only in the 1990's labour market support has become the most important transfer source. Transfers in Finland are significantly smaller than in Sweden and Norway. Also here the labour market support has been the most important factor, however not so dominant as in Sweden.

Individual level

In general there are no common benefits at the personal level for people residing and working in the northern parts of Finland, Norway and Sweden. There are however differences between the three countries in this manner.

In Northern Norway there are some regulations making it more profitable for those living in the Finnmark and northern parts of Troms. Examples of such regulations are;

- * Lower taxes
- * Better child benefit
- * Reductions on repayment of students loans.
- * Lower energy prices
- * Bonuses for some professions like doctors, dentists and teachers.

These regulations are meant to attract employees in special professions, such as teachers and doctors, to the northernmost part of the country. They are valid for the northern part of Troms and all of Finnmark.

The government of Finland has reduced some of the previous advantages to attract people to work in Lapland. The only personal economic incentive for living in Lapland is:

- * Lower taxes. Tax-reducing transfers in Finland are on average 4619 FM. Lapland gets 9246 FM per capita.

As far as we know, there are no personal economic advantages from the government related to living in Norrbotten County.

6.3 Regional policy in the Nordic north and the Russian north

To sum up some of our main findings, there are advantages and disadvantages in the relevant sub-regions related to regional policy at different levels. Income at the personal level, and enormous subsidies at the enterprise level have been the main regional incentives for the Russian north. Both these advantages have diminished during the past years with growing inflation, increasing prices and new market conditions.

Income has not been used as a stimulus in the Nordic north, but lower contributions/taxes (at least in Northern-Norway) will in many ways have the same effect as higher income in northern Russia. Enterprises in the Nordic north still have a lot of advantages, though reduced over the past years in Lapland and Norrbotten. Enterprises in Northern Russia have lost most of their advantages, and risk bankruptcy and growing unemployment.

PART 3 INDUSTRIAL ANALYSIS

7 FISHERIES

7.1 Introduction

In all the three counties of Northern Norway fishing and fish processing are important for the regional economies. In Northwest-Russia these activities are most important in Murmansk county, but are also carried in an organized form in the county of Arkhangel and the republic of Karelia. This description of fisheries will be limited to the three Norwegian sub-regions, Nordland, Troms and Finnmark, Northern Norway, and the three Russian sub-regions Arkhangel, Karelia and Murmansk, Northwest-Russia.

Much of the description in this chapter will focus on the Norwegian and Russian fishing activities in the Barents Sea. Regarding the real values produced in fisheries, the Barents Sea has been the most important area for fishing activities, and it is today the main fishing ground of both Northern Norway and Northwest Russia.

7.2 The Barents Sea

The Barents Sea is not among the largest seas in the world. Due to special biological and climatic conditions, and minor pollution compared to seas further south, it is very fertile. Thanks to a sustainable management, the Barents Sea today has the world's largest stocks of commercially important species such as cod, haddock, capelin and cold-water prawns (Sakshaug 1992). Because of the harsh Arctic climate and short growing seasons there are few species, compared to seas further south. The interdependencies between the species are therefore of special importance. This places great responsibility on the management and human harvesting of the resources in this sea. There are examples of how lack such concerns have strongly affected the biological system in the sea. In the first half of the 1980's the harvesting of capelin in the Barents Sea was very extensive. An unsustainable harvest led to a very small stock of capelin from 1986 and onward, and the harvest on this species was prohibited from 1987 to 1990. Capelin is the main prey of cod, and is also important food for haddock. The very low numbers of capelin from 1986 and onward, together with heavy harvesting resulted in a record low stock of cod at the end of the 1980's. This led to strong regulations of the cod-fisheries in the Barents sea from 1989.

Both Russia and Norway have economic interests in the Barents Sea, so far mainly connected to the fishresources. Both countries have 200 nautical miles economic zones from the coast. To regulate human harvesting in the Barents Sea both within the zones and outside, the two countries established in 1975 a joint fisheries-comission. The most important tasks for this committee are to decide on TACs (total allowable catches) in the Barents Sea each year and on the distribution of quotas between the two members and also for third countries for the following species;

- Norwegian arctic cod
- haddock
- capelin

Cooperation within the committee has been very successful, and it has each year managed to reach mutual acceptable agreements. Table 7.1 show the TAC, and allocation of quotas between Russia and Norway for the years 1989-1995. In addition to Russia and Norway, countries like Spain, Portugal and Great Britain have minor quotas in the Barents sea. These are included in the TAC. The quotas for Norway are national quotas which are divided between fishing vessels from the whole country, not only from Northern Norway. The Russian quotas are mainly directed towards the fishing fleet belonging to Northwest Russia.

Table 7.1 TACs and allocation of quotas between countries, 1000 tons

	Russia	Norway	TAC
Norwegian arctic cod			
1989	94	138	260
1993	228	248	500
1994	316	336	700
1995	314	338	700
haddock			
1989	40,5	35	83
1993	31,5	35,5	72
1994	50	67	120
1995	57	65	130
capelin			
1989	-	-	-
April -92- April -93	346	510	865
1994	-	-	-
1995	-	-	-

Source: Royal Norwegian Ministry of Fisheries

Both Russia and Norway have additional quotas on the Norwegian and the Murmansk coastal cod. These quotas have been around 40,000 tons of each in the whole period. In 1995 third countries will have a quota of 88,000 tons cod and 8,000 tons haddock. In 1989 these quotas were respectively 28,000 and 7,000 tons. The table shows the clear increase in quotas for cod and haddock from 1989 to 1995. This is due to the increase in stocks. The Barents Sea is the only sea with commercial harvesting which has had an increase in the cod stocks. If this positive development continues, it is likely that the quotas will rise in the future as well. In the period 1981-1985 the TAC for capelin varied between 1.1 mill tons to 2.3 mill tons. The distribution of this quota has been 60% to Norway and 40% to Russia. After the breakdown

of the species, the TAC for 1986 was only 120 tons, and from 1987 to 1990 harvesting of capelin was prohibited. Quotas for capelin are given for April one year to April the next year. In the years 1991-1993 harvesting on capelin was again allowed, and the quotas were about 700-900,000 tons, as showed for 1992/1993 in the table. After 1993 harvesting has again been prohibited, following advice from the the International Sea Research Association. Norway, together with Iceland and Greenland also manage a capelin stock that spawns off Iceland and is caught off Jan Mayen. In 1989 the TAC for this stock was 900,000 tons and the Norwegian quota was set at 67,000 tons. In the period April 1992 - April 1993 Norway was allowed to fish around 94,000 tons of capelin around Jan Mayen. In 1994 and 1995 these quotas will increase.

Except for the joint fisheries commission, the cooperation between Russia and Norway regarded fishing in the Barents Sea has been very limited. The main reasons for this have been the political and economic ideology of the former Soviet Union, where self-sufficiency was a main criterion for the economic activity. Further, all cross-border trade and co-operation had to go through Moscow and be approved there. The economic structure and organization of fisheries in the two countries have been very different, and finally there was the Cold War, which effectively restricted co-operation on both sides.

In the following we will give a brief presentation of the fisheries in Northwest Russia and Northern Norway as it was traditionally up to 1989, and the changes from 1989 to 1994. This presentation will mainly deal with economic and organizational structures, focusing on:

- number of vessels and plants
- quotas, employment and production
- markets and market conditions
- purchasing of input

On account of difficulties with access to data on the Northwest-Russian fisheries from before 1989, this description will be mainly qualitative.

7.3 The fisheries in Northwest-Russia up to 1989

The fishing activity in Northwest-Russia has mainly been organized in large, state-owned, integrated companies. With integrated we mean that all fishing-related activities, such as catching, transport, processing, repair of vessels and catching equipment, education and research and development have been carried out within one amalgamation. The dominant amalgamation in Northwest-Russian fisheries has been Sevryba. Sevryba, the association for fishing activities in Northwest-Russia, was established in 1965. The amalgamation included the state-owned fishing enterprises in Arkhangel, Karelia and Murmansk, and its main office was in Murmansk city. It included fishing fleets belonging in Murmansk, Arkhangel and Karelia. The total fleet consisted of more than 500 vessels, most of them trawlers. In addition there was a freezer- and transportation fleet (Davidsen 1992). The fleets were mainly operated from Murmansk. Further the amalgamation encompassed fish-processing plants in all the three sub-regions, trade-organizations and stores for distributing the fish-products to the consumers. Also included in the amalgamation was Murmansk fishing harbour, from where the fleets were operated, a shipyard, plants for production of harvesting equipment and packaging. Finally the amalgamation had its own school for education of processing workers,

- specialized processing
- production of prawns and other shellfish

Of the fish landed at North Norwegian fish-processing plants in 1992 around 40% was salted, 35% was frozen and 20% was fresh or salted filets (Norges Raafiskelag 1993). Most of the fish processing plants in Northern Norway are semi-finished products, which are used as input in the food-industry in Central Europe. This is due to the market situation. Over 95% of the fish processed by North Norwegian plants is exported. The main markets are the European Union countries, the Nordic countries and Japan. In 1992 Norway exported 1.2 million tons of fish products (Norwegian Export Council for Fish 1993). North Norwegian plants accounted for about 35% of the total Norwegian fish production in 1992, and it is likely that the share of the total export volume could be about the same. Table 7.3 shows the total Norwegian export of fish-products in 1992, measured in 1,000 tons and according to import regions.

Table 7.3 Export of fish-products from Norway, 1000 tons, 1992

	fresh products	frozen and salted products	prawns and processed prod.	total
Nordic countries	15	20	77	112
EU-countries	276	224	237	737
other European countries	25	43	21	89
The Far East	22	215	7	244
Africa	10	58	3	71
Other countries	1	66	3	70
Total	349	626	348	1,323

Source: Norwegian Export Council for Fish, 1993

In 1993 over 55% of fish-exports from Norway went to EU countries. The Far East, where Japan dominates, is the second largest market with close to 20%. Most of the exported fish-products are frozen or salted. As mentioned above, around 75% of the fish landed at North-Norwegian fish-processing plants are processed to either frozen or salted products. There are customs on processed fish products from Norway to EU countries. The tariffs increase with the degree of processing. Some products also meet tariff-barriers with a very low degree of processing. This is true for prawns, herring and bred salmon. Such market-restrictions is one reason why the Norwegian fish-processing industry has adjusted to only partly processing the fish, and to a very small extent producing consumer products for export. Such products are mostly produced for the domestic market. Other reasons for the low degree of processing are traditions and the lack of a «capitalistic entrepreneur culture» in the northern part of the country.

The purchasing structure is very different for the fleet and the industry. Whereas the fleet purchases a large part, around 50%, of the input outside Northern-Norway, the industry purchases less than 10% of the input outside Northern Norway (Arbo and Karlsen 1993). In this figure we have not included the purchase of raw-material. For the fleet fuel is the most important input that is purchased outside the sub-region. The presented structure does not

include investments. Taking investments into consideration will change the pattern, as will be shown later in this chapter.

7.5 Development of fisheries in Northwest Russia and Northern Norway in the 1990's

The dissolution of the former Sovietunion led to several changes in economic structure and organization. Some of these changes also affected the fisheries in Northwest Russia, the most important among these are the liberalization and decentralization of foreign trade. Further there is the privatization of industry, which is also related to the splitting up of the "old", large, integrated companies into smaller, separate enterprises. Since 1989 Sevryba has been strongly decentralized and split up into several smaller enterprises.

We will also present some data on Russian catches, production and employment for some of the Russian units in fisheries. The data are from 1990-1992, and due to rapid and significant changes, it is not certain that they are representative for the years subsequent.

In 1990 the Murmanskrybprom and Murmansk trawlerfleet together caught about 1,000,000 tons of fish (Nilssen 1993). Most of this was caught in distant seas, and not in the Barents Sea. The catch mainly consisted of mackerel and blue whiting, only a very small part, about 30,000 tons, was cod. The cod was mainly exported directly to West-European distributors. Shipping-companies largely delivered the catch, apart from the cod, to former Sevryba-plants. In 1991 the Murmansk fish processing combine, consisting of several partly or fully privatized Sevryba-plants processed 100,000 tons of raw material (fish and prawns). Most of the fish was mackerel and blue whiting, and only 1,200 tons was cod. The combine made over 300 different products (Vasiliev 1994)

The Arkhangel trawlerfleet caught in 1991 60,000-100,000 tons of fish and prawns, of this 6-10% was cod. About 30% of the catch was exported directly to Norway whereas 70% was sold on the local market. In 1990 the total kolkhoz-fleet in the three counties caught 35,000 tons of cod. In 1993 this was estimated to rise to 50,000 tons (Nilssen 1993).

In table 7.5 we present the most updated figures about the most important enterprises in the Northwest Russian fisheries. The data were presented in 1994 and reflect the situation at the end of 1993.

Table 7.5 Units in the Northwest-Russian fisheries 1993

Fleet	number of vessels	employees
Sevrybkholodfleet	7	
Murmanrybprom	110	10,000
Murman trawlerfleet	120	17,000
Arkhangel trawlerfleet	62	2,500
Karelryb fleet	43	
Northwest Russian kolkhoz fleet	79	
The Union of fish companies in the North	95 (+ 40 hired)	
Freezing- and transportation fleet	63	
Processing	number of plants/companies	employees
The Union of private fish companies in the North	3-4 joint ventures	few
Murman fish processing combine	130	5,000
Sever	7	
Arkhangelrybprom (earlier Sevryba)		6,100
- Mezen fish combine		- 60
- Pechora fish combine		- 330
Arkhangel fish processing combine	4	1,000
Karelrybprom (earlier Sevryba)	4	
Northwest-Russian fish-kolkhozes	31	

Source: Vasiliev 1994

The total fleet counted in 1993 around 550 vessels. Of these 2/3 have freezers on board, and about 1/3 have plants for producing fishmeal. In all the three sub-regions Murmansk, Arkhangel and Karelia the kolkhoz-fleet has been kept intact, and has now around 80 vessels. Most of the fleet still operates mainly from Murmansk city. Some of the coastal vessels sometimes operate from Arkhangel in summer. The figures for employment are uncertain. This is true both for the fleet and the processing industry.

In 1993 the total Russian quota for cod in the Barents Sea was about 230,000 tons. Of this the kolkhoz fleet together had 53,000 tons, the Murmansk trawler fleet had 43,000 tons and Arkhangel trawler fleet and Murmanskrybprom had about 25,000 tons. In 1994 the total quota rose to over 300,000 tons, of which the Murmansk trawlerfleet has 63,000 tons and the Kolkhoz fleet has 62,000 tons. The Arkhangel trawler fleet and Murmanskrybprom now has 36,000-38,000 tons (Sevryba 1994).

The close integration between fleet and industry has loosened, as many of the processing enterprises do not possess their own vessels. Regarding the processing industry, most of the companies are still integrated. The exceptions are Sever and the Union of private fishing

companies in the North. This means that the fish processing industry in Northwest Russia still includes shipyards, transport and logistics, stores and sales organizations. Sever includes 7 different plants which all only produce fish-products, and the Union of private fishing companies in the North mainly consists of joint ventures with foreign owner interests. It is uncertain whether all of these have production. The kolkhozes are very flexible and produce several different fish-products. The integrated companies today include less activities than before 1989, and the trend is a continual splitting up, and taking out production which does not belong or enhance fish-production. The Murmansk Fish Processing Combine, which is the largest conglomerate of plants, received in 1993 100,000 tons of raw-material. They produce 300 different products. The remaining companies together produced around 3.000 tons of fish-products in 1993 (Vasiliev 1994).

The process of splitting up large companies and forming smaller units is still going on and the picture is changing very fast. From the Russian side one puts much effort in to attracting foreign investments to the fisheries. Up to now there have been founded some joint-ventures (JV's) including foreign partners within the fish processing industry. It is difficult to get the full information about these. It can be worth mentioning that Norwegian investors only to a very small degree have been interested in the Northwest-Russian fish processing industry. Together with small, private Russian firms, JV's show a large variety in production, including spawn, liver and sea urchins to mayonnaise and sausages (Vasiliev 1994). Many of these smaller firms are based on technology and equipment from former traditional food processing plants. The two JVs of largest economic importance today are «Northwest» with German/multinational partners and «Atlanta» with Norwegian partners (unpublished information from J.O.Baerenholdt, 1994). The latter one produces margarine based on fish oil. The interesting questions for this report are, however, whether the production can be profitable and of a size and type that can provide the basis for transport along the NSR. The answer is still no, and we will return to this point later in this chapter.

It is not possible today to say how many people are employed in the fisheries in Northwest-Russia. Table 7.5 indicates at least 40,000, which anyway is close to a 50% reduction since 1989. The trend is however downward, especially in the land-based industry. The most important reason for this is the lack of raw materials in the industry, both because of a strong reduction in long-distance fisheries and the fleet's increased deliveries to foreign plants. The reduction in the long-distance fisheries is mainly caused by increasing costs of fuel. Regarding the other reason it is the commercially most valuable species, like cod and prawns that are delivered from Russian vessels to foreign plants. Employment is decreasing in the fleet, first of all because of rising fuel prices, which means that many trawlers are not able to cover the harvesting-costs.

The changes in structure and organization in the fisheries in Northwest-Russia have severe consequences for the fisheries, both on the Russian and Norwegian side. Only a few of the Norwegian fishing-vessels are integrated in larger companies, including both harvesting and processing. This means that most of the vessels, in reality, are free to deliver the catches to whom they wish. There are in many cases oral agreements about deliveries between vessels and plants, this is special true for the trawlers. The Raafiskeloven, a law adopted by the Parliament in 1938, secures minimum prices for all fish delivered, independent of delivered volumes and to which plant it is delivered. This encompasses all deliveries to Norwegian plants. It is the fishermen's union, Norges Raafiskelag, which sets the minimum prices, and

the prices are regulated 3 times a year. The minimum prices are based on the world market prices of fish-products.

The liberalization of foreign trade entailed that Russian fish-companies could sell their products, both raw materials and processed fish, to foreign companies. As the Russian processed fish-products are not adopted to western taste and quality standards, increased export of these products to the European market has not been very relevant. As the tight integration between the fleet and industry in the Russian fisheries has loosened, the fleet has become a more independent which enables it to sell the catches to foreign enterprises. A rise in the fuel prices in Russia has made it unprofitable to go to distant seas to fish. Consequently a larger part of the Northwest Russian fishing fleet now operates in the Barents sea compared to before 1989. The fishing grounds in the Barents Sea, which lie close to the Norwegian coast, and payment in hard currency from Norwegian plants, have made it very attractive for Russian trawlers to deliver catches to Norwegian processing plants. Table 7.6 shows the development in Russian deliveries of cod, the so-called "Russe-torsk", and prawns to Norwegian processing plants from 1989 to 1993. Most of the Russian deliveries to Norwegian plants are landed at plants in Northern Norway, and especially Finnmark county.

Table 7.6 Russian deliveries to Norwegian processing plants, 1000 tons

	cod	prawns
1989	30	
1990	20	
1991	40	0,5
1992	95	7
1993	100	12

Sources: Nilssen 1993, Norges Raafiskelag 1994

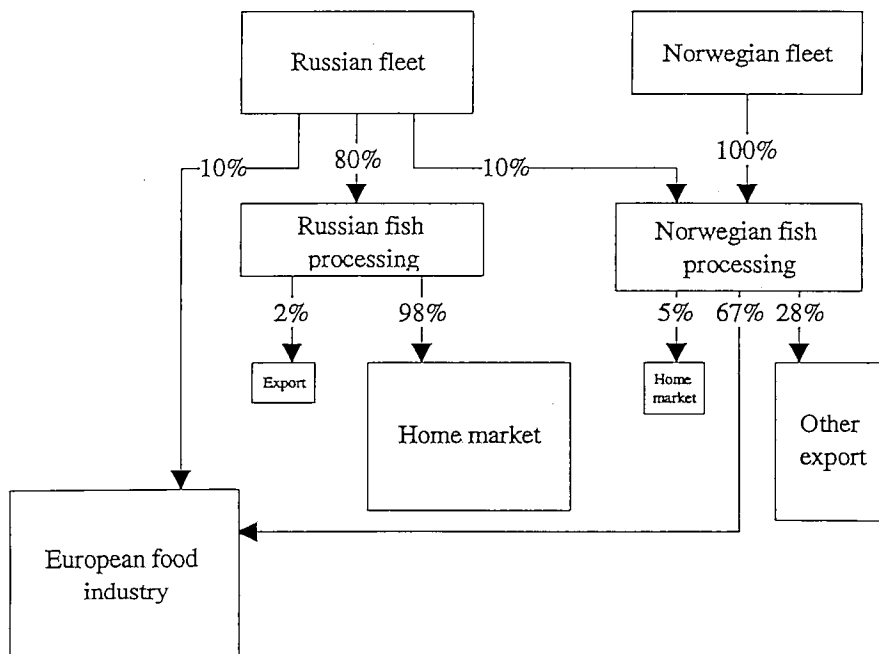
In addition to the sale of fish and prawns to Norwegian plants, the same volume is sold to other European fish-processing plants. There are several reasons for Russian trawlers to deliver the fish to Norwegian plants instead of Russian. First, they get paid in Norwegian kroner (NOK) or dollars (\$), which are hard currencies. As roubles are not internationally convertible and access to hard currency in Russia is limited, incomes in NOK or \$ are worth more than expressed by the internal exchange rate in Russia. The Russian government also encourages enterprises to increase exports and their income in hard currency. Second, in principle Russian fish shall be paid in accordance with the minimum prices set by Råfiskelaget, and this price is probably higher than the price pr kg fish that the Russian processing plants can pay. Currency earned in Norway is to a large degree used to purchase western consumer goods, equipment and repair services for the vessels. In other words, Russian vessels have strong incentives to sell fish to Norwegian processing plants and other foreign plants. Changes in this pattern must either be in the form of changed price- and/or currency incentives or through direct regulations. Another reason for the immense increase in deliveries of Russian cod to Norwegian plants is to be found on the demand side of the market. In 1989 and the following years the cod fisheries in the Barents sea were strictly regulated, with small quotas as shown in table 7.1. As a consequence many Norwegian plants

were short of raw materials, and had to lay off employees. The Russian supplies of cod were therefore very popular among North Norwegian processing plants.

The sale of Russian fish to North Norwegian processing plants can also be seen as a form of barter trade. The Russians use a significant part of the income to buy services in Norwegian shipyards and western consumer goods. There also exists a more direct form of barter trade in fisheries, in the form of exchanging quotas. This has been going on for many years, and the most important of these exchanges has been cod quotas from Russia to Norway and less valuable species in return. The Russians received larger volumes than they exchanged.

The distribution of labour between the fisheries in Northwest Russia and Northern Norway, in which the Russian fleet delivers the most valuable catches to Norwegian plants, can be seen as a short term equilibrium. The losers are the Russian plants which are dependent on deliveries from Russian trawlers. The lack of raw material has led to a significant decrease in the production of processed fish in Northwest-Russia. They also lose possibilities of processing high-valued products, as most of the commercially valuable raw material goes to foreign plants. The smaller kolkhoz-companies have adjusted more easily to this new situation, as they never were dependent on deliveries from the largest trawlers, and their traditional fleet still supplies them with raw material. Figure 7.1 summarizes the internal structure and co-operation between Russian and Norwegian fisheries in the North. The figures are given relative to total volume, measured in tons.

Figure 7.1 The structure of the Russian and Norwegian fisheries in the North



This adjustment is preliminary and does not represent a long term stable balance. There have already been some signals in this direction. First, local authorities in Murmansk and representatives from the fish-processing industry have indicated that the present situation is not satisfactory from a Russian point of view. It turns Russia into a net exporter of raw-

material, and thereby undermines the Russian fish-processing industry and the technology which has been built up. This also strongly limits the total economic activity in the fisheries. Second, foreign investors, especially from EU countries have found the Northwest-Russian fisheries interesting. Their primary interest is the access to fish quotas in the Barents Sea, to supply their own food industry. Today Norwegian processing plants supply to a large degree this industry with raw material. Further, it is also possible that they see the opportunities of turning fisheries in Northwest Russia into a profitable industry which can supply the West European market with "cheap" fish products.

7.6 Fisheries and transportation

Norway has the most significant export of fish to markets outside the region. More than 800,000 tons of Norwegian fish-products are transported annually to markets in Western and Central Europe either by ship or truck. Further 250,000 tons are transported by ship or plane to markets in the Far East, mainly Japan (Norwegian Export Council for Fish 1994). There is also an increasing export of raw fish from the Northwest Russian fishing fleet to the European food processing industry. The fish produced in Northwest-Russia, which is not sold at the local market, mainly goes by railway to the central parts of Russia. This can, however, change with increasing internationalization of the Russian fisheries.

As pointed out earlier in this chapter, the Northwest-Russian fisheries were to a large degree self-sufficient on inputs. What they did not get from local or regional producers, they got from producers elsewhere in the country. Such inputs are mainly transported by railway to Murmansk, Arkhangel or Karelia. They are mainly advanced equipment to the processing industry, motors to the vessels and fuel that are "imported" from other parts of Russia. This pattern was the same both for inputs connected to production and investments, and this is still much the situation for the processing industry. It should be mentioned, however, that some of the kolkhozes already have started to invest in western technology (personal information from J.O.Baerenholdt 1994). As pointed out earlier, the fleet today purchases much of the needed services abroad, where it delivers the catches. The structure of the industrial purchases to the North Norwegian fisheries is different. As shown earlier, the industry get most of it's inputs for production from local and regional producers or suppliers. Investment goods mainly have to be "imported", either from Southern Norway or from abroad. Machinery and other equipment is often bought in Germany or Denmark. Regarding the fleet, about half of the production costs are used to buy input from producers outside Northern Norway. This is mainly fuel, which is bought through local distributors, but produced in Southern Norway. As to investments, motors and technological advanced equipment are purchased through distributors in Southern Norway, or imported directly. Shipbuilding and ship repairs are done by local or regional shipyards.

There are however certain factors which indicate that this pattern could change in the future. If West European investors enter the Northwest-Russian fish-processing industry, e g in the form of joint ventures, the plants could be supplied with technology and equipment produced in Western Europe. As Norway has joined the European Economic Association (EEA) in 1994, a free flow of capital, goods and services can also lead to larger flows of European investments in the processing industry. Norwegian concessions acts still prohibit foreigners from investing in the fishing fleet and obtaining quotas in the Barents Sea. Foreign owners-in

the processing industry can mean a more industrial purchases of equipment from abroad, as a part of an internationalization. This will increase the demand for transportation.

Seen from a regional point of view, the main problem is that the industrial markets for investment goods like machinery and technologically advanced equipment are too small in Northern Norway and in Northwest Russia, seen as separate markets, to have their own local/regional suppliers. Such local suppliers must also operate on markets outside the sub-regions to be competitive. However, the import of such investment goods will however not, or only barely affect the Northern Sea Route. The import of inputs to Murmansk, Arkhangel and Karelia will most likely go by railway to the plants, as the railway system is rather well developed in Russia. A problem is however that the capacity is limited. Imports to North-Norwegian plants will, as now, go by ship or car. Sea transport will end in Kirkenes. There is a possibility that equipment to plants in Murmansk and Arkhangel could be sent by ship. This is likely if there could be established a transport-route between Murmansk/Arkhangel and central European harbours. Such a route could transport fish products from North to South and inputs as such machinery, other equipment and admixtures to the products and possible consumer goods, the other way. One problem is that such transport, especially of equipment to the industry, will be rather irregular. The fleet in both sub-regions has, as mentioned earlier, traditionally been self-sufficient with shipbuilding and service. On account of small capacity and lower quality at Russian shipyards, Russian trawlers have to a large degree bought services from North Norwegian shipyards, paying in currency earned by selling fish. Such a trade has also taken place in other countries where Russian trawlers have sold fish. There are also examples of purchases of shipyard services from Russian vessels for cash payment in foreign currency. This indicates that Russian actors in fisheries are becoming more active in international trades. So far these trades are of no interest for transportation along or through the NSR.

The only remaining area that could be of any interest for transport along the NSR is the export of fish-products. It is then the markets in the Far East and USA/Canada which are relevant. The latter two have their own fishing industry, and buy little fish from Norway. The Far East is a more promising market, which already imports fish-products from Norway. Today Japan imports 220,000 tons of fish-products from Norway (Norwegian Export Council for Fish). The Russian export of fish-products is currently very small. Foreign investments in the Northwest-Russian fish-industry and the introduction of western technology, taste- and quality control, could make it more competitive on the world market, including Japan. There are signals that the Russians are now trying to build up a new kind of food-processing industry, based on skills and equipment from the old, traditional fish-processing industry. They are attracting foreign capital to support this. The question is then whether such a production can be profitable enough and of a scale that makes it interesting and suited for transport by ship along the NSR. Turned around, the question, seen from a fishing industry point of view, is whether transportation along the NSR based on criteria such as price and quality can compete with alternative transport for fish-products. One must however be aware that fisheries in the eastern parts of Russia, organized in Dalryba, are also working towards the markets in the Far East.

7.7 Future developments

Regarding the North-Norwegian fisheries, it is not obvious that there will be significant changes in the internal organization and structure for the next 5 to 10 years. The different links in the production chain are closely integrated, with the fleet delivering close to 100% of the catches to local processing plants. There has been a tendency towards fewer and larger companies in the processing industry (Jentoft 1990). This is due to the high dependence on exports, and also that effective marketing and good and broad market relations in the markets for fish-products demand resources which only large companies can provide. Given that the exported share of production doesn't decrease and that access to the most relevant markets doesn't become easier, it is reasonable to believe that plants within the North Norwegian fish processing industry will continue to merge. This may also attract foreign investments to the industry. As long as it is not profitable for North-Norwegian vessels to deliver the catches further south in Europe, the fish processing industry should be ensured stable deliveries of raw material.

It has been argued that parts of the Norwegian fish processing industry would move to EU-countries if Norway didn't join the EU in 1995, together with Sweden, Finland and Austria. This is especially relevant for the producers of prawns and herring. What will happen is not possible to say today. Such a move would have consequences for the demand for transportation. Today about half of the Norwegian export of fish goes by ship and the other half by truck. Moving plants to Sweden or Finland would probably shift more of the transport of fish to Europe to train. Exports to the Far East, which is most relevant for the NSR, would however probably still go by ship or plane, as today.

The main market for North Norwegian fish products today is in Europe. The European market for fish is however limited, both by the number of persons and consumption habits. It is therefore likely to assume that the growth potential is not very large. On the other hand, Northern Norway also exports fish-products to the Far East. These markets are characterized by large number of persons, growing wealth and consumption habits that favour fish products. Another factor is that many of these countries are not self-sufficient with fish-products. More limited access to the European markets, as a consequence of the Norwegian refusal to join the EU, can force fish processing companies to search for new markets. In such a case countries in the Far East are very relevant. These are all arguments for increased export of fish products from Northern Norway to the Far East. Transportation costs and the time factor are, on the other hand, elements that limit the potential for increased export to the Far East. It is in this connection interesting to ask to what degree the NSR will be a relevant transportation route for fish products. This will depend on factors such as time and the type of products.

The internal structure of the Northwest-Russian fisheries has changed significantly the last 5-6 years. There are many reasons to believe that the adjustment, as we see it today, is not a stable one. A large part of the fleet currently delivers catches to foreign processing plants, leaving the local plants in lack of raw material. This development has led to significant reductions in the production of fish products. Since it is the commercially most valuable fish which is delivered at foreign plants, the production and export possibilities for Northwest-Russian fish processing plants are further reduced. Seen from a national economic point of view, this situation is somewhat ambiguous. On the one hand the sale of fish to foreign plants implies hard currency income to the fleet. This currency does not flow into the national economy to a large extent, as most of it is used to purchase foreign services and consumer goods. Selling the fish to local plants would give increased activity in the fisheries. Because of differences in quality and taste, it is however difficult to export Russian processed fish

products. As the situation is today, one must choose between currency income or increased employment and production in the fisheries.

A more preferable adjustment for the industry, seen as a whole, would be to deliver and process the fish at local processing plants, and export the processed products. The interesting question in this connection is whether it is likely that such an adjustment will happen within the next 5 to 10 years. There are signs of a development in such a direction. There are today some examples on joint-ventures between Russian and foreign interests in the fisheries. Foreign investments supply capital and knowledge to the processing industry. This will make it more competitive in the West European markets, and also increase profitability. This can also make it competitive and relevant in markets outside Europe, for instance in The Far East. More profitable processing plants will be more able to attract raw material. The Northwest-Russian fish processing industry has in recent years gone through a demerger, where the large integrated companies have been split into smaller units. These demergers probably makes the companies more attractive for foreign investors.

In conclusion of this analysis, we will point out two possible scenarios for the development of fisheries in the analysis region. The first scenario implies a tighter integration between the fisheries in Northern Norway and Northwest Russia. Such an integration will include cooperation in both fishing, processing, marketing and transportation. It could supply the Russian fish processing industry with relevant technology and knowledge about consumer preferences in the western markets. The fishing industry in both these areas have common interests in keeping as large a part of the production value, based on the fish caught in the Barents Sea, as possible in the Northern regions. Problem in implementing such a scenario is that the North Norwegian fisheries will not be able to supply the Northwest Russian fisheries with what for them is most important, capital. Nor can it give access to the European markets for processed fish products, which is another important factor for the development of the Northwest-Russian fisheries. What are left as positive factors for such a cooperation could be a common interest in developing markets for export to countries in The Far East. Common marketing of fish products from the Barents Sea in «new» markets could be a benefit for both parts. This could be especially effective for markets for instance in The Far East. A cooperation on transportation could also make exports to the Far East more profitable. This is however an arena where the fisheries in the eastern parts of Russia, Dalryba, already are very active. Seen from a centrally planned economic system, it would be obvious that Dalryba should serve the markets in the Far East, whereas the fisheries in Northwest-Russia should concentrate on the markets in Europe. Today, with economic liberalization and more extensive use of market regulations, this will probably not be an official Russian policy. One should be aware that there could still be regulations and market segregations in the Russian fisheries which makes it unlikely for the Northwest Russian fisheries to look upon the Far East as a potential market for their products.

The other scenario implies separate development of the fisheries in Northern Norway and Northwest-Russia. This will probably imply only small changes in the North-Norwegian fisheries. Most exports of semi-processed products, sold as input to the food industry in Europe will continue. A possible change is an increased focus on new markets, especially in the Far East. To what degree these markets can be supplied with products from Northern-Norway, depends on the size of the markets and their ability to pay. The most important factor will probably be which transport solution one finds for such exports.

For the Northwest-Russian fisheries it is necessary with foreign capital, technology and knowledge about western consumer preferences and quality. This does not come from Norway, it will probably come from other countries. The interesting question is whether the foreign investors will try to build up a competitive fish industry in Northwest-Russia, or only use Murmansk to load the catches in the Barents Sea, may be carry out basic processing there, and send the semi-processed products as input to the food industry in Europe. If the last case is the most realistic, we will have a situation in which the fish resources in the Barents Sea are largely used as input in the food industry in Central-Europe, leaving only a small part of the total production value in the Northern regions. One should however keep the possibility open that also investors from West- and Central-European countries would be interested in building up a profitable and technologically advanced fish processing industry in Northwest-Russia. Then exports to other markets, for example in the Far East, could be relevant also for this industry.

A larger degree of integration and/or cooperation between the fisheries in Northern Norway and Northwest Russia could strengthen both parties. They will have the same interests in developing a strong and competitive fish processing industry and to keep as much of the raw material and production value within the region as possible. Both will also have interests in developing new and profitable markets for their products, for example in The Far East. As the situation is today, the two parties are to a certain degree competitors, by being both suppliers of raw material and low processed products as input to the food industry in West and Central Europe.

Seen from a transportation point of view, and especially regarding the use of the NSR, it is only exports to the Far East that will be of any interest. There are however many arguments against the NSR being a suitable way of transport for fish products to the Far East. This is due to both the type of products which are to be exported and the time aspect. Today much transport of fish products from Norway to Japan goes by plane, but there are examples of sea transportation as well. We have not made any further analysis of whether fish products are relevant goods for transport along the NSR, just pointed out that fish is a product supplied in large quantities in the Western end of the NSR, and demanded in large quantities in the Eastern end.

8 MINING, METAL AND MINERAL PROCESSING

The chapter gives a description of the main deposits of industrial minerals, metals and building materials in the region. Activities like mining, beneficiation and metallurgy are examined and export markets and transport are evaluated. On the basis on reflections for the further development of this industry, conclusions about possible effects on the use of the NSR as a transport route will be drawn.

8.1. Location of mineral resources in the analysis region

8.1.1. The Russian part of the analysis-region

Murmansk County has enormous deposits of minerals. There are many rare and valuable minerals, but of importance are also traditional industrial minerals. Despite the quantity of minerals located in the region, the potential for extraction is limited. There are several reasons;

- many minerals are remote areas without communications
- conditions for extraction are difficult because of the harsh climate
- extraction demands technology which is neither available nor economically viable
- prices on the domestic or world market are so low that extraction is not recommendable

As a consequence the rich access to mineral resources is only to a small degree utilized. The county's most important deposits are situated in the northwestern part with nickel, copper and cobalt. Iron ore, apatite and rare minerals are mainly found in the central part.

The Karelian Republic has considerable mineral resources, but not comparable to Murmansk. The geological mapping has not been very extensive. Most important is the iron ore located in the northwestern part. A large number of quarries contain resources like granite, porphyrite, marble, dolomite, glimmer and pegmatite.

Arkhangel County has a limited amount of minerals. Some of the deposits, such as bauxite, are rather important in a Russian context. The main deposit is situated in the central part of the county. Diamonds were found east of Arkhangel city in the 1970. The deposits are probably bigger than the largest deposits in Russia situated in Yakutia. Deposits of gypsum, limestone and slate, used in the production of building materials, are situated in the central part of the county.

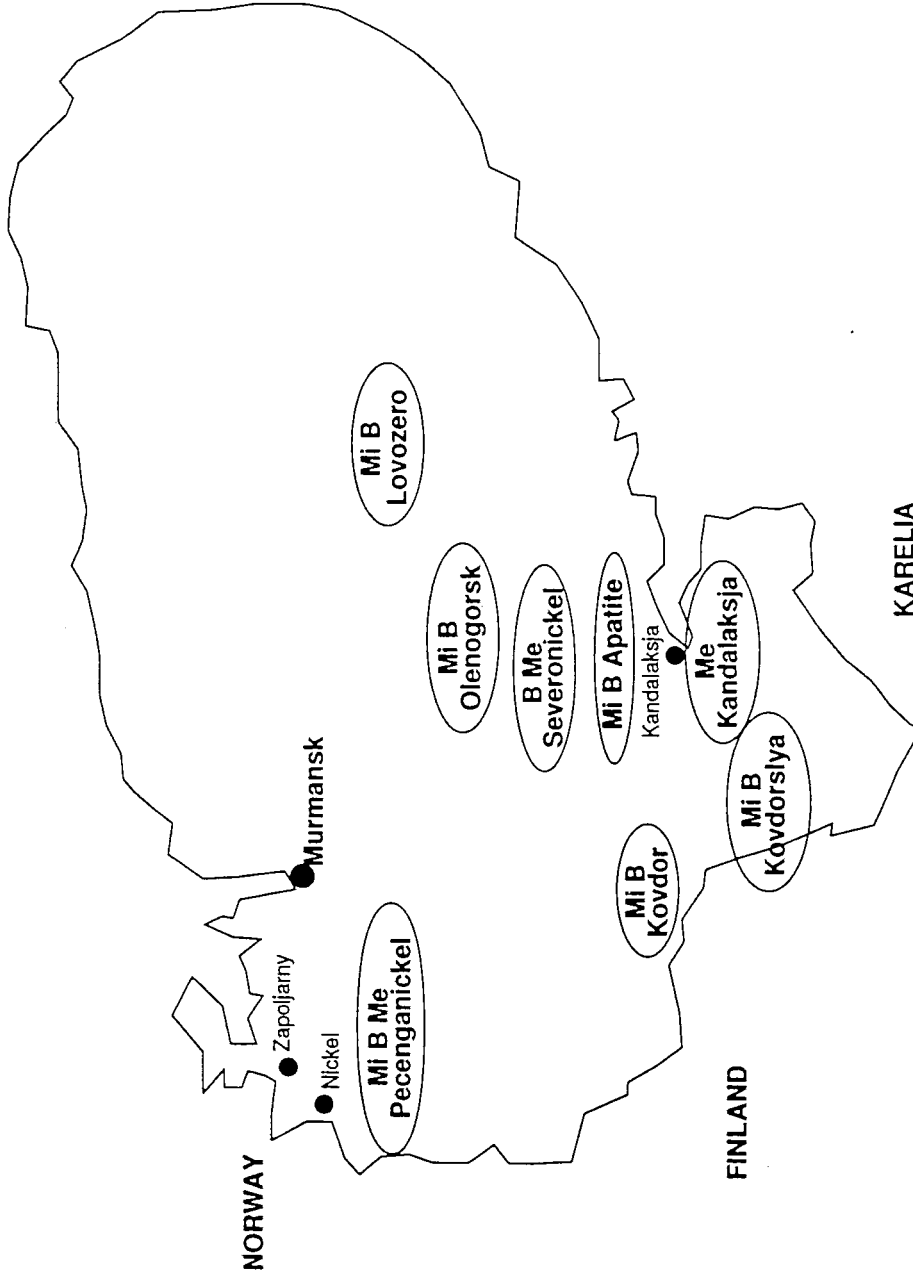
Pechora basin - Republic of Komi: Large deposits of coal are found in East-Nenets and the north-eastern part of Komi. These are called the Pechora coal basin with the centre situated in Vorkuta.

Taimyr region: The city of Norilsk is built up as a consequence of the large deposits of nickel, platinum, copper and cobalt. There are also enormous coal deposits in Northern Taimyr, but they are not extracted.

8.1.2 The Norwegian part of the analysis-region

Finnmark county has some deposits of iron ore in the eastern part, though they will soon be exhausted. Building materials like quartzite and slate are produced, and dolomite is found.

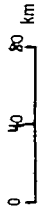
MURMANSK COUNTY



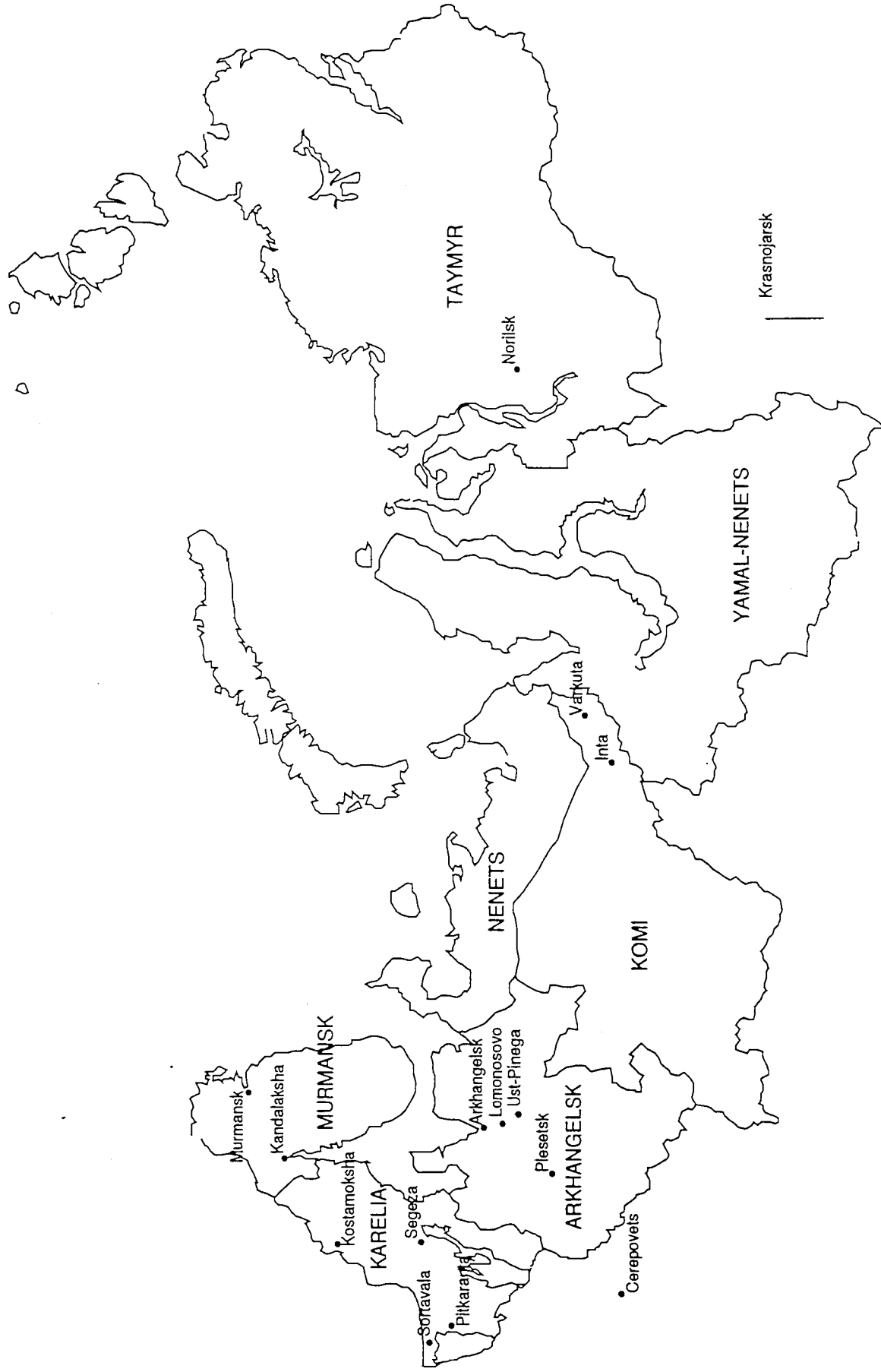
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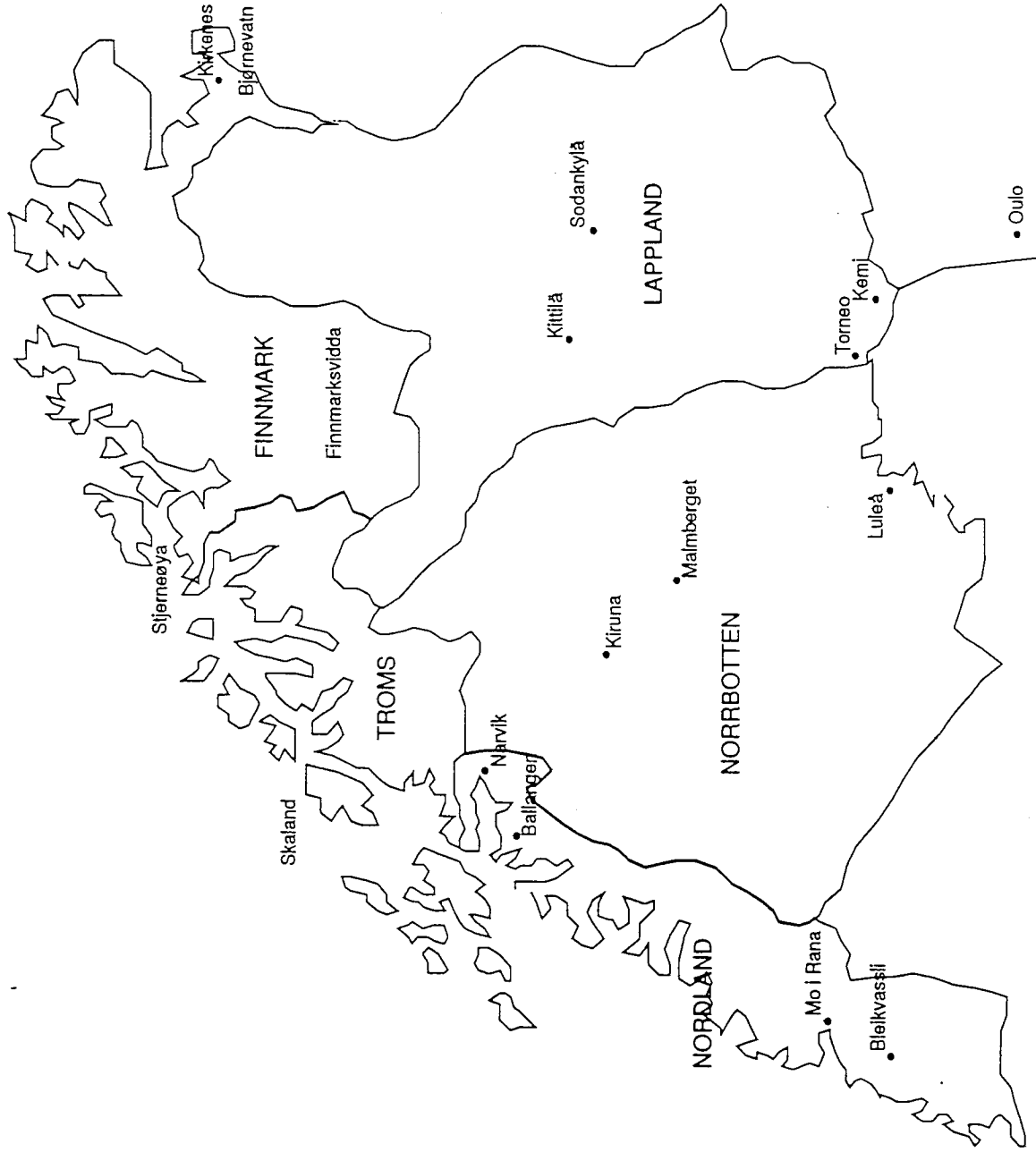
KARELIA



The Russian part of the analysis-region



The Norwegian, Swedish and Finnish part of the analysis-region



Nepheline deposits are situated at Stjernøya, and gold was recently found at Finnmarksvidda. The main resource of Troms county is graphite quartzite. Nordland county has deposits of limestone, olivine and dolomite, iron ore and zinc.

8.1.3. The Swedish part of the analysis-region

Deposits in the county consist mainly of iron ore located in Kiruna and Malmberget. Some lead deposits are situated in the southwestern part of the county, copper is also found near Kiruna.

8.1.4. The Finnish part of the analysis-region

The chromium deposits in Lappland are one of the most important and in extensive use. Rare minerals are located near Sodankylä and in the eastern part of the county. The deposits consist of nickel, copper, cobalt and apatite. Gold is also found.

8.2. Mineral mining, beneficiation and metallurgy

8.2.1. The Russian part of the analysis-region

Murmansk County

Murmansk is the sub-region with the most extensive mining activity, beneficiation and metallurgical industry, and will be analyzed in more detail than the others. The structure of the mining, beneficiation and metallurgy industries is very integrated. Big combines dominate the production process, and further treatment is carried out outside the region. It must be underlined that the statistics used in this chapter are vague. They must be looked upon as guidelines, and not as exact figures. It is still difficult to get correct statistical data from Russian enterprises.

Table 8.1. Main mineral companies in Murmansk County

Company, (location)	Activity	Products
Pechenganickel (Nikel, Zapoljarny)	Mining Beneficiation Metallurgy	nickel, copper, cobalt nickelmatte
Olenogorsk	Mining Beneficiation	iron-concentrate magnetite
Severonickel (Monchegorsk)	Beneficiation Metallurgy	nickel, cobalt, sulphur
Apatite	Mining Beneficiation	apatite concentrate, nepheline concentrate
Lovozerov (Lovozero, Revda)	Mining Beneficiation	aluminium lopartite concentrate
Kandalaksha	Metallurgy	aluminium
Kovdor	Mining Beneficiation	iron-concentrate apatite conc., baddeleyite, magnetite
Kovdorslya	Mining Beneficiation	glimmer (phlogopite, muscovite, vermiculite)

Source: Compiled from different sources

Pechenganickel

The mines in Zapoljarny contain nickel, copper and cobalt. Metallurgical plants are situated in Zapoljarny and Nikel. The company is owned by Nickel Norilsk, an integrated production company. The operations at Norilsk, North Siberia, together with refinery activity in Krasnoyarsk, South Siberia, and mining, melting and refinery operations on the Kola Peninsula (Severonickel and Pechenganickel), and Olenogorsk Mechanical Factory are controlled by Norilsk Nickel. The different plants constitute a production chain, with ore and semi-finished products transported over vast territories (more about the Norilsk production under Taimyr).

Up to 1994 the main input to the metallurgical plants of Pechenganickel was ore from Norilsk. This transport along the Northern Sea Route has now stopped because of the unprofitability. Input to the Pechenganickel plants has been switched to ore from the mines in Monchetundra.

The main product from Pechenganickel is nickelmatte, sent to Severonickel in Monchegorsk to be used in the production of nickel concentrate. The total production is now about 55.000 tons (The Geonomics Institute 1994).

Olenogorsk

Olenogorsk is together with Kovdor the only producers of iron-ore concentrate in Murmansk County. Four mines are in operation, the first was opened in 1949, and iron-concentrate has been produced since 1954.

The iron content in the concentrate is quite low and difficult to sell on the world market in addition to the reduction in internal demand. Nevertheless, the iron plant in Cherepovets was especially built for the Olenogorsk and Kovdor iron. The costs of excavation and transport to the beneficiation plant has increased as the ore is difficult to mine. Production of iron-ore constitutes 6 % of the Russian production, and has been quite stable during the last decades. The level of concentrate production has been stable at about 6 Mt per year (The Geonomics Institute 1994).

Severonickel - Monchegorsk

Severonickel was built in 1935 to use the newly discovered copper and nickel deposits in Monchetundra. This was used up to the end of the 1960s. After that time, the metallurgy industry has processed ores and semi-finished products supplied from the Norilsk and Pechenganickel plants. Main products are nickel, copper, cobalt, nickel carbonyl powder and carbonyl nickelshot. The production of nickel in Severonickel is expected to be 60.000 t in 1994 (The Geonomics Institute 1994).

Apatite

The apatite-nepheline reserves in the Khibine mountains are not as valuable as they used to be. One reason is that purity has dropped from 32 % to 14 %, and the technical conditions for mining has been more difficult and costly. The Apatite company consists of four mines and two beneficiation plants. One of the mines (Rasvumchor) is a joint venture with the Norwegian company Norsk Hydro. The total capacity of the mines is 120 Mt, and of the plants 11.7 Mt. These figures indicate the capacity, but the real production is much lower. During the last years production of apatite concentrate has dropped five times, to an annual average of 1.5-2 Mt (The Geonomics Institute 1994).

Lovozero

Two beneficiation plants are located in Revda. Ore reserves are adequate to supply the enterprise for many decades. The main product is lopartite-concentrate of which Lovozero probably is the only producer in world. There are plans to expand the mining capacity to 2.6 Mt per year (The Geonomics Institute 1994).

Kandalaksha

The production of aluminium in Kandalaksha is relatively limited in the Russian context. The plant started in 1951. Input (apatite-nepheline) to the metallurgical process is transported from Apatite in Kirovsk. The output is mainly Nepheline concentrate.

Kovdor

The iron ore deposits were discovered in 1933 and production started in 1962. A plant to process apatite and baddeleyite ore was built in 1975. Kovdor consists of an open pit mine to extract complex iron ore. The iron ore mine and beneficiation facilities are located in Kovdor city. The enterprise also produces apatite and baddeleyite concentrates. The production of baddeleyite is 3500 Mt per year, and is mainly used in the car industry (The Geonomics Institute 1994).

Kovdorsluja

Kovdorsluja in the south-western part of the county extracts minerals used as building materials and in the electronic industry. Different kinds of mica (phlogopite, muscovite, vermiculite) are the most important products.

The Karelian Republic

There are three basic metal industries in the Karelian Republic: The most significant mining enterprise is situated in Kostamoksha in the north-west. Local iron-ore is extracted, and a metallurgical combine called "Kostamoksha" produces iron-pellets for both internal and external markets. The combine was established in 1983 to mine and enrich iron-ore, and the Finns helped with the construction. An aluminium plant at Nadvoicy near Segeza is an important unit in the base metal industry. The plant produces aluminium ingots, and is in a poor condition and needs to be modernized. The Wärtsilä plant, located near the Finnish border north of Sortavala, is also ironworks. Some pegmatite quarries are situated near Pitkaranta in the south of the Republic. The output is small, and for domestic use (Eskelinen et al ed 1994).

Granite and marble are quarried and exported in fairly large quantities for use as construction materials. The Karelian Republic was one of the biggest producers of mica in Russia, but this production has been reduced during the last years.

Arkhangel

The main deposit of bauxite is situated in Severoonez'k, Plesetsk, where extraction has taken place since 1976. The bauxite is of good quality and is the largest deposit in Russia. The ore is used in the production of aluminium (63 %) and cement (16,5 %). 13,5 % goes to the iron industry in southern parts of Russia. Figures from one field (Iksinskoje) show a production of 663,000 tons in 1992 (Castberg and Bjorvatn 1993).

Search for diamonds started in the 1970s by Arkhangelgeologia. Production will probably start in 1997 at the Lomonozovo quarry, with 5 Mt ore per year. The field is run by the company "Severalmaz" (Castberg and Bjorvatn 1993).

The largest producers of building materials in the northern regions are situated in Plesetsk. Limestone and cement are produced. Figures for cement production at the Savinskij factory was in 1992 1.3 Mt. Connected to this factory is the only producer of slate and asbestine in the north. A gypsum quarry is situated in Ust-Pinega with large deposits and a production of 150,000 tons/year (Castberg and Bjorvatn 1993).

Pechora coal basin

In the Pechora fields (coal basin) the reserves of coal are estimated to 8.8 billion tons. 1616 million tons of coal are concentrated in the areas being developed. Production can last for a long time, but compared to the enormous fields in Kuzbass (59 billion tons), this is a medium size basin. The East-Nenets deposits are not in production. The climate and lack of transport routes makes the area less interesting, because of other easier accessible fields. The centre of coal mining in the north is located around the city of Vorkuta in Komi. Production has gone on for several decades, and supplied the Russian industry with energy. 13 mines are situated around Vorkuta, and 5 mines are located near the city of Inta further south. In 1988 the maximum level of coking and steam coal output from these 18 mines was achieved with 31.5 million tons. In 1993 24.4 million tons of coal was extracted (information from CNIMF).

Taimyr

Norilsk is the largest industrial centre above the Arctic Circle. Production consists of five underground mines and one ore pit, three smelters and a refinery. The Norilsk combines produce 75% of the platinum group metals and 65 per cent of the nickel in the former Soviet Union (Kyndlev and Tulinius 1994). Production of copper and cobalt are of minor importance.

8.2.2 The Norwegian part of the analysis-region

The Bjørnevattn mines have supplied AS Sydvaranger, Kirkenes with iron ore for several decades. Bjørnevattn consists of 3 mines, two are in production today. Production of pellets has expanded during the past years, but a total closedown of the mines and metallurgy is soon to come. The deposits are nearly exhausted. The total mining activities have decreased during the past years, but the portion of ore has increased. This means that the ore has become better. This fact has affected production at the metallurgical plant, and increased sales and exports.

Table 8.2 Mining and metallurgy production AS Sydvaranger, 1000 tons)

	1989	1992	1993
Ore	3,058	3,553	3,655
Waste	7,700	3,761	3,125
Total excavation	10,758	7,314	6,780
Pelletsslig	1,290	1,436	1,496
Superslig	5.7	71	105
Pellets	1,305	1,513	1,527

Source: Annual report 1993 of AS Sydvaranger

The nepheline production on Stjernøya had an output of 280,000 tons in 1993. The production plant is owned by the company "North Cape Minerals" witch has mainly Canadian owners. Nepheline is used in glass, ceramic and porcelain production (primary data from the manager).

Nikkel and Olivine in Balangen started production in 1989. 700,000 tones of ore are extracted from the mine every year. A bulk sulphide concentrate consisting of nickel, copper and cobalt makes up 30,000 ton per year. The company is owned by the Finnish Outokumpu, and is part of their production chain (primary data from the manager).

The Rana mines consist of two mines and one pit of iron-ore. Production is about 800,000 tons of slig (primary data from the manager of the company).

Fundia Norsk Jernverk is located in Mo i Rana, and uses scrap iron in the production of steel used for ship construction and armoured steel. The total production is 600,000 tons per year (primary data from the manager of the company).

Bleikvassli mining is situated in the southern part of Nordland. A normal production is 220,000 tons of ore, but in 1993 dropped to 132,000 because of lay-offs. 3821 tons of lead concentrate and 8,478 tons of zink concentrate were produced. Expected production in 1994 is 196,000 tons of ore (primary data from the manager).

8.2.3 The Swedish part of the analysis-region

There are mines and ore processing plants in Kiruna and Malmberget. Pelletize plants are working in the two sites in addition to the plant in Svappavaara. All are owned by the company LKAB.

Table 8.3 LKAB's ore production

	1992	1993
Kiruna	12.4 Mt	12.4 Mt
Malmberget	6.3 Mt	6.0 Mt

Source: LKAB Annual Report 1993

8.2.4 The Finnish part of the analysis-region

Outokumpu Oy dominates the mining sector and processing plants of Lappland County. The worldwide company is owned 50.1 % by the Finnish state. The following data are compiled from the Outokumpu Annual Report 1993.

The Kemi mines are among the world's foremost chromium deposits. Proven ore reserves are about 65 million tons, while additional mineral resources amount to 80 million tons. The reserves are estimated to last for over 100 years at the current rate of exploitation. Roughly one forth of the deposits can be excavated from an open pit. The deposit stretches over a distance of five kilometres and extends down to 1000 m underground.

The chrome ore deposits of the Kemi mine were opened in 1968. At the same time, a plant for processing the ore to ferro-chrome was built. The primary product, upgraded lumpy ore and metallurgic concentrate for use as raw materials in the ferro-chrome works in Torneo are produced at a rate of 500,000 tons a year.

Outokumpu Steel is a complete stainless steel production chain from chromite mining to semi-finished products in the Kemi-Torneo area. Operations started in Torneo in 1976. The company markets its steel under the Polarit trademark. The third cold rolling mill will be built in Torneo

in 1995 and increase the cold-rolling mill production to over 250,000 tons. An entire production chain in Kemi-Torneo from mining to stainless steel is definitely a competitive advantage.

8.3 Export and transport

This section will focus on the export figures of the main minerals and on how they are transported to the markets. The main emphasis will be on sea transport.

8.3.1 The Russian part of the analysis-region

Murmansk County

The main transport routes of mineral products out of the region to the domestic market will be mentioned. Iron ore is mainly transported to the Cherepovets metallurgical plant as well as to Central Russia and the Ural. Non-ferrous ore goes to the St. Petersburg region. Building materials are transported to St. Petersburg region, the Karelian Republic and Central Russia. Main exporters (figures of total export, 1988 from Murmansk County in tons) are Severonickel (41 %), Monchegorsk and Apatite (15 %), Iron from Kovdor (4%) and Olenogorsk (1 %) (The Geonomics Institute 1994).

The main input to the mineral processing in the county has been ore transported from Norilsk in North Siberia to the nickel plants Pechenganickel and Severonickel. This transport has diminished during the last years, to cease completely in 1994.

Table 8.4 Transport of ore Norilsk-Murmansk

Year	Transported ore in tons
1990	1,000,000
1992	500,000
1993	250,000
1994	

Source: The newspaper «Barents Nytt» June 1994

The output from Pechenganickel is mainly nickelmatte. The product is not exported, but goes directly to Severonickel Metallurgy for further processing.

Severonickel - Monchegorsk

Of the total production of nickel concentrate in Severonickel, domestic supply accounts for 60% and the export market for 40%. Customers are Finland, Norway, the USA, the Netherlands, Canada, Germany, United Kingdom, Italy and China. Export of nickelmatte to southern Norway (Kristiansand), goes by rail to Murmansk, by boat via Kirkenes to the customer. The amount is about 2,000 t per year (The Geonomics Institute 1994).

Apatite

The apatite concentrate was (in 1993) transported to 35 different enterprises in Russia, Ukraine and other republics of the former Soviet Union. Apatite was exported to 10 companies in 8 countries (Norway, Austria and Eastern Europe). According to Russian sources production has

dropped from 20 Mt in 1989 to 11 Mt in 1993. The accurate decline is probably even bigger. As a consequence, export has dropped during the past years (The Geonomics Institute 1994).

Lovozero - Lopartite

The main customer for lopartite concentrate is the Solicamskij Magnesium Plant in Ural. Export markets are the defence industries in the USA and Japan.

Aluminium from Kandalaksha is mainly sold to the Pikaljova plant in St.Petersburg. Some figures indicate an export of 50 %, but the customers are unknown.

Kovdor

The primary customer of iron ore is the Cherepovets Metallurgical Combine in the Vologda region. The apatite concentrate is sold to Russia, Ukraine and Kazakhstan, to the Finnish company "Kemira" and the German company "Waltham Electronics".

The rare baddeleyite powder is sold to domestic customers and export markets like B.M. Trading in Narvik and Sumitomo Cooperation in Japan. Transport to (Norway 2-3000 t) is done by road, and to Japan by sea westwards.

Olenogorsk

The main customer of iron-ore concentrate is the Cherepovets Metallurgical Combine. About 800,000 tons per year is exported to the Finnish company "Rautaruukki" by road. Crushed stone is sold for construction in Vologda, Yaroslavl, Kostroma, Arkhangel and Kandalaksha (The Geonomics Institute 1994).

Arkhangel county

Today the bauxite is transported by rail to the smelters in central Russia. So far, there has been no export. Some of the gypsum from Ust-Pinega is exported to Finland. The volume is not known. The other building materials go southwards to the domestic market.

The Karelian Republic

In 1992 the total export from the Karelian Republic consisted of 8% iron-ore and 6% aluminium. The iron pellets from Kostamoksha are exported to Finland. Of the total export from the Karelian Republic to Finland 24 % was minerals in 1992 (Eskelinen et al ed 1994).

Table 8.5 Export of minerals from Karelia to Finland (% of total export)

	Export 1991	Export 1992
Metals	10	6
Iron	6.8	7.9

Source: Eskelinen, Oskari and Austen (ed) 1994

Pechora coal basin- The Komi Republic

Vorkuta is situated in the far north with a railway connection to the port of Labitnangy on the Kara Sea at the north of the river Ob. Transport of coal by ship on the open sea along the Northern Sea Route is not extensive for two reasons: The port is only in function some months in the summertime due to ice conditions. Second, the markets for coal are in central Russia.

There is probably a limited sea transport during the summer months to supply the small settlements along the coastline. We have some figures on transit-transport of coal to/from Arkhangel city where 443,000 tons were shipped out in 1992 (Arkhangel Port administration 1994). Half of this goes to export, and the other half to supply the domestic customers along the coast.

The main coal production from Komi is transported by rail to the central parts of Russia. Some trains turn north again to Arkhangel and Murmansk Counties. Except from the figures mentioned concerning Arkhangel port, it is not known whether more coal goes to export markets. We have reasons to believe that the export markets are supplied by mines closer to the border areas and export harbours. The production from Komi is probably sold in the north and in central Russia.

Taimyr

Part of the nickel ore production in Norilsk has traditionally been transported along the Northern Sea Route to the plants on the Kola peninsula. This transport has now stopped, and some reasons will be discussed. The production chain of Norilsk Nickel was based on a plan economy production. Input to the heavy industry was more important than the profit of each combine. The Ministry organized deliveries and transport. When the market economy reached Russia, and the enterprises step by step were transformed into joint stock companies and were put on auction, new principles of management followed. Unprofitable links in the production could not continue as before. The transport of ore from Norilsk to Murmansk was never a profitable venture, but a consequence of the Second World War. Industries from the western and central part of Russia were moved behind the Ural mountains to be protected from the bombing. The build up of Norilsk continued in the following decades, and to keep a stable production, transport of ore to Murmansk started in 1968. Employment in two cities was dependent on the continuation of this transport. A total stop would first affect Norilsk, and then Nickel.

The nickel that is not stored in Norilsk is now transported by railway to the river and then sent on boat southwards. The platinum group metal produced in Norilsk is transported southwards to be refined at the metallurgy plant in Krasnojarsk.

8.3.2 The Norwegian part of the analysis-region

Input to the AS Sydvaranger metallurgy in Kirkenes is iron ore from the Bjørnevatn mines. Ore is transported from the pits to Kirkenes on a private railway line of some kilometres. After the pelletiz process, the products are transported from the Kirkenes harbour by ships. The export of pellets from Sydvaranger goes to the steel industry in Europe. Main importers are Germany and Great Britain.

Table 8.6 Sales of pellets from AS Sydvaranger, 1000 tons

	1992	1993
Germany	941	1059
Great Britain	348	795
Norway	49	47
Total	1,313	1,901

Source: AS Sydvaranger Annual Report 1993

The following data are primary data from the managers of the companies, and when nothing else is mentioned they refer to the year 1993.

Nepheline production at Stjernøya is exported to markets in Europe and Far East. The most important are Germany, Great Britain, France, Italy and Spain. Transport is done by ship from the plant to the continent.

Nickel and Olivin in Ballangen sell all their production of bulk sulphide concentrate (nickel, cobalt and copper) to the Finnish company Outokumpu. The annual volume transported is 30,000 tons, and goes by ship to Pori harbour in southern Finland. The concentrate is transported to the Harjavalta smelter.

The production of iron slag from the Rana mines is mainly shipped out from the harbour to export markets. A limited part of the production goes by railroad and road. The main export markets are Germany, France, Great Britain and Sweden.

Fundia Norsk Jernverk in Mo i Rana is dependent on scrap iron as input in the steel production. The consumption is 500,000 tons of scrap per year. 60 % of the scrap comes from Norway, 40 % from Germany and Eastern Europe. In addition 150,000 tons of steel material are put into the production. The company sells 120,000 tons of steel (of a total production of 600,000) to the Norwegian market. The rest of the production is mainly sold to the European market. Most important are Germany, Great Britain, France, Italy and Spain. A small quantity is sold to the USA and Asia. Transport to Norwegian customers is done by rail. The export markets are served by ship.

Bleikvassli sell their production of lead and zinc concentrate to the domestic and export markets. The Norwegian buyer is NORSINK in the southern part of the country with 50 per cent of the production. The other half of the production goes mainly to "Metallgesellschaft" in Germany. A minor buyer is a company in Switzerland. The concentrate for export is transported by road 70 kilometres to the harbour in Mo i Rana. The product is shipped out by ship southwards to the continent. The transport to Norsink is done by rail or road.

8.3.3 The Swedish part of the analysis-region

LKAB mainly delivers :

- olivine pellets to steel mills in Europe
- direct-reduction pellets to Middle East and South-East Asia
- low phosphorus ore is delivered mainly to Europe
- high-phosphorus ore is delivered to two steel mills in Europe

Pellets account for about 50 % of the production.

Table 8.7 LKAB's iron ore sales in 1993 (value: 3.3 billion SEK)

	Per cent
Germany	29.7 %
Sweden	21.1 %
Benelux	19.2 %
Middle East and Africa	10.5 %
South East Asia	7.7 %
Finland	7.7 %
Other markets	4.1 %

Source: LKAB Annual Report 1993

The iron ore and pellets production of LKAB in Kiruna, Malmfelten and Svappavaara are transported by railway to the sea and shipped out from the harbours of Luleå and Narvik, Nordland County of Norway.

Table 8.8 Transport figures for LKAB in 1993

	Shipment	Number of ships	Average loading
Narvik	14.4 Mt	219	66,000 t
Luleå	3.4 Mt	286	12,000 t

Source: LKAB Annual Report 1993

The Luleå harbour serves the Finnish and Swedish markets. The other markets are served by the Narvik harbour. There are plans to build a new harbour at Sanskär near Luleå that can serve 10 Mt per year. The harbour will be a serious competitor to Narvik.

Problems with transportation

After the privatization of the Swedish railway, LKAB have transported the ore themselves. The railway monopoly is still intact in Norway, and LKAB has tried to get a license to continue the transport to Narvik harbour on the tracks of the Norwegian state railways. This has not succeeded, and Norwegian transport authorities have threatened to stop all rail transport of ore to Narvik from the beginning of 1995. The implementation of this rejection means that all shipments must be made from the gulf of Bothnia.

8.3.4 The Finnish part of the analysis-region

Outokumpu Stainless Steel transport directly by ship every week 2,000 tons of steel to the tube production plant in the Netherlands (Annual Report 1993).

Other means of transport:

- railway to the continent
- railway to Gothenburg for further shipment overseas

8.4 Further development of the mineral industry

Important factors for further development of the mineral industries in the region are:

- World market prices
- Demand in internal and external markets
- Sufficient transport solutions

8.4.1 The Russian part of the analysis-region

Nickel production in Pechenga and Monchegorsk

Nickel sold to the domestic market is mainly used in the defence industry. Because of the conversion to civilian production, this demand has fallen dramatically. To keep up the production in 1993, Russia dumped the surplus on the world market, and this has caused a fall in the prices. It is also said that Russia has a stock of 150,000 tons (by the end of 1994), and this causes fear on the market (The Geonomics Institute 1994). The world market price is vulnerable because there are so few suppliers on the market.

During the autumn of 1994 the price has increased steadily. An explosion that cut the electricity in Norilsk caused a jump up to 9,575 dollars in the beginning of December. This will probably reduce the production of nickel concentrate in Norilsk from the planned 100,000 tons to 70,000.

Table 8.9 World market prices on nickel

Year	World market prices-dollars per ton
1988	13,800
1993	3,700
1994	6-9,500

Source: Personally collected data from different sources

The planned annual production for Pechenganickel in 1994 is 50,000 tons of nickelmatt. This is a reduction from 100,000 in 1993. At the plant in Nickel only 3 of 6 furnaces are in production. Production figures for Severonickel in 1994 are 60,000 tons of nickel concentrate (The Geonomics Institute 1994).

After the stop in supplies of ore from Norilsk, Pechenganickel and Severonickel have used the local ore from Monchetundra. This ore is of poorer quality because of lower concentration but gives less pollution when smelted due to the lower concentration of sulphur. The surpluses are however not enough for both Pechenga and Monchegorsk. Stable production is more profitable in Monchegorsk near the deposits. A step by step reduction in Pechenga has been discussed, but such a solution is difficult to take because of the labour force and the expected unemployment. International support of a cleanup of Pechenganickel plant will make it difficult to close down.

The export of apatite has dropped from 4 Mt in the mid 1980s to 0.4 Mt in 1992. One of the reasons for this drop in export was the introduction of quotas and world market obstacles to reduce the production of aluminium (The Geonomics Institute 1994).

The demand of iron ore from Kovdor is limited, and export has dropped. Apatite concentrate and baddeleyite powder are in high demand in Russia and world markets.

"North Cape Minerals" exports the entire production, and is dependent on the world market price and ecological demands in the export countries.

Nikkel and Olivin in Ballangen export their production to Finland. A long-term contract with Outokumpu secures stable supplies of bulk sulphide concentrate (nickel, copper and cobalt). The market is stable, but prices are regulated by the London stock market. This makes the company vulnerable if substantial changes occur in world prices.

Rana mines will reduce the production from 800,000 tons in 1994 to 600,000 tons of iron ore in 1995 (primary data from the manager of the company). The reason is not known.

Fundia Norsk Jernverk in Mo i Rana has good markets for steel used in the shipbuilding. Armour steel is more difficult to sell. The total production is increasing. The company is dependent on scrap iron as input in the production. This comes from Norway, Germany and Eastern Europe. The company is interested in buying scrap from the Kola peninsula because the transport distance will be shorter and the price is probably better. Negotiations are going on with the Russians through Kimek shipyard in Kirkenes. If such a transport is realized, it can affect the use of the western part of the Northern Sea Route. The Bleikvassli mines had a reduced production in 1993 and 1994 with lay-offs. Prices on the world market for lead are rising, while prices for zinc is falling. It is not difficult to sell, demands are high. Low prices makes it unprofitable to increase production.

8.4.3 The Swedish part of the analysis-region

Production at LKAB has decreased during the past years and billions have been invested in new technology to readjust to new markets and customers. Pellets production and export is increasing while high-phosphorus ore will soon go out of production. LKAB recently got a huge contract of pellets deliveries to two new German customers of 1 Mt over 5 years. A new pellets plant in Kiruna will be ready in the beginning of 1995, and will deliver most of the production (Annual Report 1993).

8.4.4 The Finnish part of the analysis-region

The existing industry in Kemi-Torneå have good market contacts. Geological surveys have found interesting deposits in Sodankylä, in the mid-Lapland. Gold is found in Pahtavaara, where the Swedish-Finnish joint company "Terra Mining" will start production. Another deposit in Kevitsa contains mainly nickel, but also cobalt, copper and rare minerals. Production is under consideration. World market prices and environmental concerns will be important in the decision. The Sokli apatite mine in Savukoski is owned by "Kemira Oy", and can also be in production in the near future. Foreign mining companies now have easier access to the minerals in Lapland as a result of the European Economic Agreement (EEA).

8.5. Prospects for further transport of minerals along the Northern Sea Route

This chapter has described main transport routes of minerals in the analysis-region. The limited transport along the Northern Norwegian coast will not affect the NSR. A possible positive effect can be achieved by better integration of the mineral industries in Northern Norway and Murmansk County. The resource base in Murmansk can be in demand as input for the Norwegian industry. Russian iron scrap can also be used in steel production. Such an

integration can come, but the total quantities are probably small. Norrbotten and Lappland do not send any mineral products northwards to the Barents Sea, and will probably not do so in the future either.

The general drop in production, the increased rates of all kinds of transport and the difficult market conditions, have affected the total volume of transported cargo from the Russian part of the analysis-region. The Karelian Republic has very limited transport out into the White Sea to the Barents sea. The transport of minerals to/from Arkhangel is also very limited, and most is towards the west. This leaves Murmansk County as the only region with a substantial transport of minerals out to Barents Sea. But the ships turn westwards, and only make use of the western part of the NSR. If the transport of ore from Norilsk to Murmansk harbour is going to stop permanently, practically all transport of minerals over a long distance of the NSR will end. There will still be some transport of local importance from Arkhangel to the settlements along the coast. Transport of coal is probably most significant.

9 FORESTRY AND WOOD PROCESSING

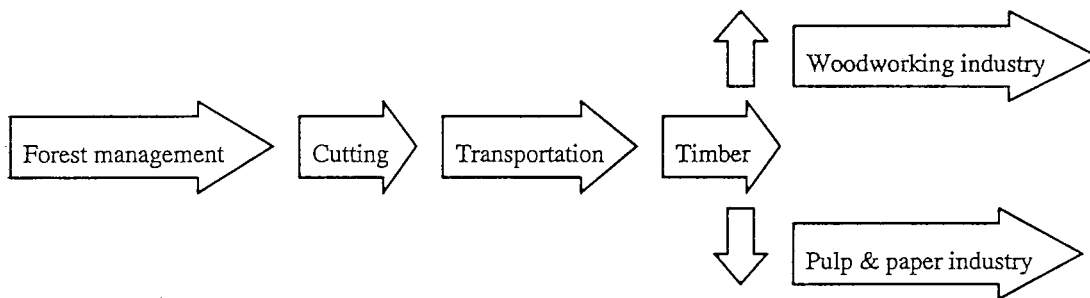
9.1 Present Situation, Trends and Characteristics

9.1.1 Timber and forest-based industry

Timber is one of the most abundant natural resources in the sub-arctic areas south of the NSR. The world's largest forest - the Taiga - stretches all the way from the Pacific Ocean to the Atlantic Ocean. West of Taimyr large volumes of timber are cut in vast and often sparsely populated areas, transported on the rivers to the industrial centres for further processing, or for export to remote markets.

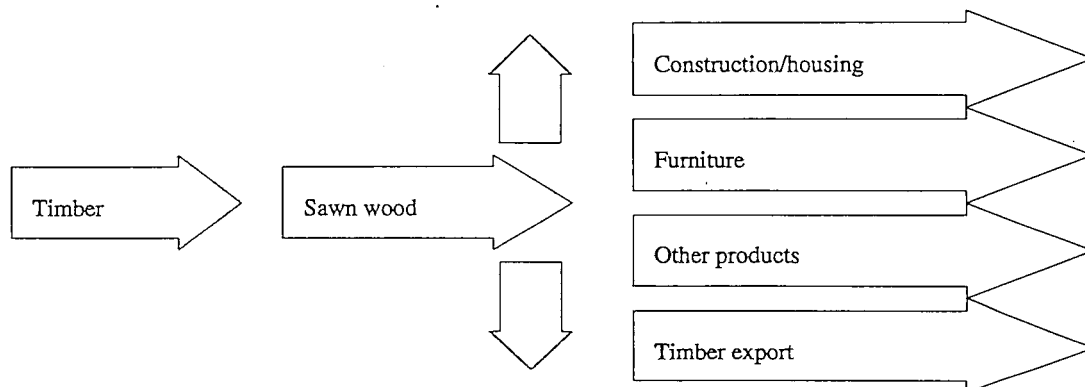
The raw material is used for different industrial activities. The timber industry can be divided into two main categories: the woodworking industry and the pulp and paper industry.

Figure 9.1 Use of timber as raw material. Value chains



In figure 9.2 the structure of the woodworking industry is illustrated.

Figure 9.2 Woodworking industry. Value chains

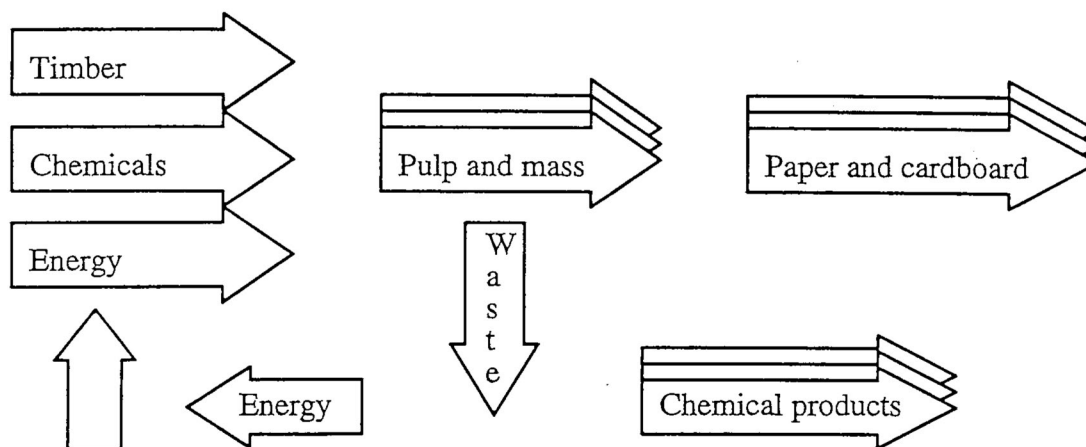


The woodworking industry gets its input from the saw and planing mills. The mills produce sawn wood and planed profiles, which are used in constructions and housebuilding, furnishing and products like pallets, imbued material and wooden packing. Within the

category construction and housing there are different branches, the most important being the construction industry, the housebuilding industry and the industry producing doors, windows, stairs etc. Some of the waste (sawmoth, chips, cut, etc.) from the woodworking industry is used as input in the pulp and paper industry.

In figure 9.3 the structure of the pulp and paper industry is illustrated.

Figure 9.3 Pulp and paper industry. Value chains



When pulp is produced the fibers in the wood are initially separated. This is done either mechanically - producing mechanic or termomechanic mass, or by steaming with lye - producing sulphite or sulphite pulp.

Timber is not the only input in this process. Chemicals and energy are also important input factors. Of the total output only about 45% is pulp and mass. The other 55% is a kind of waste, which is either deposited, recycled and used as an energy input in the production process, or used as a basis for production of chemicals such as ethanol, resins, turpentine, rosin, tanning agents etc.

On the basis of pulp and mass the paper industry recomposes the fibers to paper and cardboard. A large variations of qualities is produced.

The analysis-region is an important net exporter of timber and timber-based products to the world market. Since the end of the nineteenth century the forest-based industry has rapidly developed in the Nordic countries as well as in Russia. The volume of supplied timber has increased as the reproduction became systematically supported and new areas of forest land were made available for logging, especially in the eastern parts of the analysis-region.

The woodworking industry is significant in Sweden, Finland and Russia. Sweden and Finland are large exporters of sawn wood, prefabricated houses, doors and windows, furniture etc. The Russian part of the analysis-region supported the former Soviet Union with similar products³, but is now seeking new markets. The Norwegian woodworking industry is much smaller, and produces mainly for the home market.

³ Arkhangel alone supplied the Soviet Union with 10% of the total pulp and mass consumption, 20% of the paper and 60% of the paper bags.

In Russia most of the woodworking industry is located in the White Sea area. This industry is mainly supplied with timber from the Karelian republic and the counties of Murmansk and Arkhangel. Large quantities of sawn timber are exported, especially over the last few years. Furthermore, large quantities of sawn timber are shipped from Igarka, 500 nautical miles up the Yenisei river, every summer. Most of the export is heading for the markets in western Europe.

The development of the pulp and paper industry started in Scandinavia, but in the beginning of this century the industry spread eastward, and the total capacity rose dramatically. During the last three decades there has been a massive concentration in the Scandinavian pulp and paper industry, as the optimal size of production plants and distributional systems increased. On the Russian side the plants were constructed with extraordinary high capacity from the very beginning. While most of the Russian processed products have supported domestic needs, Central Europe is the main export market for the Nordic pulp and paper industry.

Transportation has been and still is a key factor in the development of these industries. In Russia timber from huge areas is transported on the rivers and rail. The poorly developed road system in Russia represents, however, a serious restriction to the logging activity distant from the water systems. As a result the most available areas are often utilized at a rate that is not sustainable, while large areas remain more or less untouched. Since most of the timber-based products are sold outside the region transportation is also a key factor in reaching the markets.

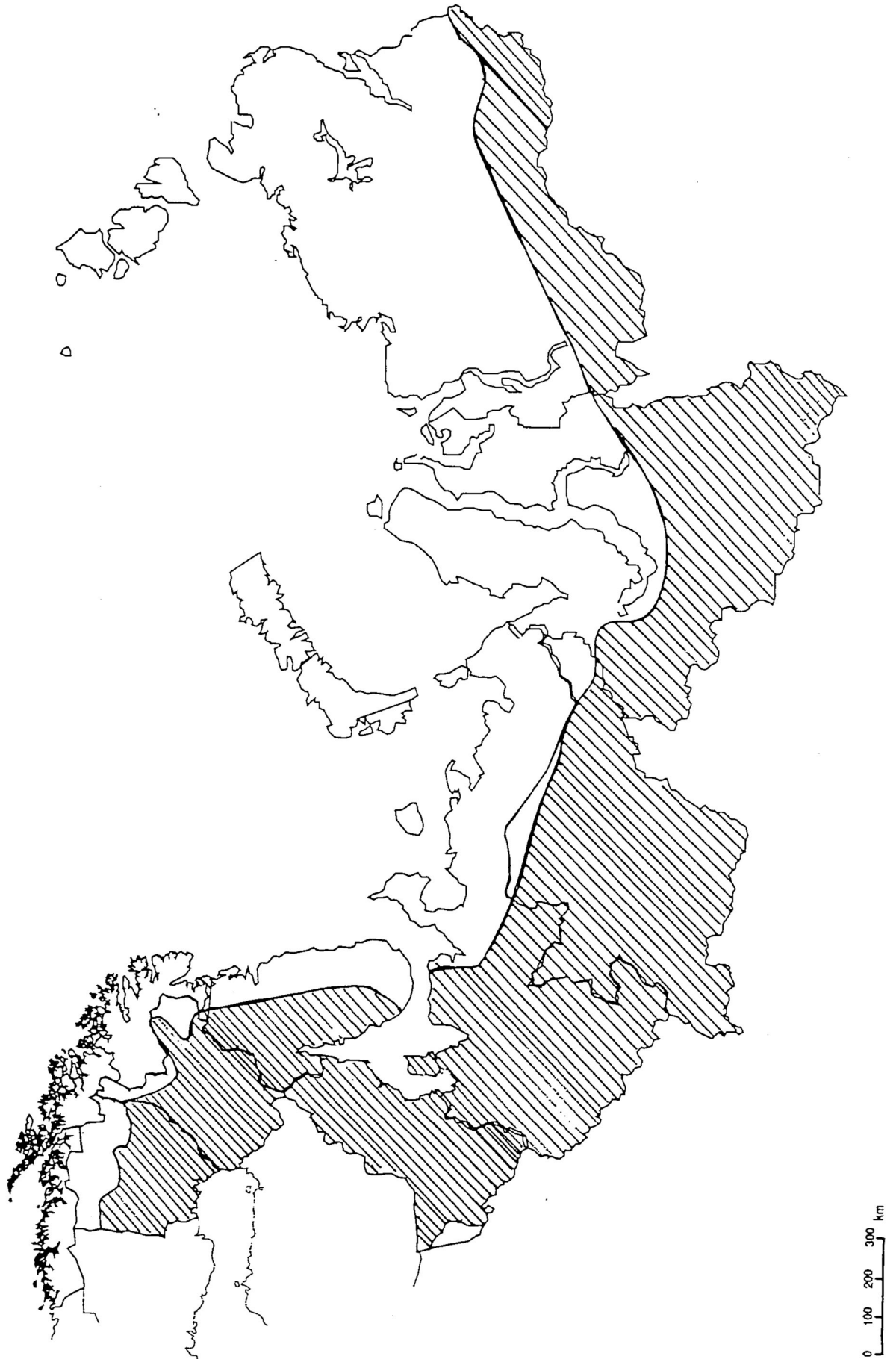
The forest-based industry has many of the same characteristics as other industries mainly based on natural resources, that is factor-determined localization, economies of scale and capital intensive production. In the Nordic countries most of the industry is located in the more populated areas south of the analysis-region, and the transportation routes are head south towards the large markets in Central Europe. The only transportation along the Northern Sea Route generated from timber and timber based export is from the Russian part of the analysis-region.

9.1.2 Factor Conditions

Timber

Timber is the most important input factor in the woodworking industry, representing 55-60% of the final product value. Labour costs constitute about 20%, and transportation costs about 10%. In the pulp and paper industry timber (including transportation) represents 35-50% of the total value, energy about 10%, chemicals 10-15% and labour costs about 10%. The timber resources in the analysis-region are enormous. The map in figure 9.4 shows the areas of productive forests.

Figure 9.4 Areas of productive forests



The areas of productive forests in figure 9.4 are covered mainly by conifers. Spruce is the most predominant species, but pine also is widespread. However, the composition of species varies within the analysis-region, and in some parts (mostly in the western and northern areas) deciduous species (like birch) is most common.

In table 9.1 the deposit figures for some of the counties are given. The figures for Yamal-Nenets and Taimyr are not available.

Table 9.1 Volume of growing stock and annual increment on forestry land

Sub-region	Volume, mill m ³	Annual increment, mill m ³	Source
Nordland, Troms Finnmark	44	1,4	Dahl 1994
Norrbottnen	250	7,6	Håkanson 1994
Lappland, 1986	283	7,5	Mattila 1986
Murmansk			
Karelia 1994	815		Eskelinen et al ed 1994
Arkhangel	2,020	16,1	Castberg/Bjorvatn 1993
Yamal-Nenets			
Taimyr			

The cutting intensity varies geographically, depending on reproduction speed, planting, policy regime, management, infrastructure and price.

Table 9.2 Annual cuttings. Mill m³

Sub-region	1985	1990	1991	1993	Source
Nordland, Troms, Finnmark				0.4	Dahl 1994
Norrbottnen	3.9	3.5		3.4	Håkanson 1994
Lappland	3.9	3.5		4.5	Mattila 1986
Murmansk		1.1	0.8		Castberg/Bjorvatn 1993
Karelia	12.2	10.8	8.9		Eskelinen et al ed 1994
Arkhangel	25.0		18.0	8.0	Nolmar
Yamal-Nenets					
Taimyr					

The supply situation in the Scandinavian countries is rather stable. The price of timber is of course an important determinant. With low prices the landowners tend to cut down the logging activity, waiting for times to improve. In Sweden and Finland, however, the land and the industry are often owned by large integrated companies, and thus some of the timber supply variations are eliminated. In Russia the land is owned by the state, and the regional authorities grant quotas for the logging activity. After a period of intensive cutting in the 1930s and 1940s, forest exploitation was dramatically reduced. In the post-war period annual cuttings were slightly increased, but over the last few years the quotas have once again been reduced, to ensure the growth of new forest. However, the Russian timber supply has dropped

far below the cutting quotas⁴, because of several, partly interdependent factors. Most important is the loss of previous domestic customers, the lack of customers with financial resources and ability to pay cash, high taxes, low morale among the workers, defective equipment and machinery and deficient infrastructure (especially roads).

The supply of timber to the regional industry also depends on the export volume of roundwood. However, dumping of Russian timber on the export markets is no longer common, since the timber prices in domestic markets have become almost equal to world market prices. Besides, increased fuel prices and transportation costs have made export less profitable.

Timber occurs in a lot of different qualities, usually corresponding to the climatic conditions where the trees have been growing. Temperature is a vital factor. Cold climate prevents illness and insects and tends to slow down the growth process, making the fibers in the wood longer. As a consequence timber grown in cold climate makes a better basis for strong building constructions, certain paper qualities and so on. However, temperature is not the only factor affecting the timber quality. Other important factors are precipitation, wind, seasonal climate variations, transportation, storage etc. Different timber qualities are produced within this large region. The best qualities are probably grown in Russia. However, all conifers are long fibered, and the timber grown within the analysis-region has in general a unique quality - that can only be compared with timber from Canada and the rest of Siberia. Because this long fiber quality is more expensive it is used only for special products such as plywood products, newsprint and magazine paper.

Timber from the analysis-region can to some extent be substituted with timber from other regions, with recycled fibers or with other raw materials. In the pulp and paper industry recycled fibers have already become a major input factor (for newsprint 34% world-wide), and the use of recycled fibers continues to increase. Shorter and less expensive fibers from tropical and sub-tropical areas are used to cut down costs. In principle the woodworking industry is in a similar situation, but for the time being high quality timber from the north is more often preferred and is therefore in itself in a substituting position.

Within the analysis-region the price of timber is high compared to long fibered timber from regions like Central Europe, the USA and Brazil. The price is also high compared to substitutes like recycled fibers (in the mass and paper production). Altogether, this puts a downward price pressure on regionally produced timber, and there is reason to believe that this pressure will be reinforced in the years to come.

The increased use of recycled fibers in the production of paper and cardboard has debilitated a major advantage for the pulp and paper industry to be located close to the timber resources. Location near densely populated areas, where the recycled paper is produced, has become relatively more profitable than before.

Energy

Energy is another important input factor in the production of pulp and mass. As explained in section 9.1.1 only about 45% of the total output from this industry is pulp or mass. The other

⁴ The drop in timber volume according to official statistics is overestimated, partly because of the lack of data from Joint Ventures.

55% are either deposited, used as a base for alternative products or recycled and used as an energy input in the production process. Consequently, the need for external energy supply depends on how much energy is produced by recycling. Besides, new technology and new production concepts have reduced the consumption of energy in the pulp and paper industry by about 20% over the last ten years.

In Sweden, Finland and Russia the production of electricity is generally based on either coal, petroleum or nuclear power, but there is also hydroelectric power. The price of energy in Sweden and Finland is relatively low compared to most European countries, but compared to Norway and Canada the price is high. However, liberalization and internationalization of the Norwegian market for hydroelectric energy now tends to even the energy prices between the Nordic countries. In Russia the energy price has increased significantly over the last five years. Key industries like the pulp and paper industry, however, still buy electric energy to prices below the Nordic average.

Future supply of energy in the analysis-region is hard to predict. It is reasonable to believe that the relative costs will increase in the long run, mainly because of the environmental impact of energy production. Furthermore, national prices will tend to converge, as more infrastructure for distribution is built and the cost of transmission is reduced.

Labour

In the northern areas of Sweden, Finland and Russia forest-based activities are the most important economic sector in terms of employees. In Karelen more than 40% of the republic's industry is based on timber (Eskelinen et al 1994). In Arkhangel about 59,000 people are employed in logging, 42,500 in saw mills and woodworking industry, 24,000 in the pulp and paper industry, 8,500 in forest authorities and 14,000 in rafting (Castberg and Bjorvatn 1993).

The labour costs vary significantly between the Scandinavian countries and Russia. While an operator's salary in Scandinavia is about 2,000-2,500 USD a month, Russian employers have to pay about 150-190 USD for a skilled worker. Nevertheless, the Russian industry still find the labour cost too high, and they stress the disadvantage caused by the government fixing the wages in the northern areas to a level above the domestic average.

Worker's education, skills, attitude and productivity are often used as an explanation of wage differences. However, the supply of skilled and motivated workers seems to be satisfactory in most parts of the analysis-region. In general the labour market is rather slack. Cultural differences appear, but this cannot explain the differences in labour costs. On the other hand, managers who know how to run a business in a flexible market economy are still rare in Russia. In most companies the leaders from the period of plan economy are still in position.

On the Nordic side young people aspiring to work in the forest or in the forest-based industry get their education locally or in the southern parts of the countries. On the Russian side there is a specialized university in Arkhangel, training students in different subjects relating to this business. Exchange of students and cooperation between colleges, within the analysis-region and across national borders, is now extended. More extensive cooperation and exchange of information, new ideas and insights between the countries will, however, be necessary to speed up the upgrading process. Such a policy will be beneficial to all parties and to the analysis-region as a whole. Labour mobility between the countries is very low. However, as mentioned, some student exchange programmes have been established lately.

In the pulp and paper industry most of the research and development (R&D) is carried out as company internal activities. Some consultancy companies and research institutions in the area are also important for the upgrading process in the industry.

Technology

During the past decades the technology in the woodworking industry has become quite advanced. Mill automation and data assistant production have already entered the production process, at least in the Nordic countries. In Russian industry the technology is less updated. Most of the equipment and the machinery here are produced in Russia, and some of it is imported. Common for both categories, however, is that it is often old.

The pulp and paper processing technology is continually developing. New chemical based mass production processes, substitutes for chloride bleaching agents, new products based on waste, large integrated factories, new machinery for large scale paper production etc., have changed the conditions for how to make this industry competitive. In general technological development has increased the advantage of scale economy. In newsprint production an efficient plant needs an investment of 200-500 million USD, and the plant will have a lifetime of 20-30 years. The situation in the Russian pulp and paper industry is even worse than for the Russian woodworking industry. In most of the factories the machinery is old, and consequently the technology is out of date. For instance at the Solombola-factory in Arkhangel the machinery is more than 30 years old.

For Russian industry modern technology is available in theory, but in practice high prices and shortage of capital prevent needed modernization programmes. Besides, in Russian forests the foreign equipment is sometimes inadequate, because it is not designed for the summer season in the boggy landscape that is characteristic for this area.

In general there is still room for rationalization by introduction of new technology in forest-based industry, both in Scandinavia and in Russia. With full automation even more people may be replaced.

Capital

Shortage of capital is often said to be the main reason for the current difficulties in the forest-based industry, especially on the Russian side. In reality the matter is more complicated. If investments in this industry gave high returns at minimal risk, capital would certainly be attracted. Besides, profitability would enable continual accumulation of capital.

The fundamental political changes in Russia have altered the national economy and created a difficult situation for Russian industry. To compete on the export markets much of the Russian forest-based industry has to modernize, in order to improve product quality and rationalize production. However, capital is not available, or the cost of capital is too high. In the summer 1994 the interest was about 300% pa, and the inflation was out of control. Foreign capital owners are considering entering to enter Russian forest-based industry, but hesitate for several reasons. First of all, the need for capital is often very high, and the risk involved is sometimes estimated to be unacceptable related to profit rate. Protection of private property, timber supply prospects, future tax policies, export regulations etc. are considered to be unpredictable. Furthermore, the European capacity of production exceeds current demand in several markets, which means that the timing is not optimal. Nevertheless,

foreign capital has to some extent been invested recently in both the woodworking industry and the pulp and paper industry in the Russian part of the analysis-region.

9.1.3 Demand Conditions

Demand

As described in section 9.1.1 Europe is a net importer of timber and forest-based products, while the Nordic countries are large exporters to the European market. The Russian part of the analysis-region used to support internal markets in the former Soviet Union. After the collapse of the Soviet Union some of these markets have become external and protected by new trade barriers, others have disappeared or changed.

The European market is characterized by strong competition, and segmentation on quality and price. Because of its expensive timber the Nordic countries have to compete on the high quality segments. Especially on prefabricated houses, furnitures and newsprint the Nordic countries have achieved a strong market position. In the European newsprint market the three largest Nordic companies, Stora Feldmule (Sweden), Union Paper Mills (Finland) and Norske Skog (Norway), cover about half of the total demand. In Russia former important markets have shrunk or become inaccessible. Consequently, Russian industry has turned to export markets seeking new opportunities, and the export of products like roundwood, sawn wood, pallets, plywood, pulp, paper and cardboard to Europe and North Africa has expanded. But the results are only halfway successful. In the beginning of this decade trade barriers were put up to prevent strategically important products from leaving the country. This chokes the export volume. Later on these export restrictions were gradually loosened, but the Russian industry still has difficulties in supplying the export markets with requested qualities on schedule.

With the present technology, Russian saw and planing mills lack the ability to produce high quality profiles and other processed products for the export markets. Most of the export is therefore roundwood and sawn wood, which is further processed in Europe. In 1993 the Lenin Mill in Arkhangel exported 90% of the total production of sawn wood to Germany, the Netherlands, Belgium, Great Britain and France. Traditionally the Far East has not been an export market for timber and timber based products from the northwestern parts of Russia. In 1993, however, large volumes of sawn wood were exported from Igarka to Japan, because of favourable prices. In Russia new markets emerge. For instance a new group of wealthy Russians now demand a variety of high quality consumer products (houses, windows, doors, furniture, etc.). These markets even accept premium prices compared to western markets. The Russian industry has great difficulties in meeting the new design and quality standards, however.

The paper market is divided in a number of quality segments. Geographically, however, the different qualities are quite homogeneous across national borders, the main difference being perhaps that rich countries buy more high quality products than less wealthy countries. In these rich countries, for instance in Western Europe, the markets also demand a large variety of qualities and an ability to deliver just-in-time. The Russian pulp and paper industry therefore exports mass to the European markets for further processing. In 1993 800,000 tons of mass and cardboard were exported from Arkhangel to Europe (Arkhangel Port administration).

Transportation

Exports from the Nordic countries to Central Europe follow the main transport routes on land and through the southern ports of these countries. To be able to deliver just in time several Nordic paper producers have invested in their own vessels and terminals for transportation to Central Europe. From the Russian part of the analysis-region most of the export of timber and timber-based products are transported on vessels along the western part of the Northern Sea Route.

As described in chapter 5 timber from Igarka and other ports along the Yenisei is exported directly to the European markets on ice strengthened vessels from the Northern Shipping Company of Arkhangel. Because of heavy ice conditions in the wintertime, timber is transported from Yenisei only in the summer. Almost no timber from Yenisei is transported to the White Sea area for further processing. The timber is exported as roundwood and sawn wood. As mentioned, timber has lately been exported from Igarka to Japan. However, this cargo was transported on the Trans-Siberian Railway, and not along the Northern Sea Route. From the White Sea area all timber for export is transported on vessels into the Barents Sea and southward. In the wintertime the White Sea is covered by ice. Nevertheless, timber is shipped from Arkhangel the year round. From January to May only Russian vessels operate in the White Sea, but during the rest of the year foreign vessels also call at ports here. The Northern Shipping Company has about 80% of the timber transportation volume over the port of Arkhangel. The cost of winter transportation when exporting timber from the White Sea is about 10-20% of the cargo's total value. Another 15% has to be paid for ice-breaker assistance.

9.1.4 Firm Strategy, Structure and Rivalry

In the Nordic countries many small and medium-sized factories were established in an early phase of the development of this industry. The history of Russia is different. Here factories were often planned large from the start. For instance three very large pulp and paper plants are located in the county of Arkhangel. The plant in Kotlas is supposed to be the largest in the world. Furthermore, as described in chapter 5, Russian companies are usually vertically and horizontally integrated enterprises. In the Nordic countries the forest-based industry has also changed to larger and more rational plants, and to larger and more integrated companies. This development continues. In the woodworking industry large companies like IKEA have been very competitive.

In the pulp and paper industry just a few companies now dominate the European market. In newsprint seven companies supply about 70% of the market, and six of these companies are controlled by Nordic capital. The pulp and paper companies have become more and more integrated, the plants have become more specialized and the minimum effective plant size is growing.

Russian forest-based industry moves to some extent in the opposite direction. The large integrated enterprises are split into smaller and interdependent private companies. However, the starting point is different. Both the factories and the companies are usually very large. Russian so-called combines have internalized public functions like kindergartens, fire stations, hospitals etc., as well as upstream and downstream commercial functions. Besides demergers are often a necessary part of the privatization process, when competition is to be stimulated.

Both the woodworking industry and the pulp and paper industry are normally located close to timber resources, and sometimes close to energy resources. The reasons are historical. Timber supply was ensured, and based on local markets transportation costs made such a location profitable. However, the situation is changing. Market barriers are removed and homogeneous European markets prevail in nearly all segments. Market contacts, information, distribution and just-in-time delivery become more important, and favouring a more central localization. In paper production recycled fiber is also produced in the most populated areas.

This could mean a relocation of the forest-based industrial activity towards Central Europe. However, the Nordic cluster is strong and viable, and with an extended cooperation and integration eastward an even stronger and more dynamic regional cluster could be evaluated. The alternative could be a situation where Russian timber undermined the Nordic position on the European markets. The whole area could then end up supplying the industry in Central Europe with raw material and semi-manufactured products.

9.1.5 Related and Supporting Industries

In Sweden, Finland and Russia strong supplier industries or related industries are present. Equipment and machinery for the forest-based industry are produced. However, the suppliers of equipment and machinery are located in the southern areas of Sweden and Finland, that is outside the analysis-region. Especially Swedish and Finnish products are internationally competitive. The Swedish and Finnish engineering and consultancy companies related to the pulp and paper industry are among the world's most competitive. Close and dynamic relations between the supply and demand side are developed.

In Russia, high-quality equipment, machinery and components often have to be imported. For instance a Russian/Norwegian (joint venture) producer of windows and doors in Arkhangel uses foreign machinery and imported inputs like screws, mounting, lacquer, paint and glue. Inputs like pane and veneer are bought locally. The disintegration of the large Russian combinats is important to release the ties between the industry to local suppliers of low quality input.

Scandinavian and Finnish educational and R&D-institutions related to the forest-based industry are viable and cooperate closely with the industry, but in general they are located in the south. In northern Russia both the Central Mechanical Woodworking Research Institution at the Pomorsky State Pedagogical University and the Academy of Science's Arkhangel Research Centre of Ecological Problems of the North are located in Arkhangel.

In all parts of the analysis-region there are also several public institutions and authorities supporting, directing and controlling the timber industry. It is hard to describe this sector and the effects of it in general terms. Partly it has conserved inefficient structures, and partly it has stimulated modernization and change. In the Russian part of the analysis-region it is of special importance that more decision-making is now done by the regional authorities.

9.1.6 Economic Policy

As described in chapter 6, in all three countries the most northernly counties enjoy special grants designed to stimulate business development and employment in the area. In Norway and Russia individual benefits are introduced as well. These arrangements are supposed to compensate for higher costs in production, transportation and living. The Barents Region initiative offers a framework for political, cultural and commercial cooperation across the

national borders in the analysis-region. However, there are no special funds to finance concrete projects that might be created within the framework of the Barents Region.

The opportunities for business cooperation between the countries in the analysis-region are based on differences more than similarities. While the Nordic industries need stable supply of natural resources, Russia has large unused reserves of for instance timber. Russian industry needs improved infrastructure, market access, know-how and capital to upgrade production. With respect to the forest-based industry, much of this could be offered by the Nordic countries. Besides, the location of resources and cost of manpower are positive elements making investments in Russia more attractive. However, Russian economic policy restricts the eagerness of potential investors. Export barriers, uncertain rights of possession, restrictions on foreigners rights to own land, frequent changes in legislation and bureaucracy make foreign investors pursue a wait-and-see policy.

9.2 Future Development

9.2.1 Competitive advantages/barriers

The Nordic forest-based industry may be characterized as a strong and dynamic cluster. To compensate for high timber prices the industry has become innovative and cost-efficient. New methods of production, new products and structural and organizational changes have strengthened the competitiveness of the industry. In the woodworking industry prefabricated houses and IKEA furniture are examples of Nordic success. Although the Nordic company integration is quite weak, dynamic relations across borders can easily be identified. The Nordic pulp and paper industry has an even stronger international position. High input prices and strict environmental regimes have forced the industry to innovate and upgrade its competitive advantage. As a result the Nordic pulp and paper industry is technologically in the forefront.

In Russia the forest-based industry experiences multiple problems and depression. However, the timber resources and the capacity of the woodworking industry and the pulp and paper industry are enormous. Future development of this Russian economic sector may therefore have a great influence on markets and structures in other parts of the analysis-region and the rest of Europe. The regional size, structure and dynamics of the forest-based industry will be the most important competitive advantage for future progress and development within this sector.

Another competitive advantage which has been really important for the forest-based industry in the analysis-region is its localization close to large, high-quality timber resources. As previously described, however, this advantage is losing significance for several reasons. First of all, the importance of being close to the main markets has increased relatively, as market preferences are changing more rapidly and just-in-time delivery has become a rule. Secondly, cheaper input substitutes like short-fibered timber and recycled paper are produced in or closer to the main consumer markets. Finally, the optimal size of processing plants has increased. Consequently, the logistics of a scattered and small-scale industry structure is no longer a real alternative. The collection of raw material has already been centralized, and the advantage of being localized close to resources has been correspondingly reduced. Even the pulp and paper industry's advantage of being localized close to the energy sources (like in Norway) is reduced.

This could mean a geographical distortion of value chains, moving more of the final product processing towards densely populated areas, while the peripheral areas of woodland become producers of raw materials or semi-products. Such a development would be very negative for all parts of the analysis-region. Nevertheless, it could be the situation unless the Nordic and the Russian forest-based industry cooperate and reinforce the regional structures and dynamics.

9.2.2 Growth and trade potential

The growth potential of the regional forest-based industry essentially depends on two factors:

- the general rate of growth in Russia and previous COMECON countries
- the development of a regional cluster of forest-based industry

Generally speaking, the markets for timber based products in Western Europe will probably grow at a moderate rate. In the furniture market the potential for high quality wooden products from the area might be quite high. In other markets, however, like newsprint, the growth potential is less favourable, and the input of long-fibered mass based on timber from the analysis-region will probably be reduced.

Demand stimulated growth might therefore be dependent on the future growth rates and income distribution in Russia and other previous COMECON countries. In Russia new markets for timber based products have emerged and are rapidly growing. So far, however, the growth of these markets depends on a distortion and concentration of wealth, rather than on a genuine economic growth. The first question is whether this situation will be followed by general economic growth that stimulates consumption at a broader level.

The second question concerns the future role of the analysis-region within the context of international value chains; whether the region will become more of an exporter of timber raw material, or the dynamic centre of Russian-European forest-based industry. To avoid weakening of the total industry structure and employment transfer to Central Europe, industry relations between Russia and the Nordic countries have to be improved. To stimulate business cooperation between the countries in the analysis-region it is important to open up for goods and capital movements. Investments in business development and infrastructure should be planned within the framework of consentient regional strategies.

9.2.3 Changes in transport demand

Assumed positive sustained economic growth in Russia and the Eastern European countries, Russian forest-based industry might continue to supply these markets. To modernize Russian production foreign capital is needed, but this could be attracted even without further integration with Nordic industry. Under such a scenario the patterns of transportation could be much like in the past, with most of the Russian production being transported south and east, and most of the Nordic production heading south and west. The Northern Sea Route would then be more or less unaffected by the development of the forest-based industry.

The other scenario is the development of a regional forest-based industry, based on integrated and dynamic relations across national borders. The analysis-region might then become the active centre of an international industry. If so, the patterns of transport could be changed significantly. Export could expand both ways, from the Nordic countries and eastwards, and from Russia and westwards. Being a strong international industry even export to the Far East

could be expanded. The Northern Sea Route could then be an important transport route for timber based products, both to the North Atlantic markets and to the North Pacific markets.

10 OIL AND GAS EXPLORATION

This chapter will first give a general review of the present situation for petroleum extraction and the search for new deposits in the analysis-region. The second part will make some hypotheses concerning future developments of oil and gas activities and related industry. The main concern will be about how this activity can generate new, or even extended transport along the Northern Sea Route.

The main areas for petroleum extraction offshore within the analysis-region are the Central Norwegian Shelf, the Northern Shelf (Norwegian and Russian part of the Barents Sea), Pechora Basin and Kara Sea. The most important onshore activities are found in Arkhangel County (Nenets okrug), Yamal-Nenets okrug (a part of Tyumen region) and to a limited extent Taimyr okrug (a part of Krasnoyarsk region). Joint solutions on logistics will also make the hinterlands interesting for transport.

10.1 Present situation, trends and characteristics

10.1.1 The Norwegian part of the analysis-region

This survey will concentrate on the northern part of the central Norwegian shelf (from 65° to 67° N) and the Northern shelf above 69° N (see map). These fields are located on the continental shelf off Northern Norway, but cannot be seen as the property of the region. The shelf belongs to the Norwegian State, but the activity will be investigated as an important contribution to the development of industries onshore and sea transport from the fields (via terminals/pipes) to the markets.

Oil and gas have been produced from the rich North Sea Shelf since the late 1960's, and domestic technological knowledge has developed in a rapid manner. When it all started, Norway was dependent on foreign know-how, but after some decades, both knowledge and Norwegian produced equipment have made the related industries more competitive. The first fields in production are now about to be exhausted, and new fields have to be developed further north.

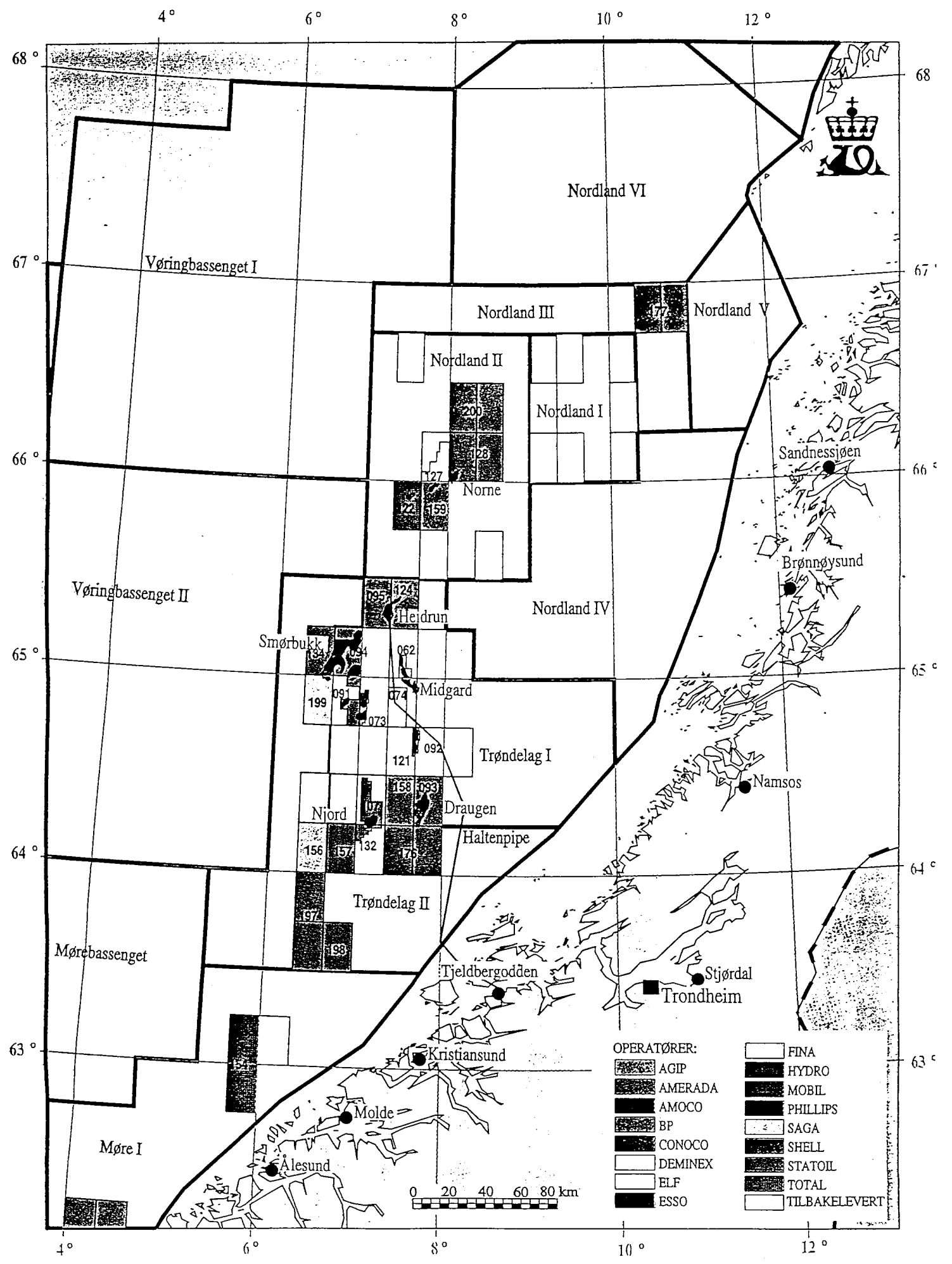
Central Norwegian Shelf

Exploration began on the central Norwegian shelf in 1980, and oil production started in the southern part in 1993. The first discoveries in the northern part (outside Nordland County) were made in 1991. Oil from the Norne field will be the first to come from Northern Norway, and the first delivery is scheduled in 1997/1998. Total recoverable reserves are about 70 mill m³ of crude oil and 10 billion m³ of natural gas. With a daily production of 160,000 barrels, the Norne field will last for 20 years (Norwegian Oil Review). Logistics are solved by a production ship to store crude oil, before transferring it to tankers. The discussion of where to put the administrative centre onshore is not decided, but Harstad may become the capital of petroleum activity in Northern Norway.

Barents Sea

The first promising gas discoveries in the Norwegian part of the Barents sea were done in 1981 in the Askeladden field, and in 1992 in the Albatross field. But there were many obstacles to

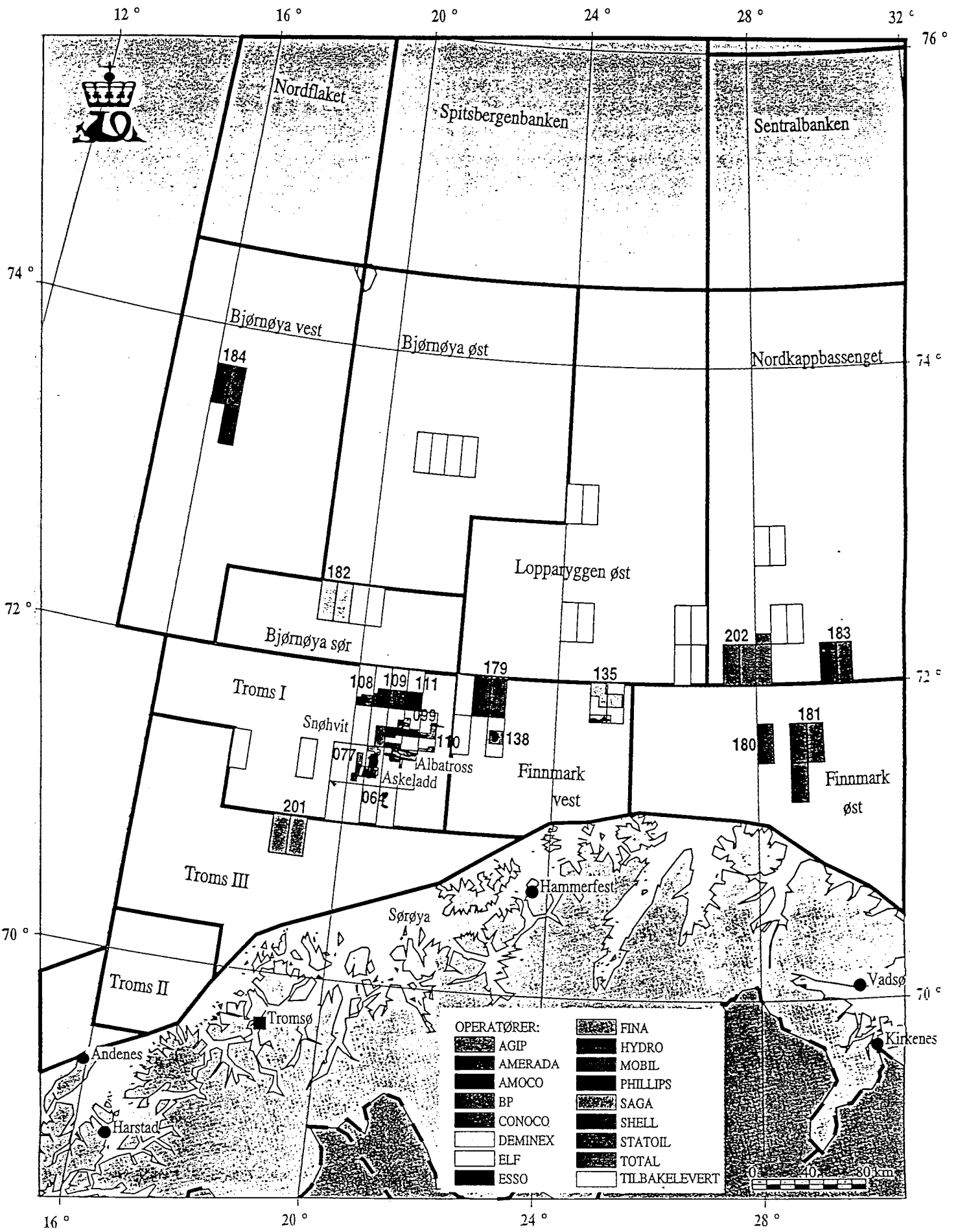
Norskehavet



OPERATØRER:

	FINA
	AGIP
	AMERADA
	AMOCO
	BP
	CONOCO
	DEMINEX
	ELF
	ESSO
	HYDRO
	MOBIL
	PHILLIPS
	SAGA
	SHELL
	STATOIL
	TOTAL
	TILBAKELEVERT

Barentshavet



expanding the activity further northwards. Environmental factors were important as the area is rich on fish resources and an important work-place for Norwegian fishermen. Deep water and a harsh climate made exploration more difficult and costly. Operations were delayed several times because of local protests and unstable market conditions for gas deliveries. The climate shifted in the mid 1980 s. Regional authorities supported petroleum exploration as the fishing industry experienced a crisis and serious economic problems affected the region. New employment was needed, and petroleum activities were seen as a solution.

The largest gas reserves were found on the Snøhvit field in 1984. With prospects of producing 110 bill m³ of natural gas, the finds resulted in enormous expectations for development of local employment and industry (Norwegian Oil Review). A base was built outside Hammerfest to supply the Barents fields with equipment. It was never an important receiver of products from local industries, but transitstation for equipment from southern Norway and abroad. Several projects on logistics alternatives were worked out starting with direct transport of the gas from the field. The gas would be cooled down to liquid and stored on ships to the market. In a longer perspective, there were plans to build a pipeline to the Slettnes terminal where the gas would be transformed to LNG and transported to the market by ship. A methanol factory was also considered in connection to the terminal. However, all these projects were based on ENEL, Italy as the buyer of the LNG. Negotiations broke down in 1992 as a result of disputes about the price. When the rupture was a fact, all plans stopped, and the production start was postponed.

Anyway, the resources are there, the technology is worked out and plans are ready to start production. Statoil is only waiting for a buyer who can offer a reasonable price for the gas.

The proven reserves in the Norwegian part of the Barents Sea are estimated at 0,27 billion toe, 98 per cent of it is gas (Norwegian Oil Review)

Table 10.1 Proven reserves in the Norwegian part of the Barents Sea

Oil	7	mill m ³
Gas	257	bill m ³
NGL	9	mill ton
toe	272	mill ton

Source: Royal Norwegian Ministry of industry and energy

About 35 exploration licenses have been distributed in the Norwegian part of the Barents Sea, and 53 wells have been drilled. The finds are of small or medium-scale. After all, the resources together with proposed logistics solutions are at present (except for Snøhvit) not commercially viable for production. The first optimism dropped, and few companies wanted to invest more money in exploration. Most licenses for exploration were returned, and the Norwegian Government made more profitable conditions for the companies in June 1994. Applications for exploration licenses may now be sent by a group of companies, and the distributed blocks are bigger. The risks and costs of drilling can be shared, and the technology exchanged. Some fees are reduced and the period of licence is prolonged to 10 years. The climate has recently shifted from competition to cooperation among the companies, and Hydro, Statoil and Saga joined three more foreign companies for further exploration.

Before turning to the Russian part of the Barents Sea, a note should be made on the disputed sea area of 155,000 km². Norway and Russia have negotiated over a delimitation line since 1974.

Norway claims that the boundary should be drawn according to the median line principles, whereas Russia claims the sector line. Gas finds have been made by Russia in this area, and the potential for new resources is probably considerable. Exploration is impossible as long as the area is disputed. There are propositions to develop a common Norwegian-Russian jurisdiction of the area.

10.1.2 The Russian part of the analysis-region

Russia has produced oil and gas onshore under a harsh Arctic climate in Siberia for a long time. The centre of West-Siberian petroleum activity is situated in Urengoy in Yamal-Nenets okrug. New test fields have been made further north, and production will start first of all in the areas that can be connected to existing infrastructure.

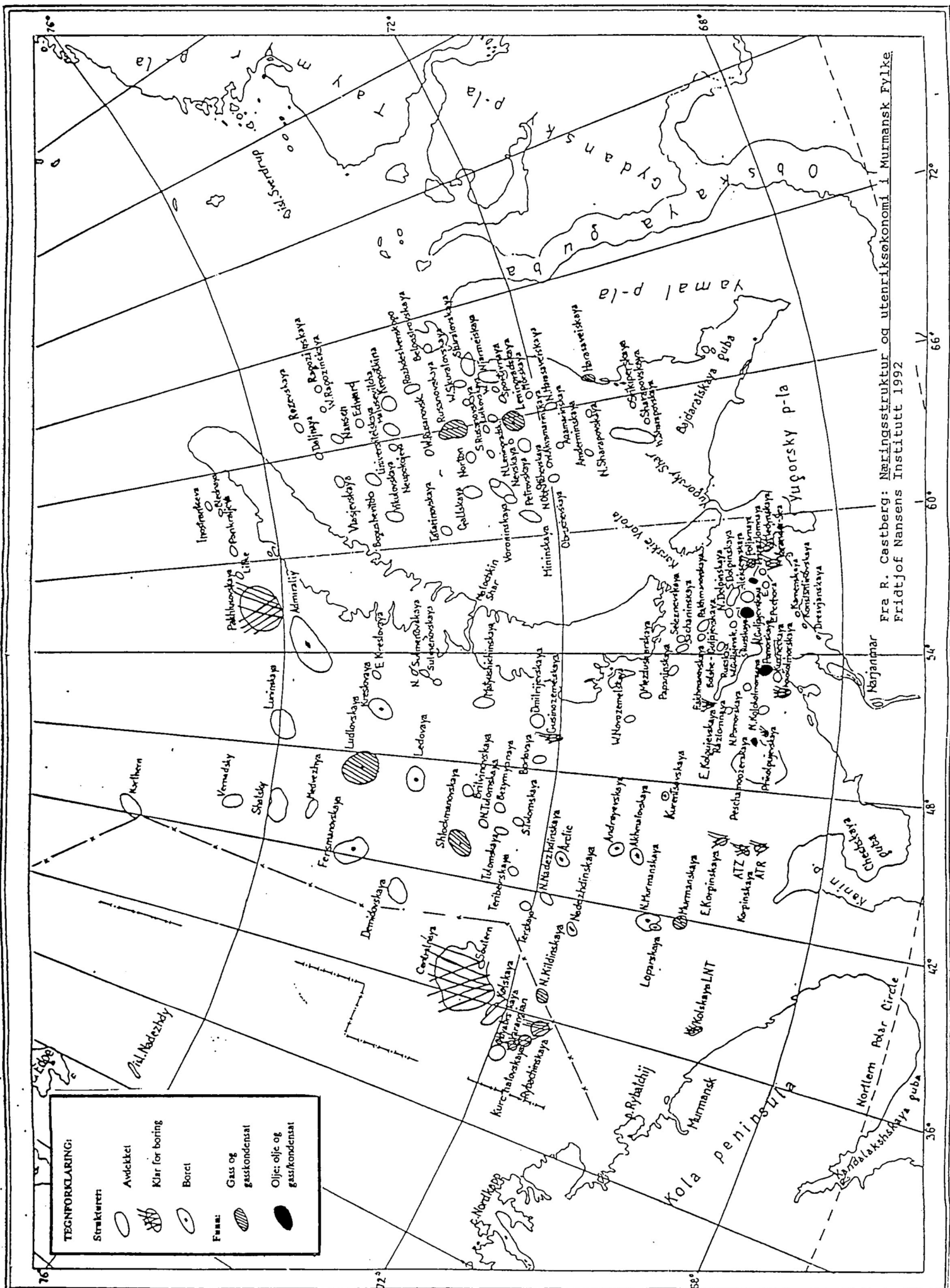
Exploration offshore has been limited by a lack of technical knowledge and financing. The new finds in the northern part of the analysis-region are more spread, though together they make up considerable revenues. Production on these fields must be considered in connection with other operative fields, costs and markets. One reason for postponing production is that Russia has traditionally concentrated production from mega fields. Infrastructure is so expensive in these areas, that only fields with substantial resources over a long time can be taken into consideration.

An other important factor is the ownership of property where the resources are found. Oil and gas offshore are exclusively federal property, while landbased resources are shared between federal and regional authorities. This fact matters when it comes to priorities of fields to be developed; who shall be the operator, and who shall get the profit of production. Offshore activity in the Barents Sea reflects the general priority of Russian authorities concerning energy policy, while onshore activity in Arkhangel County is more a question of regional priorities. Decisions are here partly made at a lower level (regional authorities can at least stop a project). Regional authorities and regional geological survey organisations in Arkhangel have invited foreign companies to cooperate. The main aim of cooperation is to get foreign expertise and capital for investments. Joint ventures and cost sharing arrangements are now seen to become more and more commonly acceptable for first development between Russian and foreign companies.

Both state owned companies and regional authorities are interested in more export of their petroleum production. Oil and gas export has for a long time been the main source of income for the federal budget, but an increasing budget deficit and general economic problems have led to a search for more hard currency. The domestic market for the product is even more acute. The dissolution of the Soviet Union has disrupted the market and transport routes for Russian petroleum. In addition, the internal Russian demand has decreased dramatically due to:

- * increased prices
- * the energy intensive industry has reduced production or closed down
- * distribution lines have changed with the new independent states and made transport more expensive

An increase in internal demand is dependent on a stable economic and political situation, and is not expected for the first years. Increased export will be more profitable. Export is probably the only solution to keep production at a stable level.



TEGNFORKLARING:

Strukturen	
Avdekket	
Klar for boring	
Boret	
Funn:	
Gass og gaskondensat	
Olje; olje og gass/kondensat	

Fra R. Castberg: Næringsstruktur og utenriksøkonomi i Murmansk Fylke
 Fridtjof Nansens Institutt 1992

76° 72° 68° 66° 60° 54° 48° 42° 36°
 26° 32° 38° 44° 50° 56° 62° 68° 74°

Conditions for increased export will first of all depend on sufficient revenues and decisions to develop and start production on new fields. A general view of existing and potential fields, present and planned production is evaluated below.

Barents Sea

The Shtockmanovskoye field in the Barents Sea was discovered in 1988, 600 km north-east of Murmansk. Revenues are estimated at the enormous amount of 2500 bill m³ gas, about 20 times as much as the Snøhvit field in the Norwegian part of the Barents Sea (Dahl-Nygaard and Bjorvatn 1993). The area is covered by ice 6 months of the year, and makes production difficult and expensive. A letter of intent was signed in 1989 between some foreign companies and the Ministry of Oil and Gas to consider technical and economical requirements for development of the field. Arktikmorneftegazrazvedka was engaged on the Russian side to do geological research, while Neste (Finland) should be responsible for the economy, Wärtsila and Metra (Finland) for gas transport and Norsk Hydro (Norway) for development of the field. The group was called "Arctic Star", and concluded that commercial production is possible; development could start in 1993, and production in 2000. Annual production is estimated at 50 bill m³ (Dahl-Nygaard and Bjorvatn 1993). The western firms hoped to play an important role in the development, until a new actor, Gasprom appeared on the stage. With a decree of November 1992, Yeltsin gave Rosshelf (owned 51% by Gasprom) the right to develop Shtockmanovskoye field. The foreign firms were forced to leave. Yeltsin preferred Rosshelf to protect the Russian work force since Rosshelf was given the task to transform earlier military enterprises to civil production. *Arctic Star* wanted to extract gas for export, while Rosshelf wanted to sell most of it to the Russian market. Arctic Star preferred foreign sub-contractors, while Rosshelf would use Russian.

Murmanskoe gas field is situated north-east of Murmansk city. This field was of great interest, with reserves over 100 bill m³, until Shtockmanovskoye was discovered. Development is probably not viable as long as Shtockmanovskoye can produce much more gas (Dahl-Nygaard and Bjorvatn 1993).

Kara Sea

Rusanovskoye field east of Novaya Zemlja in the Kara Sea, not far from the Yamal peninsula was discovered in 1989. This field contains much bigger gas reserves than Shtockmanovskoye. Not far from this field, is the Leningradskoye structure, also with enormous gas reserves.

Pechora Sea

The most promising field in the Pechora Sea is Prirazlomnoye in the southern part not far from the shore. Rosshelf was given the right to develop the field in 1992, and has discovered enormous oil reserves. This is probably the most interesting oil field offshore in the north, and the one that it seems reasonable to start producing on first. Technical and economic studies are under consideration. Rosshelf has signed a cooperation agreement with BHP Petroleum (Australia) to carry out joint geological evaluations. There are also plans to go further and sign a contract with Gasprom on production. Preliminary figures for extraction have been set at 4 mill tons per year (Dahl-Nygaard and Bjorvatn 1993).

Table 10.2 Main offshore fields in the Russian part of the analysis-region

Barents Sea	Murmanskoye	gas
	Shtockmanovskoye	gas and condensate
Pechora Sea	Prirazlomnoye	oil
Kara Sea	Rusanovskoye	gas and condensate
	Leningradskoye	gas and condensate
Total recoverable reserves	Oil	400 mill tons
	Gas	12 000 bill m ³

Source: Dahl-Nygaard and Bjorvatn 1993

Activity onshore in Nenets okrug

The first oilfields in Nenets were opened in 1966, but production has been limited due to difficult conditions and many revenues. As long as the area was under exploration, it was never of great interest for the mega stateowned companies. The regional geological association Arkhangelgeologia, was set to do explorations, but needed expertise and financial support. During the past years, Arkhangelgeologia has started cooperation with foreign companies and formed joint ventures with some.

The activity has moved into a new phase where some of the foreign companies are interested in signing production-sharing contracts for commercial production. The Ministry of Fuel and Energy and the Government started to be more active. The federal authorities claim a higher per cent of the distribution of profit, and want to diminish the role of Arkhangelgeologia for the benefit of Rosснеft. The purpose is obvious; to strengthen federal control and profits from production. The geological enterprises now have a looser connection to the Russian Committee for Underground Resources (Roskomnedra), and are not given more state funding. The enterprises are transformed to joint-stock companies, and have to live on their production quotas which all can be exported. Arkhangelgeologia has a quota of 400,000 tons per year (Dahl-Nygaard and Bjorvatn 1993).

Today's production

Oil was first found on Kolguyev Island in the Pechora Sea in 1980, and limited production takes place. The Arktikmorneftegasrazvedka production association (a division of the Murmansk-based state enterprise Rosснеft) has a licence to extract and export 50,000 tons of crude oil per year. The first export was made in 1987, and makes it possible for the enterprise to earn some hard currency. Arkhangelgeologia has a licence of 100,000 tons per year, but this was not fulfilled in 1992. Arkhangelgeologia and Arktikmorneftegasrazvedka operates a floating sea terminal at Kolguyev Island (Dahl-Nygaard and Bjorvatn 1993).

Only one oilfield has full commercial production going on today; Kharyaginskoye field in the southern part of Nenets is operated by Arkhangelneftegas (a division of the joint stock company *Komineft*). The field is connected to the main southbound pipeline system. Production is expected to reach 1.6 million tons in 1994, with a maximum annual production of 3 mill (Dahl-Nygaard and Bjorvatn 1993).

A small amount of **gas** is produced east of the capital Naryan Mar. Vasilkovskoye is the only operative field, and supplies the city through a pipeline. Severgazprom (under Gazprom) operates the field, and production was reported at 35 mill m³ in 1992 and 100 mill m³ in 1993.

Production is planned to start further south in 1996 at Layavozhskoye field, and in 2000 at Vaneyvisskoye (Dahl-Nygaard and Bjorvatn 1993).

Annual production for the whole Nenets okrug is now 2 mill tons of crude oil and 100 mill m³ of gas per year. The production is estimated to be extended to 20 mill tons of oil by the year 2000 if most foreign companies and joint ventures start production during the mid-1990s (Dahl-Nygaard and Bjorvatn 1993).

Table 10.3 Reserves and production in Nenets okrug

	Oil	Gas
Estimated recoverable reserves	1.24 bill tons	490 bill m ³
Production in 1990	927 000 tons	
Production in 1991	1.60 mill tons	
Production in 1992	1.83 mill tons	35 mill m ³
Production in 1993	2 mill tons	100 mill m ³
Estimated production in 2000	20 mill tons	9 bill m ³

Source: Dahl-Nygaard and Bjorvatn 1993

Foreign companies and their activities in Nenets

The French company Total has shown interest in some problematic fields on the *Karyaginskoye* structure, and has worked for a production-sharing contract. Komineft was the Russian part in the exploration phase, but is now replaced by Rosneft because of regional disputes. Komineft as a regional enterprise of the Komi Republic could not be the Russian representative in another region, Nenets okrug (RPI).

Conoco was the first foreign company to start a Joint Venture with Arkhangelgeologia called Polar Lights. The Ardalinsk field which is already in production, is connected with above ground pipeline of 65 km southwards to Kharyaga. Here it is connected to the trunk pipes of Komineft. The group of fields covered by Polar Lights is estimated to contain 19 mill tons of oil. Full commercial production started in August 1994, with a monthly production of 60.000 tons. The crude is not exported directly, but an equivalent amount is taken out at the export points in central Europe (RPI).

Conoco is also working on another Joint Venture with Arkhangelgeologia called Northern Oil Company. Production is planned to start by the end of the 1990s, to reach an annual output of 5.7 mill tons (RPI).

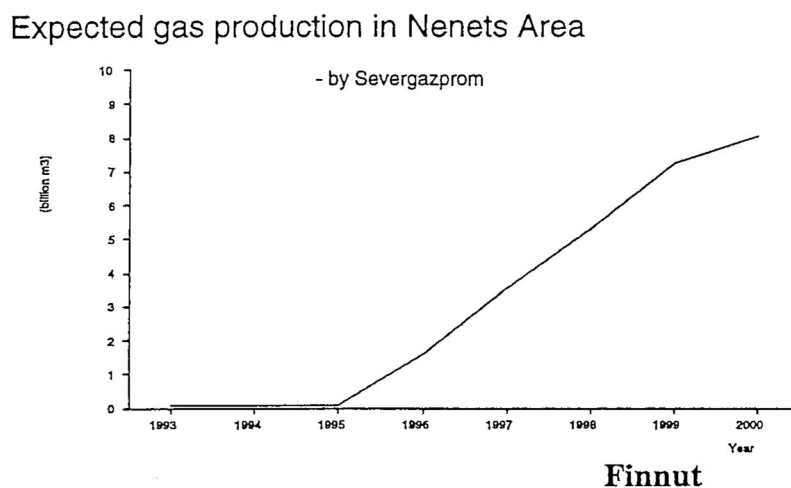
Texaco started a production sharing project with Arkhangelgeologia in the north-eastern part of Nenets, an area of 7,300 square kilometres. The first oil from the fields is expected to be produce in 1995 with an amount of 1.5 mill. Fullscale production is estimated to be achieved in 1998 with 6.5 mill tons per year, with a top in 2006 at 12 mill tons. According to the feasibility study, 700 mill tons of crude are expected to be produced (RPI).

The production start has been halted by several setbacks in negotiations with the Government, and the final signing of the production-contract has been delayed. Texaco brought Amoco, Exxon and Norsk Hydro into the deal in April 1994, and formed a consortium called Timan Pechora Company. TPC is Texaco's legal successor in the venture, with Texaco transferring 70 % of its interest in the project to its new partners. The advantages are clear; to reduce capital requirements and share the risk for each company. It also enables a raise of the Russian share of the profit, to meet some of the opposition to the project. A consortium will have better bargaining power towards the Government. The venture is now the largest energy project with foreign participation under negotiation in Russia, and there are hopes to achieve a solution during 1994. Ownership in the consortium is split into the following propositions (RPI):

Texaco	30 %
Exxon	30 %
Amoco	20 %
Norsk Hydro	20 %

Saga Petroleum and Shell cooperate with Severgazprom, a regional production company under Gazprom in the western part of Nenets. The Layavozjskoye field contains gas and condensate, while oil is found in the Northern Kharyaginskoye field. Five small gas fields are of interest, and the two companies want to develop the field with a share of 25 % to Saga and 75 % to Shell. No production agreement has yet been signed with the Government. The size of the reserves is not known.

Figure 10.1 Expected gas production in the Nenets area

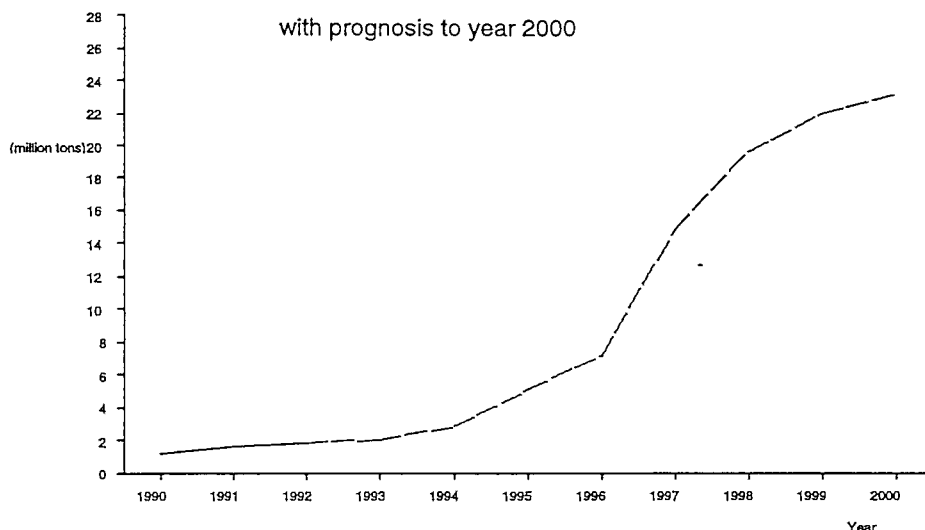


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The figure includes Vasilkovskoje field (in production), Lajavozjskoje field (production to be started in 1996) and Vanejviskoje field (production from 2000). Source: Arkhangelgeologia

Figure 10.2 Expected oil production in Arkhangel county

Crude oil production in Arkhangelsk County



Finnut

2

Under certain conditions fulfilled by Russian and Western actors, the following scenario for development of oil extraction in Arkhangel County/Nenets okrug can be expected:

- Development speed of existing fields will increase by 10 per cent per year
- Conoco starts the Polar Lights project in August 1994 with an annual production of 1,2 million ton
- Texaco and Norsk Hydro will start production in 1995 with the following production in million tons per year: 1.5, 2.5, 3.5, 6.5, 7.0, 7.5
- Conoco will start production east of Naryan-Mar in 1997 with an annual production of 4.5, 5.0, 5.5, 6.0 mill tons.
- Rosshelf will start production on Prirazlomnoye in 1997 with an annual production of 1.3, 2.3, 3.3, 3.3 mill tons.
- Total starts production in mid 1996 with an annual production of 1,46 million ton.
- Figures for Saga, Neste and other Russian or foreign companies are not accounted for. The estimate is vague and must be seen as a guideline and not as the final figures for oil production in Nenets.

Yamal - onshore

The first Siberian gas was produced at the Medvezhiye field by the city of Nadym in 1972, and the development was completed in 1977. The second stage began in 1978 when Vyingapur and Urengoi began producing.

Today, 86% of the gas production in Russia is done in West-Siberia. Most of it originates from the three giant fields in Yamal-Nenets okrug (Urengoy, Yamburg and Medvezhiye). The biggest gas field in the world is situated in Urengoy with total recoverable reserves of 5700 billion m³ (RPI). Reserves on Urengoy and Yamburg will not last forever, and new fields must be developed.

There are plans to start production on three more fields near Urengoy; Yubilejnoye, Komsomolskoye and Omsovetskoye. Together with increased production from Yamburg, this

will constitute an increase of 50 billion m³ in 1995. Further production on the Zapolyarnoye field will give 50-60 billion m³ more. In 1997 the second phase starts in gas development on the Yamal peninsula with new fields in production in the northern part. Production will be extended by 180-200 billion m³ per year. Total production on the Yamal peninsula will reach 900-1000 billion m³ per year in 2010 (RPI). This expansion will demand enormous investments in infrastructure; building of a new pipeline system from Yamal through Belarus, Poland and Germany and an extension of the railway from Labytnangi near Vorkuta.

Gasprom dominates production in Yamal, with local production companies as subsidiaries. A more autonomous position for the local companies is expected as parts of Gasprom will be privatised. One of them, Purneftegas, has formed a joint venture with Quintana (USA) called Pur River to operate the Komsomolskoye field. Both oil and gas are found, but oil extraction will be most interesting for the JV. Recoverable oil reserves are 159 mill tons of oil (RPI).

Taimyr region

There are some small gas fields of local importance in the western part of the Taimyr region. The Messoyakha and Solenaya fields supply energy to the Norilsk Metallurgical Combine (Bradshaw 1992). The production volume is not known.

10.2 Future development

10.2.1 The Norwegian part of the analysis-region

At the time of writing (September 1994), no commercial production is taking place on the continental shelf off Northern Norway. The Norne field will be in production from 1998, but with markets in the south, this will not affect transport along the Northern Sea Route. 12 tankers will transport the oil directly to markets. Some equipment can be delivered from the north of Norway to the field, but this will probably only be a small part of the needed equipment. The industry is hardly developed to meet the requirements, and most of the equipment will probably be shipped from Southern Norway or Western Europe and the USA.

Of all test fields made in the Barents Sea, only the Snøhvit field is currently of commercial importance. In the following we will consider important aspects related to the development of the field in the future.

Conditions for the development of the Snøhvit field

*** Market conditions for gas**

The European demand for gas is enormous with rising expectations on the world market. Gas has many advantages over alternative sources in connection with environmental impacts. With the end of the cold war in Europe, Central and Eastern Europe have come closer to the western standard and increased expectations of a better environment. Especially old nuclear power plants and coal can need to be replaced by gas. Some Western European countries have (due to public pressure) started a step by step closedown of nuclear power plants. This fact is expected to raise the demand for gas in Europe.

*** Potential markets**

Because of the vast hydro electrical resources, Norway has never produced gas for domestic use. Today's production will all go to export markets. There are plans to build a gas power plant to transform the gas to electrical power for export.

Initially, when Snøhvit was considered developed, Italy was the potential buyer. The geographical distance would hardly make Italy and other Southern European countries interested in Snøhvit field. North African producers can supply these markets cheaper. North-central Europe (Germany, Holland, Austria, Belgium and Spain) will soon be supplied by Norwegian gas from the North Sea through the Troll pipeline, and would hardly be interested in the Barents gas as long as other sources are situated near by.

Sweden and Finland recently showed interest in buying Norwegian gas. Ingvar Carlson, Prime Minister of Sweden will start negotiations to buy Norwegian gas to replace nuclear power. Esko Aho, Prime Minister of Finland immediately responded, they had been waiting for this step for a long time. Finland is sceptical to wait for Shtockmanovskoye to be developed, too unstable politically and economically. Finland wants to buy 4 bill m³ per year not to be dependent on Russian Gasprom. The Swedes have not mentioned gas from Snøhvit as especially interesting, but pointed to two possible pipeline solutions from Haltenbanken through Northern Sweden or from the North Sea to the western coast of Sweden.

At the same time, Neste Oy cooperates with Gasprom about an extension of today's gas export to Finland. A new pipeline solution is under consideration, but such a development needs more consumers outside Finland, for instance in Sweden. This is a problem to solve not only between the Finnish government and Neste, but also between Sweden and Norway.

* Competitors

This example shows that Norwegian and Russian gas is already in a competitive position of competition. A development of both the Snøhvit and the Shtockmanovskoye fields in the north, will make a huge contribution to the European market, and effect the general gas production and price. Snøhvit will not be developed before an interested buyer has signed the contract. Russian gas has many advantages in existing infrastructure, the Norwegian gas from Snøhvit requires new facilities like an LNG plant and specially constructed tankers.

* Transport solution

A transport solution for a possible development of the Snøhvit field is already worked out with tankers transporting LNG directly to the markets. A pipeline solution is probably not economically viable even if the markets are close to the field (e g Sweden and Finland).

10.2.2 The Russian part of the analysis-region

There are reasons to believe that development of gas fields in Yamal will be on the priority list before Shtockmanovskoye. Though Shtockmanovskoye is closer to the international gas market, production on Yamal will be easier and less expensive. Gasprom is more experienced in building pipelines onshore than in developing new logistics offshore. Lower transport costs will probably compensate for the high costs of exploration and production on Yamal.

Development of the Prirazlomnoye oil field

Since Prirazlomnoye probably is the offshore field to be developed first, it is important to start the planning of transport. There are two main solutions, but the final decision has not yet been made. The most likely sea solution is to transport the crude oil on ice classified tankers from the terminal at the field, and load the oil to ordinary tankers in Murmansk. From Murmansk it can

be sent directly to export markets or refined for internal use in Murmansk and Arkhangel Counties.

The pipeline solution requires a sub-sea and above ground pipeline connected to the existing system in Ushinsk in the Republic of Komi. This pipeline will cross the Nenets okrug, a vast distance of arctic land. Crude oil transport connected to the central pipeline system will be refined in Yaroslav County.

It is obvious that the first solution will make intensive use of the NSR, both for transport of equipment and the crude oil. The pipeline solution will demand transport of equipment, especially a huge amount of pipelines. There are reasons to believe that a railway track will be built to the shore (probably a continuation from Vorkuta).

Further development of onshore fields in Nenets

All the foreign firms operating onshore in Nenets okrug have the same problems connected with transport solutions. They plan production for export, but lack a transport system for their crude. For fields close to the shore, a sea solution with tankers or a floating terminal seems reasonable, while southern fields will be closer to the *existing pipeline system*, and can easily be connected to this. There are advantages and disadvantages with both solutions, and each company has to take the other actors into consideration. Some of the western firms (Texaco, Norsk Hydro, Conoco, Amoco, Neste Oy, Saga Petroleum and Shell) operating in the northern part of Nenets, cooperate on a feasibility study concerning a floating export terminal at Varandey. The project, which is called the *Northern Gate*, also involves Arkhangelgeologia, Rosshelf, and the Nenets government and can handle 25 to 30 mill tons of oil per year (RPI).

The Polar Lights project of Conoco is already connected to the central pipeline system of Komineft. The Ardalinsk field and transport solution has been blessed by highly ranked officials as a priority project. The JV is a showcase for the Russian Ministry of Fuel and Energy to attract more foreign investors to the area. But the JV is not satisfied with the transport solution. Demand for crude is not particularly strong in Central Europe, and Conoco can not rely on this arrangement for a long time. The other northern fields will not be developed as long as the transport question remains unsolved.

A southward connection can also be a solution for Total operating at the Komi border and other companies like Saga Petroleum. Saga has to build a 550 km pipeline southwards to be connected to the Polar Lights pipe.

The following positive and negative implications related to the transport solution may be identified:

* Costs of building

None of the operating foreign companies in the north of Nenets have the capacity to develop a transport system on their own. A cooperation like the Northern Gate Project has many practical advantages, and the investments don't have to be enormous for each company. It would be reasonable for Rosshelf (who is one of the partners and also the operator on Prirazlomnoye) to look for joint solutions for Northern Gate and Prirazlomnoye.

The building of a Northern Gate sea terminal will not be extremely expensive. The costs are related to construction of ice classified tankers especially built for the purpose. When all these investments are made, the terminal and the ships may easily be moved to other sites if needed.

The costs of connection to the central pipeline system is related to the distance from the central pipeline. The southern fields close to the Komi border will be connected at a reasonable sum. The northern and eastern fields must be prepared for a more expensive solution where more pipes are needed in a difficult climate for construction.

* Costs of operation

The central pipeline system is owned by Transneft. With this monopoly Transneft can dictate the price for using their pipelines. The tariffs have been raised several times lately, and the western companies using the facility can do nothing but accept it. Without other alternative pipeline systems, the companies risk unlimited tariff increases, where transport costs eat more and more of the total profits.

Another problem is that the quality of the oil put into the central pipeline system is not the same as you get out. Oil from Nenets is of good quality, while Siberian oil is less valuable. All the oil is mixed to one average quality, and the companies producing the best grade will get paid for something less valuable.

With a sea terminal and ship transport the costs of operation easier to predict. The companies will not be dependent on Russian monopolies. The solution is probably more stable economically, but the costs will probably vary during the season. Extra fuel and icebreakers are needed in the winter.

* Capacity

Transneft's pipeline system is a bottleneck for foreign and Russian companies. The capacity is at the maximum, and the need for new pipelines and a rehabilitation of the old are acute. Accidents often occur, and much is lost on the way to refineries or harbours. Transneft cannot afford the needed repairs, and tries to get more money by raising the tariffs.

The Northern Gate project is more dependent on the capacity of the harbours. An ice-free harbour is needed to ship the oil over from ice-classed ships to vessels further to the west. Murmansk is an interesting solution, but also Linnahamari or Kirkenes have been considered. The capacity of Murmansk harbour is limited, and with such a transport, a new site is needed in addition to the old facilities.

* Central support

The Northern Gate project experienced a backlash in September 1994. The Russian Government will not support the transport solution, and Minister Shafranik dismissed the idea as another small affair of local importance. Shafranik supports building a 400-kilometer pipeline from Timan-Pechora to a proposed export port near St. Petersburg.

* Environment

Both the sea and the pipeline solution will have enormous impacts on the environment in case of an accident. Nature is vulnerable in the Arctic areas, and damage will be restored slowly or not at all (like the Exxon Valdez accident north of Alaska). A terminal will apparently be at some distance from the shore (the water is not deep in the area), and will cause little damage to

the people in Varandey. One can never prevent accidents and leakages, and in this case, the environmental impacts are incalculable.

The pipeline will cross native land of the indigenous population used for reindeer breeding. The land is extensively utilized by the reindeer, and a pipeline will cross their routes to the coast. The building phase will probably do more damage than the production phase.

The building of a pipeline to St.Petersburg (Shafranik's proposal) will also cause protests because the export terminal will be close to the city. Ecological groups have already mobilized against the project.

* Processing

Petroleum-exporting countries often want to maintain as much profit as possible in the country to increase the production value before exporting the final product. The final exported product can be sold at a higher price, thus creating jobs and keeping a stable workforce active. National industry can deliver equipment to the processing plants and the state can demand a higher per cent in taxes and fees on a processed product in comparison to crude oil exported directly. Processing before exporting will be an important part of the Russian Government's policy to transform the military industry into civil production to obtain highly valued hard currency.

In most western countries processing plants are situated near the energy sources. This has never been the case in Russia, where most refineries are placed in the central part of the country. Petroleum for internal use, distributed via the central pipeline system, can be processed at existing sites. If petroleum is to be exported from the north via the Northern Sea Route, it would be appropriate to build new processing industries in the area.

Gasprom is considering several petrochemical projects involving foreign firms. It plans a 340,000 tons-per-year ethylene plant and a 300,000 tons-per-year LDPE plant at Novy Urengoi in Siberia. These plants should become operational in 1997.

Gasprom and Ferrostahl (Germany) have formed a JV called Metaprom to construct a 700 000 tons-per-year methanol plant in Arkhangel. The output will go to the United States and Europe. It is not known how the transport solution will be solved, but we have reason to believe that tankers will carry the methanol along the western part of the NSR to the markets.

Development of the Shtockmanovskoye field

After the foreign companies in Arctic Star were forced to leave Shtockmanovskoye, Rosshelf worked out plans for development of the field on their own, and little has been done in practice. Recently there have been discussions with some of the Arctic Star participants, but if they are let in at all, it will only be as sub-contractors. The first statement of Rosshelf (owned by Gasprom) primarily using Russian equipment and expertise, has now changed to a more cooperative attitude towards foreign companies. Investments of 10 billion dollars have to be made, and this is far too much for Rosshelf on their own. However, it is too early to say how much the foreign companies will participate in the development and production process.

Teriberka, east of Murmansk, is chosen as the site for terminals storing gas from the Shtockmanovskoye field. Though it is unclear when production will start, there are plans to build LNG plants and a methanol factory. A 600 km sub-sea pipeline will transport the gas to Teriberka. Teriberka will be connected to the Yamal-Europe pipeline in Vologda, and the

product exported directly to Europe. Of the total pipeline capacity of 50 bill m³ per year, 6 bill will be transported to Murmansk. The building of the pipeline from Vologda to Murmansk is scheduled to start in 1995 over a two year period. From 1997 the pipeline will be used to transport gas from Yamal to Murmansk for internal use. When Shtockmanovskoye is ready for production, the gas will go from the Barents Sea southwards to export markets in Europe.

* Transport solution

Rosshelf has chosen a pipeline solution, and this will diminish the role of the NSR as a transport route for the gas from, and equipment to the field. Russian equipment will probably be transported to Murmansk by railway, and shipped out to the field. Foreign equipment will reasonably be transported along the western part of the NSR, but it is impossible to measure the total amount of this transport.

* Markets

The produced gas sent through the pipeline will primarily go to the Central-Western European market. Germany has showed the most interest in the gas.

It is not known which markets that the products of the planned methanol factory and LNG plant at Teriberka will serve. Internal markets will presumably be reached by railway. If export is considered, the most reasonable transport will be on ships along the western part of the NSR. But railway transport can also be considered if the markets are situated in eastern/central Europe.

Further development of Yamal

Production from the gas fields on the Yamal peninsula will primarily be used for internal consumption, but one parallel pipeline will transport gas to Germany through Poland. The fields will be connected to the central pipeline system in Orenburg, and transport of new pipes has already started. They have been shipped along the western part of the NSR, and this transport will continue as long as the railway (a continuation from Labytnangy to Kharasavey) is under construction. When the infrastructure is completely developed, the need for sea transport will diminish. As far as we know, there are no plans to ship the gas out by sea. Processing plants will be built further south, and all gas will be sent through the pipeline system. The production phase will not require use of the NSR.

10.3 Conclusion

This survey has pointed out the main fields of production and recoverable reserves in the analysis-region. Today's production is limited to the Yamal peninsula and a small scale production in Nenets, both on-shore. There are some fields of local importance situated in Taimyr. In addition are several enormous fields, on-shore and off-shore, discovered, but not yet developed.

In the second part of the survey, efforts have been made to make some forecasts about the future development of oil and gas production in the region. Several aspects have been analyzed to discuss possible production and transport solutions from the fields to the markets. Special emphasis has been placed on those fields where sea transport along the Northern Sea Route is likely. The fields, from where a southbound pipeline is expected to be constructed, will not generate transport along the NSR. Limited sea transport will be made in this century, probably

only from the northern fields in the Nenets region. The dominant factors here are political will from Moscow and conditions for foreign investments.

More fields can be developed after the year 2000, but transport solutions from these fields are more wage. On the Norwegian side (Snøhvit field) markets and prices are important for development of the gas. On the Russian side political will and priorities among several other fields are the dominant factors. Lack of competence, equipment and investments have brought foreign firms to the Russian part of the analysis-region. These firms are more eager to choose a sea-transport solution to be independent of the monopoly pipeline system of Transneft. The climate for foreign investments in equipment, production and transport will definitely be positive correlated to extensive use of the Northern Sea Route. Russian companies and related Ministries are probably more interested in pipeline transport. The product can be refined in the country before export, and more taxes can be demanded from the buyer.

Table 10.4 Expected transport of equipment and production to/from fields in the analysis-region along the Northern Sea Route

	Before 2000		After 2000	
	Equipment	Production	Equipment	Production
Norne	Not along the NSR	Not along the NSR	Not along the NSR	Not along the NSR
Snøhvit	-	-	Possible, if markets for the gas. Transport only on the western part of the NSR	Possible, if markets for the gas. Transport only on the western part of the NSR
Shtockmanovskoye	-	-	Possible start depending on political priority. Transport only on the western part of the NSR.	Possible production depending on political priority. Limited transport along the NSR if pipe solution.
Murmansk	-	-	Unknown	Unknown
Prirazlomn	Some, depending on political priority	-	Some	Transport route not decided. Extensive use of NSR if sea-way transport
Leningradsk.	-	-	Unknown	Unknown
Rusanovsk	-	-	Unknown	Unknown
Nenets on-shore	Equipment from the west. Extensive use of the NSR	If Northern Gate, extensive use of the NSR	Equipment from the west. Extensive use of the NSR.	If Northern Gate, extensive use of the NSR
Yamal	Transport of pipes	- (Through southbound pipelines)	Transport will mainly be served by the southbound railway	- (Through southbound pipelines)
Taimyr	-	-(local transport - pipes)	-	-(local transport - pipes)

PART 4 CONCLUSIONS

11 REGIONAL DEVELOPMENT AND DEMAND FOR SEA TRANSPORTATION

In North-Norwegian fisheries the processing plants have always been dependent on the local fleet. Close to 100% of the catches taken by vessels from the region are delivered to local plants. About 70% of the fish products are exported to European countries. Due to tariffs on processed fish from Norway to EU-countries, most of the fish landed in Northern Norway is processed in the most basic and elementary way. This means that a significant part of the total production value based on the fish caught in the Barents sea is realised in other European countries. As Norway chose not to join the EU, the access for processed fish products on European markets will not be better in the future. Because the quotas are limited, the only way of increasing the Norwegian production value based on fish from the Barents Sea is to find and develop new and profitable markets. Interesting markets in this connection are to be found in The Far East. Today about 20% of the total Norwegian export of fish products goes to countries in The Far East. High prices on transportation are, however, significant obstacles to utilizing these markets to a larger extent.

The fisheries in Northwest-Russia were up to 1989 organized in one large amalgamation, including both fishing, processing and other fishing-related activities, and some smaller kolkhozes (collective production units). A major share of the catches to the amalgamation was taken in far-away seas, with factory-trawlers or trawlers equipped with freezers. Most of the processing was canning, and the products were sold on national markets. The disintegration of the Soviet Union also split up the fishery-companies in Northwest-Russia. Today there are several fish companies, some including only vessels, some only processing plants and some both vessels and plants. Increases in the fuel price has made fishing in distant unprofitable, and this activity has now come to a complete stop. An important result of the disintegration of the fleet and the processing industry is that a large part of the fleet now delivers the catches to foreign plants.

In combination these two factors result in large reductions in the access to raw material for the fish processing plants in Northwest-Russia, and production has decreased significantly. Furthermore, it is the commercially most important species, like cod and prawns, that are delivered to foreign plants, leaving less valuable raw material to the local plants. This reduces the possibilities for the Russian fish processing industry to produce for export, at least to West-European countries. Within the fisheries some joint-ventures (JV) with foreign investors, mainly from Germany and other West-European countries, have been established. These JV's are, however, small and without a significant production. To be competitive on international markets, the processing companies need capital and know-how to be upgraded. This can be supplied by foreign investors.

From the analysis-region mineral resources are transported to central industrial areas for processing and consumption. This transport has lasted since the 1930s, but increased in the 1950s and 1960s. Development of industrial centres within the region was part of the policy to keep a stable workforce and settlement in the Northern regions. The mineral base is rich in the analysis-region, but extraction is not extensive in all sub-regions. Murmansk County is

most important, with extensive sea transport from the ports of Murmansk and Kandalaksha. Main export products are iron ore, nickel and apatite.

The most extensive transport along the Northern Sea Route has been the nickel ore shipped from Norilsk in Taimyr to Murmansk. This transport has recently dropped, and ended in 1994. It is not known whether the transport will start again. Transport of minerals out from Arkhangel County by sea is limited, and the other subregions have their markets in the south. This means that the industry today only generates essential volumes of transport along the western part of the Northern Sea Route from Kola.

Timber is one of the most abundant natural resources in the analysis-region, and the most important raw material for regional activity. In the Swedish, Finnish and Russian parts of the region a significant share of the workforce is employed in forestry and forest-based industry. Both the Nordic woodworking industry and the Nordic pulp and paper industry have strong positions in the international markets. The Nordic forest-based industry is a dynamic and highly competitive cluster. However, since most of the production is sold on the European markets no transportation along the Northern Sea Route is generated from it.

In the Russian part of the analysis-region the forest resources and the capacity of forest-based industry are enormous. In the Soviet Union period this industry was mainly producing for domestic markets. Today the forest-based sector faces a lot of difficulties, and the volumes of production are significantly reduced. Nevertheless, large volumes of roundwood, sawn wood and cardboard are exported to the European markets. This export generates quite a lot of transport along the Northern Sea Route. Timber and timber based products are shipped from several Russian harbours west of Taimyr, the most important being Arkhangel, other White Sea harbours and Igarka by the Yenisei river. While both Russian and foreign vessels are involved in the timber export from the White Sea area, only Russian vessels operate on the Yenisei river.

Production of oil and gas is a relatively new activity in our analysis-region, though it is rich on petroleum resources. Deposits are located on the central Norwegian shelf, and in the Barents, Kara and Pechora Seas. On-shore deposits are found in the Nenets area, on the Yamal peninsula and in Taimyr. Today's production is dominated by the mega on-shore fields in Yamal-Nenets. A further expansion northwards to the Yamal peninsula has started. Some small fields on-shore in the Nenets area and in Taimyr have a limited production.

The companies exploring on the Norwegian side, include both foreign companies and Norwegian private ones, and Norwegian stateowned companies. The Russian petroleum sector is dominated by the state owned Gazprom and Rosshelf enterprises with regional subsidiaries. An integration in the petroleum industry has started across borders in our analysis-region. Norwegian and Finnish companies have, together with other western firms, been engaged in exploring and developing some of the fields in the Russian part of the region. Technology and investments are needed both at existing sites and in the development of new fields.

12 FUTURE DEVELOPMENT AND THE NORTHERN SEA ROUTE

The analysis-region is extremely rich in terms of natural resources. In general these resources are the basis for all regional activity and settlement. Still, the potential for further utilization and processing of the regions natural resources is large, especially in the Russian sector. Foreign investors therefore consider entering projects which can offer them access to the regional resource base.

Retrospectively, regional industry has developed on the basis of local natural resources. Localization close to the resources was often a major advantage, if not a necessity, for industrial production. Today the situation has changed. The determinants for industry localization have changed. The significance of close and strong relations to the main markets has increased. Although the price of transportation is reduced relatively, the customers of industrial products often require just-in-time deliveries, and this favours a central location. Information about market preferences and quality demand will also be easier with proximity to customers. On the other hand, substitutes sometimes reduce the dependence on natural raw materials. And, finally, being part of a dynamic industrial cluster has become far more important.

The consequence of these new conditions is that peripheral areas with abundant natural resources may lose industrial production. Within the context of international value chains the analysis-region might become an exporter of raw material, as the processing industry is developing in more central areas. Trade barriers are no longer an adequate answer to this challenge, as the export markets are the key to regional success. The only possible strategy left is to develop a few strong and dynamic industrial clusters based on natural resources from the area.

This strategy implies that business relations and infrastructure are developed to strengthen the regional clusters, rather than to improve the relations between the central and the peripheral areas. Cooperation and integration across borders and within the analysis-region has to be stimulated at all levels, from the business level to the political level. This is the only way to make industrial localization within the analysis-region more attractive.

Another important determinant for the industrial development in the analysis-region, especially in the Russian part, will be the general rate of economic growth in Russia and the Eastern-European countries. The Russian industrial capacity is very large, and a sudden and partial focus on a few export markets will disturb market balances and prices. Increase in domestic demand, however, would be an important stimulation to the upgrading process of Russian industry, and consequently to its future competitiveness on international markets.

These considerations are certainly relevant for fisheries. Northern Norway and Northwest-Russia are both important suppliers of fish and fish-based products. Until recently they supplied different markets. But today the situation is different. Much of the fish caught by Russian vessels is now delivered to Norwegian and other European plants, and the products are sold to European consumers. From this trade both the Russian fishing fleet and the Norwegian fish processing industry gain a short term profit. However, this trade does not stimulate a general and balanced upgrading of the regional fisheries, so that future

competitiveness of both the North-Norwegian and the Northwest-Russian fish industry can be enhanced. To enter such a process, cooperation within the analysis-region has to be far more extensive and close, ensuring transfer of capital, technology and know-how across national borders.

If the regional fisheries do succeed in developing a strong and integrated industry the analysis-region might become an even more important supplier of fish products to the world market. Since the fish processing industry in both Norway and Russia are facing trade barriers when exporting advanced fish products to the EU-market, expansion might to some extent have to take place in alternative markets. For instance, cooperation between the fisheries in the Northernmost part of Europe should be of mutual interest regarding an market expansion eastwards. If cooperation on marketing and transportation could lower the price of exporting to the Far East, these markets may emerge as profitable alternatives for fish export from the region. On the other hand, if Northern Norway and Northwest-Russia start to compete by dumping raw material on the European markets this could be destructive to the industrial development on both sides.

Most mineral based industries in the analysis-region have experienced a drop in production during the last years. In the Russian part of the region this was a consequence of the introduction of a market economy, rising prices of energy and transport, and loss of markets. Further development of these industries is hard to predict, but we can hardly imagine a significant increase in production without affecting the world market prices. The total capacity already exceeds the world market demand in several segments, and many companies are storing their production surplus. The total drop in production has not affected sea transport to the same extent as railway transport. The export drop is not as big as the drop in sales to domestic markets. We believe that there will still be an important transport of minerals from Murmansk to the western markets in the future, but a very limited transport along the Northern Sea Route from Taimyr.

The Northern Norwegian, Swedish and Finnish mineral industries transport their minerals to domestic or European markets in the south, and future variations of production in these industries will not affect the use of the Northern Sea Route.

Nordic forest-based industry has a strong position on the West-European markets. However, the advantages of being localized close to the timber resources are reduced, and the consequence might be that processing is moved from the northernmost areas to the populated areas in Central Europe. The risk of such a centralization will increase if the European forest-based industry is supplied with timber resources from the enormous Russian Taiga. However, a centralization of the Nordic industry will simultaneously tap any effort in developing the Russian forest-based industry. Consequently, the Nordic and the Russian parts of the analysis-region will have a common interest in developing a strong regional cluster of forest-based industry.

Since the European markets for timber based products will probably increase at a moderate rate, demandstimulated industry development might therefore be dependent on the future growth rates and income distribution in Russia and other previous COMECON countries. Given positive and sustained economic growth in Russia and the Eastern European countries, the Russian forest-based industry might continue to supply these markets. To modernize Russian production foreign capital is needed, but this could be attracted even without a

further integration with Nordic industry. If so, the patterns of transportation could be much like in the past, with most of the Russian production being transported south and east, and most of the Nordic production heading south and west. The Northern Sea Route would then be more or less unaffected by the development of the forest-based industry.

On the other hand, if a strong regional cluster of forest-based industry is developed, the analysis-region might then become the dynamic centre of an international industry. In such a situation patterns of transportation could be changed significantly. Export could be expanding both ways, from the Nordic countries and eastwards, and from Russia and westwards. Being a strong international industry even export to the Far East could be expanded. The Northern Sea Route could then be an important transport route for timberbased products, both to the North Atlantic markets and to the North Pacific markets.

The regional petroleum sector will probably expand significantly in the years to come. On the Norwegian central shelf one field will be in production when Norne starts to pump oil in 1997. The Snøhvit gas field in the Barents Sea may also be in production in the next century if customers are found. On the Russian side the gas fields in Yamal will be of first priority, and second the Prirazlomnoye oil field in the Pechora sea is supposed to start production in 1997. The Shtockmanovskoe gas field in the Barents sea will only be developed after investments are made in the previously mentioned fields. The decision is made by the Government. Petroleum export is an important source of hard currency earnings. The on-shore fields in Nenets will be developed in cooperation with foreign companies, but the speed will depend on the general political climate for foreign companies related to productionsharing agreements and investment policy.

Expansion of the mentioned petroleum activities in Northern Russia will cause an important transport flow along the Northern Sea Route. Transport of petroleum products out of the region to export markets in Europe and transport of equipment to the sites will generate a substantial number of vessel calls. How extensive this transport is going to be, will depend on the production of new pipeline systems. It is reasonable to believe transport of petroleum products will be the most important transport along the Northern Sea Route in the next century.

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The three main cooperating institutions of INSROP



Ship & Ocean Foundation (SOF), Tokyo, Japan.

SOF was established in 1975 as a non-profit organization to advance modernization and rationalization of Japan's shipbuilding and related industries, and to give assistance to non-profit organizations associated with these industries. SOF is provided with operation funds by the Sasakawa Foundation, the world's largest foundation operated with revenue from motorboat racing. An integral part of SOF, the Tsukuba Institute, carries out experimental research into ocean environment protection and ocean development.



Central Marine Research & Design Institute (CNIIMF), St. Petersburg, Russia.

CNIIMF was founded in 1929. The institute's research focus is applied and technological with four main goals: the improvement of merchant fleet efficiency; shipping safety; technical development of the merchant fleet; and design support for future fleet development. CNIIMF was a Russian state institution up to 1993, when it was converted into a stock-holding company.



The Fridtjof Nansen Institute (FNI), Lysaker, Norway.

FNI was founded in 1958 and is based at Polhøgda, the home of Fridtjof Nansen, famous Norwegian polar explorer, scientist, humanist and statesman. The institute specializes in applied social science research, with special focus on international resource and environmental management. In addition to INSROP, the research is organized in six integrated programmes. Typical of FNI research is a multi-disciplinary approach, entailing extensive cooperation with other research institutions both at home and abroad. The INSROP Secretariat is located at FNI.

