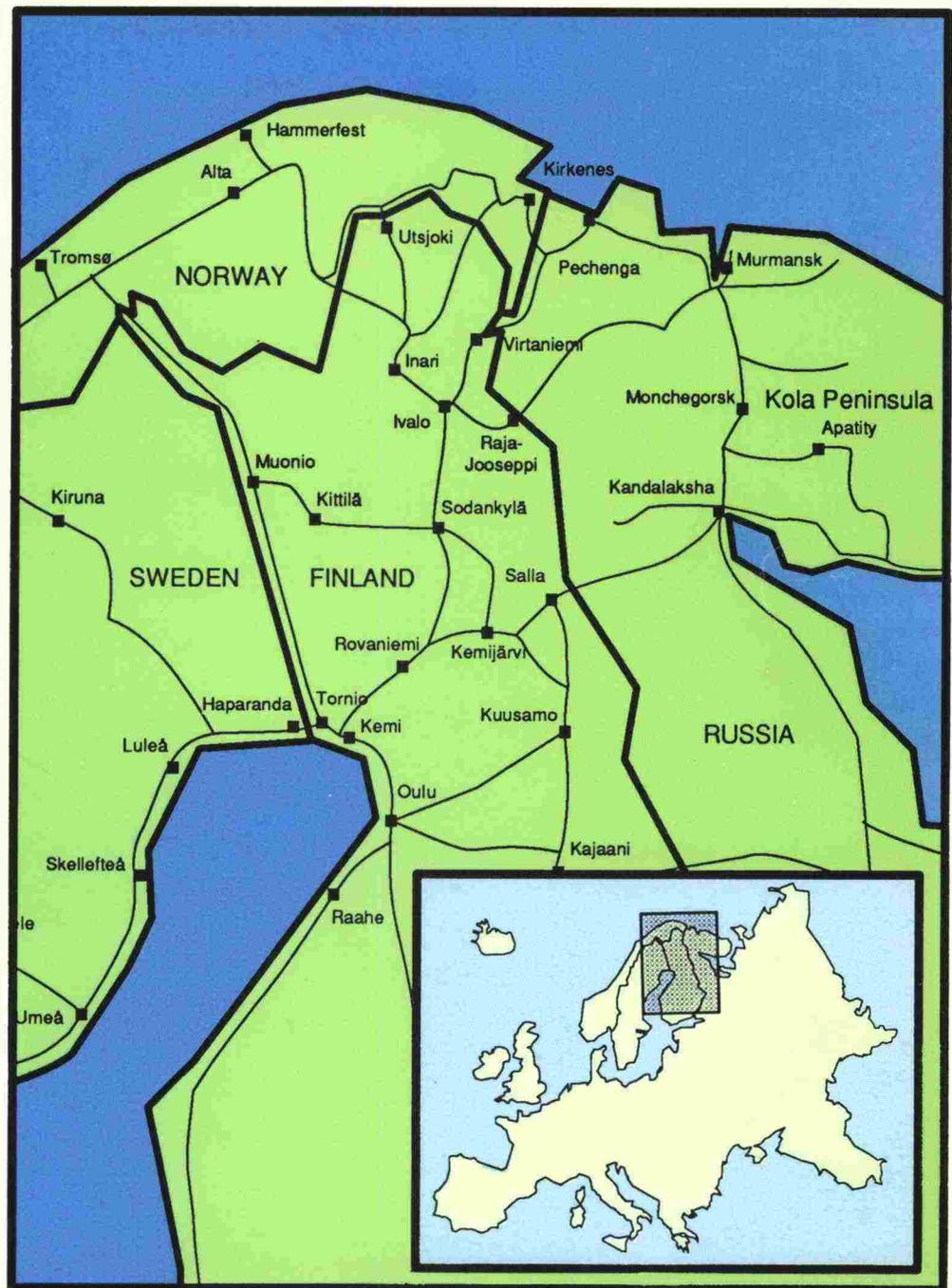


FinnRA

# A Study on Road Connections between Finland and the Murmansk region



1992

Finnish National  
Road Administration

Lappi Road District

# **A Study on Road Connections between Finland and the Murmansk Region**

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# A STUDY ON ROAD CONNECTIONS BETWEEN FINLAND AND THE MURMANSK REGION

## ABSTRACT

Being a part of Russia, the Murmansk region is under a profound social and economic change. It is difficult to forecast the future of the Murmansk region. However the population of 1.1 million and huge natural resources create a good base for future progress. The major western neighbor for the Murmansk region is Finnish Lapland. With Norway the Murmansk region has a short common border in the very north. Taking advantage of the location and economic resources of Finnish Lapland as well as the existing potential of the Murmansk region there are good possibilities for cooperation in different fields. Actually there have been some joint projects already started between the Finns and Russians and many significant projects are under negotiations. If these projects be realized they would have considerable economic impact on the region.

Commercial ties are not possible without good transportation connections. The present condition of roads between Lapland and the Murmansk region is not very good. The only road connection from Lapland to the Murmansk region is now via the Raja-Jooseppi border station and this road leading to Murmansk is in a very bad condition. Another road connection from Finland's Lapland to Murmansk is via Kirkenes in Norway. This connection is in a better condition but the distance from Ivalo to Murmansk is longer and there are some restrictions in the use of the road between Nikel and Murmansk. The need for good roads has lead to several proposals of construction and improving the roads between Lapland and the Murmansk region. The three main alternatives are

- a) improving the existing road via Raja-Jooseppi to Murmansk
- b) construction and improving the road from Salla to Kandalaksha
- c) improving the old road from Virtaniemi to Pechenga.

Improving all these three connections is not economically feasible. In order to find the best solution the costs and benefits of each alternative have been evaluated in this study. Traffic forecast is based on the gravity model which has been calibrated using the existing traffic between the northern parts of Finland, Sweden and Norway. The future prospects of economic and demographic development in the Murmansk region have been considered as well.

The best alternative proved to be the road from Salla to Kandalaksha. The road would shorten the trips between Finland and Murmansk region on an average of 160 km. Also the construction cost is the lowest in this alternative. Transportation economy of the Salla-Kandalaksha road is very good and there are also other aspects which support this project. Most of the significant projects which are under negotiations in Murmansk are situated in the southern part of the region where also the most interesting places for tourists are situated. The Salla-Kandalaksha road leads also to the Kandalaksha-Murmansk road which is the main road of the Murmansk region.

Improving the road from Raja-Jooseppi to Murmansk could be beneficial in the future if traffic were to increase noticeably and only if the road were to be the only connection from Lapland to the Murmansk region. If the Salla road is constructed this would leave little traffic on the Raja-Jooseppi road.

The old road from Virtaniemi to Pechenga is always the shortest connection to the Pechenga Region. The transportation potential for this road is not presently significant. The road is local in character and serves mainly the traffic between northern parts of Finland, Norway and the Pechenga region.

## ПОЯСНИТЕЛЬНАЯ ЗАПИСКА О ДОРОЖНЫХ СВЯЗЯХ МЕЖДУ ЛАПЛАНДИЕЙ И КОЛЬСКИМ ПОЛУОСТРОВОМ

### РЕЗЮМЕ

Территория Кольского полуострова испытывает в настоящее время сильные общественные и экономические изменения. Предугадать будущее является трудным делом, однако большой населенческий потенциал и богатые природные ресурсы региона Кольского полуострова, а также общая граница с финляндской Лапландией превращают с точки зрения Финляндии этот регион в очень интересный. Уже на данный момент разрабатываются значительные совместные проекты по сотрудничеству, и по их осуществлению они имели бы большое экономическое значение для Финляндии.

Взаимные связи предполагают наличие хороших путей сообщения. На данный момент их нет между Финляндией и Кольским полуостровом. На сегодняшний день единственная дорога из финляндской Лапландии на Кольский полуостров проходит через пограничную станцию Рая-Йоосеппи. И следует отметить, что она находится в плохом состоянии. Другое возможное дорожное сообщение, которое находится в более лучшем состоянии, но по протяженности длиннее, проходит через норвежскую Кирккониemi. Для улучшения дорожных связей разрабатываются три значительных дорожных проекта:

- а) улучшение дороги от Рая-Йоосеппи до Мурманска
- б) улучшение и строительство дороги от Салла до Кандалакшы
- в) улучшение дороги от Виртаниemi до Печенги

Средств на улучшение всех трех дорожных сообщений нет ни по одну, ни по другую сторону границы. Поэтому проводилось сравнение выгод и затрат данных проектов с целью поиска наилучшего решения. Наиболее рентабельным проектом в ходе исследований признали дорогу, проходящую через Салла. Данная дорога уменьшит транспортные расстояния между Финляндией и Кольским полуостровом в среднем на 160 км. Также по строительным затратам эта дорога является самой дешевой из трех исследованных альтернатив. С точки зрения транспортно-экономической данный проект является очень рентабельным. В пользу его говорят также такие факторы как размещение проектов по сотрудничеству именно в южной части Кольского полуострова, местонахождение наиболее интересных объектов с точки зрения туризма в данной местности и примыкание к магистрали Кандалакша-Мурманск, которая находится в хорошем состоянии.

Возможно, что с перспективной точки зрения улучшение дороги через Рая-Йоосеппи было бы рентабельным, если бы количество движения значительно возросло и эта дорога была бы единственным путем сообщения из Лапландии на Кольский полуостров. В случае, если дорога, проходящая через Салла будет построена и улучшена, то движение по дороге через Рая-Йоосеппи останется довольно незначительным.

Дорога от Виртаниemi до Печенги является самым оптимальным и коротким сообщением в регион Печенги. Однако, в данном регионе потенциал транспорта не большой. По своему характеру эта дорога местного назначения и служит, в основном, для транспортного сообщения между Северной Лапландией, Северной Норвегией и Печенгой.

## INTRODUCTION

In Russia and its northernmost part in the Murmansk region, great social and economic changes have occurred during the last few years within a short period of time. The profound process of change is continuing, and predicting the future is extremely difficult. If the situation develops favorably, it is likely that the cooperation between Finland and the Murmansk region will get more active. The traffic from Finland to the Murmansk region mostly goes via Lapland. The Lapland Road District has had this study made in order to predict the future needs of traffic and development strategies of road connections in the direction of the Murmansk region.

In the Lapland Road District, the work has been supervised by Road Director Sauli Niku-Paavo and Chief of Staff Erkki Vuotisjärvi. As consultants in the study have been Martti Miettinen and Liisi Vähätalo of Viasys Oy (Ltd.) as well as Matti Jäntti of Oulun Viatek Oy (Ltd.).

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## 1 BACKGROUND

### 1.1 General

The rapid change in the economies of the areas, which belonged to the former Soviet Union, causes a need to develop and maintain direct economic relations between these areas and Finland. The economic cooperation and decision-making may be transferred to a larger extent to local level in Russia. This is also fairly rapidly reflected in the need for construction of transport routes and especially road connections between Finland and its neighboring areas in the east. The development of the Via Baltica road connection through the Baltic countries is already in progress and connections between St. Petersburg and Karelia are being studied.

Lately, the status of the Murmansk region in Finland's relations with the CIS-countries has become more pronounced. As central areas in Finland's Russian policy have been especially identified the neighboring areas — St. Petersburg, Karelia and the Murmansk region. This is also supported by the neighboring area agreement concluded in January 1992.

The development of road connections is especially important in the Murmansk region, since there are practically no usable roads between the Murmansk region and Finland. However, the Murmansk region is exceptionally interesting, initially because of environmental reasons and within a longer time interval because of the natural resources of the area and the natural gas and oil fields of the Arctic Ocean. The tourism potential of the Murmansk region is also not unimportant. The need for the road connections between Finland and the Murmansk area is also emphasized, as the connections between Finland and Central Europe improve. Central Europe is also very interested in the Arctic Ocean, and the land connections into this area naturally go via Finland and the Finnish Lapland.

More than one million inhabitants are living in the Murmansk region, which offers plenty of possibilities for a successful business activity. All in all, Finland is capable of offering the necessary infrastructure, human resources and know-how for a successful economic cooperation and development of this large area.

### 1.2 Cooperation between Lapland and the Murmansk region

The role of the northern areas in the world economy is increasing as a result of the exploitation of the natural resources in the arctic areas. Similarly, the cooperation of the northern areas will grow. One example thereof is the Northern Forum established in Alaska in 1991, which is a cooperative platform of the northern areas in the field of industrial policy, environmental issues and culture. In this cooperation, Finland is represented by Lapland.

The integration of Europe will on its part decrease the importance of national borders in the cooperation between nations. In this context the North Calotte area forms traditionally a natural cooperation area. In May 1992, the North Calotte Committee accepted the Murmansk region as an observer member in the committee. At the same time, a possibility was given to the Murmansk region to participate in the Calotte cooperation on project basis if it so desires.

In Lapland's own long-term development plan, as focal points have been selected the becoming more international, the environment, know-how as well as development of regional structure and administration. The cooperation with the

Murmansk region is closely related to internationalization, environmental issues and formation of Lapland's future regional structure.

The neighboring area cooperation agreement concluded between Finland and Russia at the beginning of 1992 legalizes an unofficial cooperation started already several years ago between the Murmansk region and Lapland. There are good starting points for the neighboring area cooperation. In a broader extent, Finland may act as a support area also for establishing companies of third states in Russia.

Lapland has a good infrastructure, high-quality education and training network, tourism know-how, small-business know-how and a favorable location in the Calotte area. On the basis of these starting points, Lapland can be developed as an intermediary in the direction of the Murmansk area, and from an international point of view, as an exemplary area when creating forms of cooperation between the Western countries and Russia.

A central starting point for the neighboring area cooperation is the development of transport connections. In this case, the most important aim from the point of view of both areas is the construction of the Salla—Kandalaksha road and the provision of an official border crossing point at Kelloselkä as soon as possible.

### **1.3 Important projects in the Murmansk region**

#### **Oil and gas resources of the continental shelf of the Arctic Ocean**

On the continental shelf of Russia's northern seas, mostly the Barents Sea, the Kara Sea and the Laptev Sea, crude oil and natural gas have systematically been prospected since 1979. The quantity of the oil resources to be utilized with the technology currently in use is estimated to be 11–24 billion tons and the natural gas resources are estimated to be 25–55 trillion m<sup>3</sup>. So far, nine oil and gas fields have been found in the Barents and Kara Sea.

#### **Shtokmanovskoje natural gas field**

The Shtokmanovskoje gas field is located in the Barents Sea at a distance of approximately 500 km north of the Murmansk region. It is estimated to contain 2 500 billion m<sup>3</sup> of natural gas. The Shtokmanovskoje field is capable of supplying gas for one hundred years. The gas is planned to be led in a subsea pipeline to the Murmansk coast and therefrom via North Finland or Karelia to South Finland and further through the Baltic Sea or Sweden to Central Europe.

The main alignment alternative of the pipeline is from Teriberka via Finland or Russia to Central Europe. Another alternative is to build the pipe from the fields to Pechenga. Teriberka is possibly a seismic area, and in addition, the alignment therefrom would go through natural conservation areas to their detriment. The military would also have their own comments on the route.

During 1990–91, a feasibility study was prepared on the project. In addition to the Russian institutions, Neste, Imatran Voima and Metra from Finland, Norsk Hydro from Norway and Conoco from the United States participated in the study process.

The Finnish companies, which are the partners in the project, formed in 1991 a consortium entitled the Finnish Barents Group for preparing the Shtokma-

BACKGROUND

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novskoje project. Negotiations are now in progress on the commissions of the next step, and additional exploration work is being carried out in the gas field as well as in the marketing of the gas. The utilization of the gas field requires large investments for developing the field, for construction of the pipeline, etc., and marketing the gas is more uncertain than that of well-selling crude oil. The goal is to enter into production at the end of this century.

The authorities of the Murmansk region regard the realization of the project as important – presently there is no gas pipeline leading to the Murmansk region, and it will not be built in the near future without the Shtokmanovskoje gas because of financial difficulties. From the point of view of the environmental protection of the region, gas as a source of energy would be extremely important. On the other hand, environmentalists are worried about the dangers of offshore operation to the sea environment and especially fishing. The participation of foreign companies is regarded as the only guarantee for a sufficient technical and safety level of this operation.

The building costs of the first step of the Shtokmanovskoje gas field have been estimated in 1991 to amount to approximately 15 billion dollars. With this money, a production platform suitable for arctic conditions, a base and the necessary installations on the coast, a subsea gas pipe and a pipeline from the Murmansk region via Lapland and Karelia to Central Europe and a village of 5000 inhabitants for employees will be built. 10 % of the employees would be foreigners.

### **The Northeast Passage**

The Northeast Passage, the northern sea route via the Bering Strait eastward, could be used for shipping even for half a year when assisted by ice-strengthened vessels and icebreakers. The Northeast Passage shortens the travel to Japan by 8–10 days. The actual shortening may not be as high, since in practice, a convoy of several ships would be formed. One ship at a time is not piloted through.

In the Murmansk region, Murmansk is desired as a loading and unloading port of the Northeast Passage. If a railway from Finland could be built to the Murmansk railway along with new roads, many of the shipments would be transported via Finland to Europe.

The Nansen Institute is preparing a study on the Northeast Passage and its effects. There will be a meeting in Tromsø in October 1992, in which also the road experts of Russia will participate.

### **Reconstruction of the Nikel Smeltery**

In June 1992, Outokumpu Oy has made a new offer to Norilsk Nikel concern concerning the Pechenganikel Smeltery. The value of the offer is US\$ 600 million, i.e. FIM 2.7 billion. This corresponds to about 80 000 tons of cathode nickel, which equals to 50–60 % of the annual nickel production of the Murmansk region. Cost for the auxiliary projects is US\$ 40 million.

The project has been in progress for a long time, but making an agreement has been delayed because of financing arrangements. Finland and Norway have been ready to donate as an environmental assistance about FIM 400 million.

President Yeltsin himself by two orders has speeded up the administrative process of the project. By his decree, Yeltsin has appointed a financing group and advised the regional administration and border guard authorities of the Murmansk region to start negotiations with Finland on the Virtaniemi border crossing point. The project can be initiated rapidly, if a favorable solution is obtained in the financing negotiations. The construction time is 3 years.

The basic task is the rebuilding of the electric smeltery into a flash smeltery and the construction of a sulphuric-acid plant. The project comprises industrial buildings to an extent of approximately 500 000 m<sup>3</sup>. Additional objects comprise e.g. two residence buildings, a training centre and a polyclinic, altogether 70 000 m<sup>3</sup>. The weight of the machines, devices and other materials is approximately 65 000 tons. This corresponds to about 6 000 truck loads or to about 5 000 containers. It has been estimated that about 20 000 persons will cross the border during the construction time. The traffic volume caused by the construction would thus be some tens of vehicles per day.

The deliveries will take place by truck, ship, train and partly by air. The project will employ max. 700–800 Western employees, which causes a regular bus traffic to Ivalo and especially to Kirkenes, where restaurants, movie theatres, swimming halls, etc. are located. The average numerical strength is 550–650 persons.

In the long term, the Outokumpu project will not cause freight transports. The maintenance, spare parts service and communications may cause traffic to an extent of a couple of trucks per week after the completion of the project.

The distance from Ivalo to Nikel via Kirkenes is 280 km and via Virtaniemi 160 km, which means that Outokumpu would like to manage the equipment and service deliveries of the Nikel Smeltery via Virtaniemi. The offer for the Nikel Smeltery project has been calculated such that if the old road from Virtaniemi to Pechenga cannot be used, the road connection west of Lake Inari or the sea connection to the Kirkenes port is used. Railway transports are the third alternative.

At the moment, Outokumpu has in progress a project, which started five years ago in Zapoljarny. There have been freight transports along the old road from Virtaniemi to Pechenga in connection with the project. The latest transports have occurred in the spring of 1990. The old road has withstood the heavy transports well.

Outokumpu uses 20 000 tons of nickel per year, of which 1/4 at the most is bought from one source. If fine stone be bought to Finland, the amount would be approximately 10 000 tons per year. Fine stone is generally transported by train.

At the Russian plants, the number of employees is 3–5 fold compared to that of Finnish plants. Decreasing the number of employees is slow and it is possible only by means of new technology.

The Norilsk Nickel concern is dependent on other production inputs. If disruptions occur therein, the concern is not capable of maintaining the production. The nuclear power plants of the Murmansk region supply electricity to Nikel. The remaining life of the Nikel plants is currently estimated to be 2–5 years.

### **Renovation of nuclear reactors of the Murmansk region**

Imatran Voima Oy (Ltd.) has designed the repairs of the four nuclear reactors of Poljarnye Zory. The design of the reconstruction program of the plants will be paid by the state of Finland. The Ministry of Trade and Industry has granted Imatran Voima for this FIM 3.2 million. There is a desire to use even the oldest units of the plant until the year 2004. The improvements should be ready in 1996. Russia should clarify, how currency can be obtained for the repairs. According to the management of the plant, the financing in rubles is guaranteed.

Also new nuclear power plants are being designed for Poljarnye Zory. The intention is to build at least one plant, but the design of a second plant is already in progress. In addition, space has been reserved for two other plants at a distance of 10 km from the existing plants.

The solution regarding to the plant type will be made between two alternatives. One of them is VVER-91 planned jointly by Imatran Voima and Atomenergoprojekt of St. Petersburg and the other one is the Muscovite project VVER-92.

The decision in principle on a new plant of approximately one thousand MW has already been made in the Murmansk region, but the financing negotiations with Moscow are not yet completed. In the Murmansk region, a preliminary selection of the VVER-91 reactor type has already been made, which has been jointly designed by Imatran Voima and Atomenergoprojekt of St. Petersburg.

Imatran Voima estimates the price to be US\$ 1–1.5 billion. The share of Western technology in such a plant should be about a tenth, or more than US\$ 100 million, so that the plant would fulfil the Western safety standards.

### **Reconstruction of Kandalaksha aluminum smeltery**

The Finnish Kumera company has negotiated on the reconstruction of the Nadvoitsy aluminum smelteries of Kandalaksha and Karelia. In Kandalaksha, Kumera will negotiate with the Ministry of Industry of Russia. A preliminary contract relative to the project planning and implementation has already been signed. The rebuilding of the smelteries is a major project, whose total price amounts to about FIM two billion.

### **Alakurtti officer village**

The troops of the Russian Army are being withdrawn from Germany at the accelerated rate. Part of the repatriated troops will be positioned in Alakurtti, where the intention is to build 500–600 apartments as well as numerous service buildings and other infrastructure. The value of the contract is approximately FIM 300 million. In the fall of 1992, an international competitive bidding will be arranged relative to the construction of the village, in which bidding Finnish constructions firms will participate. The distance from the Finnish border to Alakurtti is about 70 km, which means that the construction would probably cause plenty of goods traffic from Finland via Salla to Alakurtti.

### **Other projects**

Outokumpu Oy's project to renovate the nickel enrichment plant in Zapoljarny is being completed. Outokumpu has also a letter of intent on a project of FIM

500–700 million for deepening an open pit mine into an underground mine in Zapoljarny.

Kemira Oy (Ltd.) has already for a long time been studying the renovation of the Kovdor apatite enrichment plant, but there are no agreements on the project.

Ahlström Oy (Ltd.) is starting contract negotiations on a project for decreasing the sulphur emissions of the Monchegorsk nickel smeltery.

In the Murmansk region, there is Tiivi Oy's (Ltd.) joint venture, the Arctic window factory, which is already in production.

Outokumpu Oy has delivered a flotation plant to the apatite enrichment plant. The value of the project is FIM 150 million and the works are close to completion. Outokumpu Oy has a plan ready for rebuilding a second flotation plant, but there is no final agreement on the project.

Tamrock Oy (Ltd.) is entering into agreement on establishing a joint venture for manufacturing mining machines, but there is no final agreement on the project.

Atri Oy (Ltd.), a subsidiary of Kemijoki Oy (Ltd.), had a fish breeding establishment inaugurated in May 1992 in Ylä-Tuloma.



Location of important projects in the Kola Peninsula

## 2 THE MURMANSK REGION

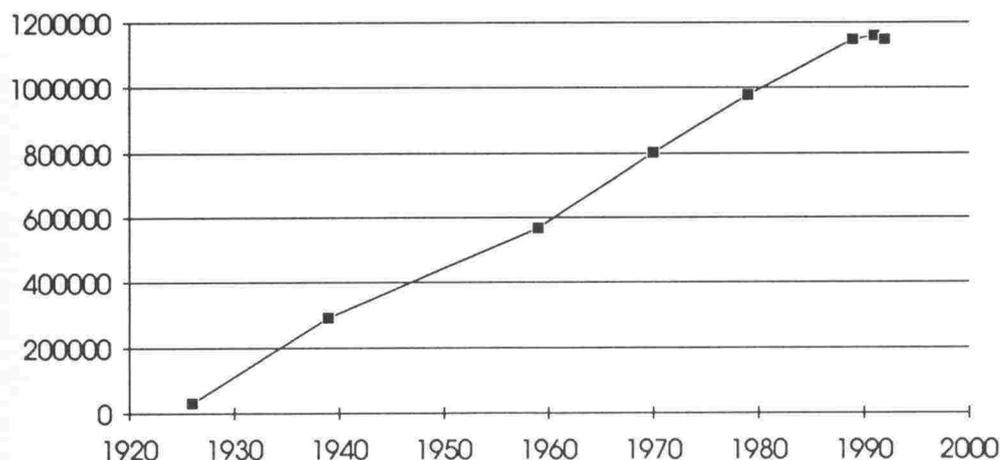
### 2.1 Population

As an arctic area, the Murmansk region and the city of Murmansk have very large population. They are clearly larger than other corresponding areas and cities. As reference objects may be regarded Finland's, Sweden's and Norway's Lapland as well as Alaska.

Region	Area	Population	Population	Biggest city	
	km <sup>2</sup>	inhab.	density (inhab./km <sup>2</sup> )		
Kola Peninsula	145 000	1 147 000	7.9	Murmansk	(468 000 inh.)
Arkhangelsk	2 500 000	1 500 000	0.6	Arkhangelsk	(450 000 inh.)
Lapland	93 000	200 000	2.2	Rovaniemi	(54 000 inh.)
Norrbotnen	99 000	264 000	2.7	Luleå	(68 000 inh.)
Finnmark / Troms	75 000	223 000	3.0	Tromsø	(52 000 inh.)
Alaska	1 700 000	550 000	0.3	Anchorage	(226 000 inh.)

The population of the Murmansk region grew steadily until the year 1990. The growth were supported by the needs of the super power Soviet Union and the population potential behind it as well as many advantages provided for the Soviet citizens, who settled down in the arctic areas. Today, these fundamental factors of the Murmansk region's economy are changing and partly disappearing, and the future of the region has thus become unpredictable.

At the beginning of 1992, 1 147 400 inhabitants were living in the Murmansk region, which is 11 600 inhabitants less than a year ago. The decrease in the population is due to an intensive out migration. In 1991, 16 200 and in 1992 until the beginning of October 35 000 inhabitants moved away from the region. However, moving occurs also in another direction, and the local authorities have estimated the net decrease to be about one percentage point also in 1992.



*Development of population in the Kola Peninsula*

## 2.2 Jobs

The number of jobs in the Kola Peninsula in 1990 was 470 000.

Share of jobs in various fields of economy

Industrial production	32 %
Construction	12 %
Trade	11 %
Education and culture	11 %
Transport	10 %
Health care, sport	7 %
Public services	6 %
Agriculture and forestry	3 %
Research	3 %
Communications	2 %
Miscellaneous	3 %

Regionally, the jobs are spread approximately in relation to the population. More than half of the jobs in the Kola Peninsula are concentrated in the Murmansk district. The jobs of the Monchegorsk, Kirovsk, Olenegorsk and Lovozero districts comprise about 30 % of the total amount. The jobs in the Kandalaksha and Kovdor districts comprise about 10 % and those of the Pechenga district 5 %. A significant share of the military bases is located in the northern part.

As for the industrial sectors, the food industry, on the basis of the number of employees, is concentrated in the cities of Murmansk, Severomorsk and Poljarny on the northern coast. This is natural, since the production based on fish forms the major part of the food production.

The strong areas of colour metallurgy are Monchegorsk, Pechenga and Lovozero. Ferrous metallurgy is predominant in Olenegorsk and Kovdor. The mining chemistry industry is concentrated in Kirovsk and Apatity.

The share of the machine-shop industry is considerable among the industrial jobs in Severomorsk and Kandalaksha, but about 2/3 of the jobs in the field is yet in Murmansk.

The main locations of the electricity production are Poljarnye Zory and Apatity. The building material industry is an important employer in Kovdor and Murmansk. The forest and wood processing industry is concentrated in the Kandalaksha district.

## 2.3 Industry

During the years 1986–89, the output of the industrial production grew steadily. In 1990, no growth occurred, and in 1991, the production declined by 3 %. From the start of 1992, the output of the industrial production decreased by 15 % until the summer. Especially the production of the mining, chemical and colour metal industry has weakened much, but also the food production has declined. Growth has occurred only in the machine and metal processing industry, in which the production output has increased by 19.2 % during the year. The share of finished products and consumer goods of the total volume of the industrial

production has also increased. The housing production has declined and the price of the apartments has multiplied within a short time.

One reason for the decline in the industrial production is the decrease in the demand for raw materials of the fertilizer, cast-iron and steel producers. Thus, it has been necessary to decrease the production capacity of the mining enrichment plants producing raw materials. The decline in the production output has also been affected by the fact that the previous trade relations have been disturbed and that the tight centralized economic control and the distribution of resources are no longer in existence. For these reasons, the prices of products and raw materials have increased and the production has declined. The acquisition of imported goods were given to companies just when the exchange rate of rouble started to decrease.

The production of the fish industry has declined, although the demand is high. The reason for this is the insufficiency of fishing waters. Previously, the major part of fishing occurred in the territorial waters of other states. Nowadays, the foreign currency support granted by the state for buying fishing licences has abruptly decreased. The production costs have simultaneously increased to a considerable extent.

#### Industrial production by sector 1991

Food industry	34 %
Ferrous and non-ferrous metallurgy	29 %
Geochemistry	10 %
Mechanical engineering	9 %
Energy production	8 %
Construction materials industry	5 %
Woodprocessing industries	2 %
Miscellaneous	3 %

## 2.4 Foreign trade and joint ventures

The foreign trade of the region has started to grow. The export grew by 70 % in 1990 and the Murmansk region exported goods by the value of 885 million rubles. The export of electric energy grew by 12 %, that of mineral oil by 8 % and that of wild berries by 70 %. The export of nickel decreased by 5 %, that of cut timber by 6 %, that of lumber by 66 % and that of apatite concentrate by 44 %.

#### Export shares 1990 and 1991

Field of activity	1990	1991
Fish and fishing industry products	33 %	37 %
Non-ferrous metals	47 %	44 %
Ferrous metal	6 %	4 %
Miscellaneous metal products	11 %	9 %
Wood	2 %	1 %
Miscellaneous	1 %	5 %

In import, the share of foodstuffs and consumer goods will increase.

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Joint ventures have been established in the region especially during the last few years. The joint ventures mainly export fish products, wild berries and wood construction products. Import articles are mainly cars and devices.

## Joint ventures 1991 and 1992

	1991	1992
Finland	12	17
Sweden	6	7
Norway	7	8
Germany		6
Others	12	11
Total	37	49
Personnel	2 774	3 354

## Joint venture exports and imports per country in 1991 (1 000 Rubles)

	Export		Import	
Finland	1 820	(14.7 %)	13 892	(51.4 %)
Sweden	1 005	(8.1 %)	6 587	(24.4 %)
Norway	2 143	(17.3 %)	3 584	(13.3 %)
Others	7 404	(59.8 %)	2 956	(10.9 %)
Total	12 372		27 019	

## Joint venture export and import per country. First quarter of the year 1992 (1 000 US\$)

	Export		Import	
Finland	211.2	(3.1 %)	3 381.5	(72 %)
Sweden	889.0	(12.8 %)	1 037.9	(22.1 %)
Norway	3 578.0	(51.7 %)	92.3	(2 %)
Germany	1 276.0	(18.4 %)	61.0	(1 %)
Others	972.0	(14.0 %)	123.3	(2.9 %)
Total	6 926.2		4 969.0	

## 2.5 Economic situation

The economy of the Murmansk region and the city of Murmansk have significantly been dependent on the structures of the old planned economy and because of this on the income transfers taking place from the rest of Russia to this region. Funds to the region have been transferred through the wages, acquisitions and investments of the Russian defence forces, through transportation supports and through the wages of a fairly large state administration. The wages paid in the region have been 1.5–2 times higher than those in the rest of the country.

The most important pillars of the economy of the region have been:

- ✓ Fishing and fish industry
- ✓ Mining operation and processing of ores based thereon
- ✓ Harbour and transports related thereto
- ✓ Defence forces and services needed by them

The defence forces are fairly self-supporting, but they have supported many transportation infrastructure projects of the region to a great extent.

The economy of the Murmansk region have to continuously operate on the conditions of the old rules of the Soviet era, although they are currently breaking apart. The situation has led to difficult distortions of the income distribution in the region. The entire public sector is experiencing extremely cumbersome financial difficulties, since it is nearly completely dependent on Moscow and on the distribution of appropriations granted there. Also, as for the enterprise activity, the forming of the prices is not free in spite of a certain kind of transfer to a market economy. The transfer time has on one hand led to an extremely tight financial situations in the enterprises and on the other hand to a fairly large supply of money in certain sectors, such as the mining industry. This situation may be temporary.

Problems typical of the Murmansk region include:

- ✓ The special advantages of the region are now nearly non-existent, which is indicated e.g. by out migration.
- ✓ Both production plants and offices are obsolete. The continuing of this situation may be impossible in the future.
- ✓ The production plants and the remaining infrastructure are run down. This requires a sizable rebuilding and investments, for which the arrangement of local financing is difficult.
- ✓ In connection with the transfer to market economy, the relative competitiveness of the Murmansk region compared to the remaining parts of Russia is unclear. On one hand, Murmansk's products may be more easily obtained from elsewhere, but on the other hand, the fact may be that the Murmansk region will obtain market shares from areas producing raw materials that are located even farther from Russia's industrial centres.
- ✓ The right to self-determination of the region and especially its right to taxation are still developing. The situation is currently unclear. What conditions of development the region will have depends greatly on how the political decisions regarding these matters will evolve. The ownership of productive facilities and the land are related to the same issues.
- ✓ The future role of the defence forces and the income transfers caused by it to the region are not yet known.

Advantages of the Murmansk region in the future include:

- ✓ Plentiful natural resources in the Murmansk region itself and especially in the Barents Sea, which are easy to market also in Western countries.

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- ✓ From the point of view of Russia, good transportation connections and the increasing importance of the harbours nationally and internationally.
- ✓ The relative vicinity of the region relative to the Russian industrial areas in comparison e.g. to Siberia's mining localities.
- ✓ The continuous strategic importance of the region to Russia, which may guarantee the investments for the infrastructure also in the future.
- ✓ Vicinity of the developed Western countries (Finland, Sweden, Norway).
- ✓ Interesting tourist destinations for special groups are found in the Murmansk region.

## 2.6 Future

The future of the Murmansk region is completely dependent on what happens in Russia both politically and economically. Therefore, for creating such prognoses that will be of importance to this task the following assumptions have to be made concerning the general development in Russia:

- ✓ The development in Russia will continue peacefully towards the Western democracy and market economy.
- ✓ The regional self-administration will develop and local budgeting power will be increased.
- ✓ Cooperation with the neighbouring countries will be eased.
- ✓ The operation of foreign enterprises in Russia will become more free.

With these assumptions, it is possible to create a prognosis related to the future development of the Murmansk region:

### Population and level of income:

The number of inhabitants will decrease, but its level of income may increase rapidly. Also, the share of well-paid foreigners may significantly increase in the region.

### Productive operation and jobs

The mining activity and the metallurgic industry will maintain their position, although there are difficulties relative to ferrous metals. A renovation of the production plants is yet to come. It might take place only by foreign enterprises. The number of jobs will clearly decrease.

The production plants based on fish might also survive, but it requires new investments and a decrease in the number of jobs.

The importance of the harbour and the transports may increase, since Russia has lost the Baltic harbours. Also international transports have an interest in the Northeast Passage. However, this requires fairly large investments in the transportation and telecommunications systems.

The volume of the defence forces in the region may not increase, but may possibly instead decrease. The importance of the defence forces in the

region will yet remain as such, which on the other hand insures a continuous flow of the infrastructure investments into the region. At the top of these public investments are the improvement in the transportation connections and the telecommunications network.

The gas and oil prospects of the Barents Sea will be utilized. On a larger scale, this may occur only by the assistance of foreign oil companies. This creates in the region a large number of well-paid jobs both for foreigners and local people.

The area has potential for improving timber harvesting, which may be sold to Western countries to an ever-increasing extent. The jobs will be retained.

#### Services

The various services of the region will develop, but it possibly occurs at the pace of the transition in the production activity. The development of the services have to be based on a strong know-how and investment inputs coming from the neighbouring countries.

The development conditions of tourism in the special fields will improve.

It is possible to maintain and develop high-quality research services in the region, especially in the fields of arctic research and mining industry.

The Murmansk region has a high potential to develop and prosper, even very rapidly. However, it requires the entry of foreign enterprises and capital into the region on its own conditions. Rebuilding of the entire production sectors and infrastructure of the region are to be anticipated. The situation is facilitated by the fact that in principle, the natural resources of the region are sufficient for paying off this development. As for this, the solutions depend on the allocation of money between the local and central administrations.

### 3 PRESENT ROAD CONNECTIONS TO THE MURMANSK REGION

#### 3.1 Ivalo—Raja-Jooseppi/Lotta—Murmansk

Raja-Jooseppi/Lotta is currently the only international border crossing point from Finland's Lapland to the Murmansk region. The distance from Ivalo to Raja-Jooseppi is 53 km and from Lotta to Murmansk 249 km, altogether 302 km.

In Finland, plans for improving the highway 968 have been prepared in two steps: sections Akujärvi—Kolmosjoki and Kolmosjoki—Raja-Jooseppi, altogether 45 km of gravel road reconstruction. The planned cross-section is 7 m wide and the pavement of oil gravel. The design speed is 80 km/h. The cost estimate of the road improvement is FIM 57.5 million. A traffic forecast has been estimated on the basis of the counts of 1987 and 1988. In 2002 there will be 610 vehicles/day at the start of the road at the Akujärvi village, of which 18 % are comprised of heavy vehicles. Elsewhere, the forecast is 170 vehicles/day, of which the share of heavy vehicles is 52 %. Construction of these projects have not been scheduled in the 5-year programs of the Road District.

For the road section Lotta—Ylä-Tuloma, the Finnish companies have prepared a plan concerning the improvement of the gravel road for a distance of about 150 km. A design speed of 80 km/h has been used in the plan. The design width of the road is 8 m, of which the width of the oil gravel pavement is 7 m. The bearing capacity has been designed for less than 500 vehicles/day, of which the share of heavy vehicles is 30 %. The effective width of the bridges is 10 m. The plan has been financed by a private contractor, which means that no cost estimate has been published. The cost estimate may be of the order of FIM 200 million, which corresponds to about FIM 1.3 million per kilometre. There are no agreements on the construction contract.

In Russia, the road is now under reconstruction. The work advances slowly, since until the summer of 1993 the road will be built only by one construction unit of the Murmansk road district. During one year, 10–15 km of paved road will be completed. During the other half of 1993, it employs 1.5 work units, since labour will be released from Olenegorsk. In September 1994, 131 km of paved road will be ready from the direction of the Murmansk region, and about 100 km thus remain unpaved.

#### 3.2 Ivalo—Näätämö—Kirkenes—Nikel—Murmansk

Another road connection currently in use from Lapland to the Murmansk region leads via Norway's Kirkenes. The distance from Ivalo to Kirkenes is 231 km and that from Kirkenes to Nickel 50 km. The distance from Nickel via Pechenga to Murmansk is 184 km. The distance from Ivalo to Murmansk via Kirkenes is thus 465 km.

The Sevettijärvi road, highway 971 and path road 50023 from Jäniskoski to the Norwegian border will be ready in Finland in 1993. The road is 6 m wide and provided with an oil gravel pavement.

The road from Kirkenes to Nickel is paved and in a fairly good condition. From Nickel onwards, the road is also paved with asphalt and in a fairly good condition, but it is partly located in an arctic hill district with no trees. The winter mainte-

nance of the road is difficult and the road is dangerous when it is slippery or foggy. The Nickel–Murmansk road was opened to international traffic in April 1992. Since the road goes via a military area, its usage is not completely free. The road is open to international traffic on Sundays, Wednesdays and Fridays at 6–12 am and 6–12 pm. The international transit traffic is allowed to use the road only during these periods of time. Parking is allowed only at official parking points, and detouring from the main road or driving to population centres on the way is not allowed. The road may also be totally closed for a month or for a shorter time owing to military exercises or other actions.



Road connections from Lapland to the Murmansk region

## 4 CURRENT ROAD PROJECTS

### 4.1 Salla road (Salla—Kellosekä—Kairala—Kandalaksha)

For the old road and railway line Kellosekä—Alakurtti—Kandalaksha (appr. 160—170 km) at the latitude of Salla, the Lapland Road District has prepared a preliminary plan for a distance of 32 km between Kellosekä—Kairala.

The Road District of the Murmansk region is now investing most in the Salla road. Presently the road has two construction sites and two work units.

#### 1) Section Kandalaksha—Alakurtti (builder: Murmanskdorstroi)

- ✓ 30 km starting from Kandalaksha is asphalt road.
- ✓ 23 km of the road is gravel road in a poor condition, of which 10 km will be paved in 1993.
- ✓ A bridge over 100 m long has to be built over the river Tuntsa.
- ✓ The entire section Kandalaksha—Alakurtti will be paved by 1995.

#### 2) Section Alakurtti—Kairala (builder: Avtodor Unit)

- ✓ 30 km of the gravel road from Alakurtti is in a reasonable driving condition, in 1993 it will be 40 km.
- ✓ The entire section will be ready as a proper gravel road in 1995.

The section Kairala—Finnish border will be built only after 1995, if no additional funds can be found. A proposal has been made to the governor concerning the building of the road before 1995. The financing is being contemplated.

Also the Umba—Varzuka road consumes the resources of Avtodor. Without it, the Salla road would not be ready in 1994.

### 4.2 The Arctic Ocean road (Ivalo—Virtaniemi—Nikel—Pechenga)

The old road from Virtaniemi to Nikel, The Arctic Ocean road, is to a limited extent in principle open to international traffic in the same way as the Murmansk—Nikel road. However, Russia has not yet provided information about the condition of the road and what the schedule is for taking the road into use. In Finland, the condition of the road is such that the road could be taken into use immediately. However, the official opening of the road requires an agreement by the Foreign Ministries of the countries regarding the border station.

In Russia, the Nikel Road District paves the Arctic Ocean road by 2—3 km per year, financed by Avtodor. The inhabitants of Rajakoski have required the improvement of the road, but Avtodor has no funds for the improvement work. If the governors of the Murmansk region and the province of Lapland decide on the improvement of the road, some other project has to be given up. According to Avtodor, the opening of the road can be decided by the management of the region.

### 4.3 Road connection Ivalo—Virtaniemi—Kirkenes

A feasibility study for the road connection Ivalo—Kirkenes was completed in 1991. The connection would mainly serve the traffic between Finland and Norway, but it would also offer one possible connection from Finland to the

Murmansk region via Norway. The project comprises altogether 205 km of road, of which 52 km is new road between Virtaniemi–Nyrud. The improvement on the current road would be 134 km and a section of 10 km would require no actions.

The total width of the road is designed to be 7 m and the pavement is oil gravel. The design speed is 80–90 km/h and the axle load for the whole section 10 tons. The amount of traffic crossing the border in 2010 is predicted to be 200–250 vehicles per day. The summer traffic is 2–3 fold.

The project will amount to a total of FIM 275 million estimated on the basis on the price level of 1990, of which FIM 111 million is in Finland and FIM 164 million in Norway. The benefit-cost ratio is calculated to be 0.3–0.5.

In Finland, the construction is made difficult by wilderness areas and in Norway by the national park and environmental protection projects.

Lately, the building of the connection has been proposed such that there would be a border crossing point at Virtaniemi to Russia on the old road from Virtaniemi to Pechenga, from which the road would be taken over the Paatsjoki river to Norway as soon as possible. Advantages of this alternative would be the utilization of the old road from Virtaniemi to Pechenga and the fact that no road would be necessary through the Kessi wilderness area.

A road plan has been prepared on the improvement of the alignment and pavement structure of the highway 9681 between Akujärvi and Nellimö. The length of the section is 5.2 km and the cost estimate FIM 7.9 million. In addition to the complete road improvement, the Nellimö road should be reconstructed for a distance of 35 km. The total costs would be FIM 30 million.

#### **4.4 Other road projects in the Murmansk region**

##### **Kovdor road**

There is a good road connection from the Murmansk–St. Petersburg road to Kovdor, and only 5 km thereof is now unpaved. The project proposed by the Kovdor region for building a road to Salla is problematic, since Kovdor has no funds and the terrain is difficult. The distance between Kovdor and Salla is 90 km and 20 bridges would be needed for the road. According to Avtodor, Kovdor's turn will be after the Salla road.

##### **Connection from Prirechnyi to Lotta road**

A proposal on the road connecting Nickel and the Lotta road has been made, when the northern road from Nickel to Murmansk was closed "forever". The road is mainly intended for the traffic between Norway and Murmansk. There are no military bases along the road so that there would be no traffic limitations. Prirechnyi is a region known for natural beauty, and there are plans for building a camping area in the region. There is a mine in Prirechnyi, but it will be closed in 1992. It is believed in Avtodor of the Murmansk region that the road will still be built.



Connection of the Murmansk region roads to the road network in the North Calotte area

## 4.5 Situation at the border stations of the Murmansk region

### Lotta

According to the Murmansk Customs District, the Lotta border station is operative. Both the number of passengers and the quantities of goods are increasing.

The construction of a new border station in Lotta was started in the fall of 1992. In addition to the station, the intention is to build a two-floored accommodation unit on the border. The total price of the border station is US\$ 2 million, and it will be financed half by the Kola Association and half by the Customs Committee. In the future, a gasoline station and other service units will be built at a distance of 8 km from the border.

### Salla, Rajakoski, Tuntsa

The president of Russia, Mr. Yeltsin, has ordered the border stations of Salla, Rajakoski and Tuntsa to be opened. Nowadays, they are occupied by border guard departments. The order obliges the management of the Murmansk region, which has applied for funds from Moscow for opening all three border stations.

According to the Murmansk Customs District, the construction of the Salla border station will be the second one in order after the construction of the Lotta border station. Salla with its border station buildings and apartments may be ready in 1995. The Customs Committee and the city of Kandalaksha will finance site investigations, which are currently in progress.

The Murmansk Customs Superintendent has made a regional-level decision on the opening of the Rajakoski border crossing point permanently only for goods transportation.

In Tuntsa, only timber now crosses the border. The Murmansk Customs District will send a customs officer to the border, when needed.

### Borisoglebsk

On the Norwegian border, the number of travellers has multiplied after the completion of the road. In 1991, 1 103 cars crossed the Borisoglebsk border station, which were mainly Russian. During the first five months of 1992, the number was 1 824 cars, of which the main part crossed the station after March, when the road was opened to international traffic.

In 1991, 2 700 tons of goods crossed the border. During the first five months of 1992, the 136 000 tons of goods crossed the border, of which 133 000 tons were imports, mainly timber. A new customs station was opened in Borisoglebsk on July 6, 1992.

### Murmansk airport

In 1991, 280 airplanes from Finland and Norway landed on the Murmansk airport. In these airplanes, 1 130 foreigners arrived in Murmansk, of which 360 were businessmen or members of delegations. 300 tons of goods were carried by the airplanes.

According to the Murmansk Customs District, it is possible that an international airport and a customs point will be opened in Apatity.

## 5 TRAFFIC

### 5.1 Border traffic in Lapland

The information about the vehicle traffic crossing the Finnish border are based on the counts obtained from the border stations in 1991. The traffic between Finland and Sweden was 19 200 vehicles per day and the traffic between Finland and Norway 2 100 vehicles per day. Raja-Jooseppi is the only official crossing point from Lapland to the Kola Peninsula. On the border of Norway, Finland has 5 crossing points and Sweden 6 crossing points.

The statistics of the Lapland Customs District concerning foreign traffic indicates a considerable increase from 1991 to 1992. The vehicle traffic in Raja-Jooseppi has doubled, if a comparison of the traffic is made between the first seven months in 1991 and 1992. The number of travellers has increased by more than 50 % during the corresponding period. If the growth continues to the same extent also during the rest of the year, the average daily traffic between Finland and the Murmansk region will increase to 30 vehicles per day.

More than half of the vehicles are Finnish, although the share of Finnish vehicles has slightly dropped. The share of Russian vehicles has instead increased from 10 % of the previous year to nearly 20 %. The amount of Swedish private cars has doubled, but their share is only slightly larger than that of Russian private cars.

Vehicles entering Finland via Raja-Jooseppi border crossing point in January – July 1992

Nationality	Passenger vehicles	Buses	Trucks	Vehicles total	Share
Finnish	838	200	308	1 346	52 %
Swedish	238	33	118	434	17 %
Norwegian	185	36	54	275	11 %
Russian	245	78	169	492	19 %
Others	22	1	14	37	1 %
Total	1 573	348	663	2 584	100 %

Vehicles leaving Finland via Raja-Jooseppi border crossing point in January – July 1992

Nationality	Passenger vehicles	Buses	Trucks	Vehicles total
Total	1 663	345	622	2 630

Growth of traffic entering Finland via Raja-Jooseppi border control point in January—July 1991—1992

Nationality	Passenger vehicles	Buses	Trucks	Vehicles total
Finnish	58 %	223 %	398 %	91 %
Swedish	105 %	94 %	104 %	112 %
Norwegian	31 %	89 %	243 %	35 %
Russian	214 %	767 %	833 %	373 %
Others	10 %		600 %	76 %
Total	74 %	225 %	326 %	109 %

Growth of traffic departing from Finland via Raja-Jooseppi border crossing point in January—July 1991—1992

Nationality	Passenger vehicles	Buses	Trucks	Vehicles total
Total	67 %	208 %	77 %	92 %

## 5.2 Goods traffic between Finland and the Murmansk region

The import from the Murmansk region to Finland is mainly timber and ores. The ore transports mainly occur by train and raw-wood transports by trucks. Timber transports occur via Raja-Jooseppi, but also via the Virtaniemi, Puitsi and Onkamo border crossing points. Mainly manufactured and processed goods are exported from Finland.

The Ministry of Transport and Communications has had a study made in 1990 on the effects of the construction of the northern railway connections of Finland and the Soviet Union. The study focused on the railway lines going through Vartius and Salla. The rehabilitation and reconstruction of the Salla railway would mainly serve the traffic between Finland and the Murmansk region.

The volume data of the goods flows were collected by means of detailed enquiries. According to Finnish companies, it would have been preferable to import 690 000 tons of the goods flows coming from the Soviet Union to Finland via the Salla railway connection. 70 000 tons of the truck transports would transfer to rail. The import possibly to be obtained in the future would be approximately 1 million tons per year, of which 270 300 tons would be transferred from truck transports.

The exports from Finland in 1990 were 450 tons per year, which were entirely truck transports. It was not possible to estimate the extent of the export possibly occurring in the future because of the changes in the situation of the Murmansk region.

In the municipality of Salla, an estimate has been prepared on the amount of truck traffic passing via Kellosekä. The estimate is based on the needs of transportation known so far as well as on transports to be expected, which will be brought about along with the start-up of the joint projects.

## TRAFFIC

Estimated volume of imports entering Finland via Kelloselkä border crossing point (truck load/year):

Timber	2 000
Wood chips	400
Carpentry products	10
Fish feedstuffs	10
Mineral salts	50
Mechanical engineering products	30
Miscellaneous / bulk	200
Imports total	2 700

Estimated volume of exports departing Finland is 400 truck loads in the first year connection is opened via Kelloselkä.

The first year border crossings of freight are estimated to be 6 200 trucks (outward and inward traffic combined). The number is estimated to grow 20 % a year and even more if numerous industrial and other projects start or transit traffic via the Northeast Passage increases.

### 5.3 Tourist traffic

In the summer of 1989, the Lapland unit of the Tourism Training and Research Centre has studied the interest and willingness of travelling to the Murmansk region among the tourists coming to Lapland. They also made a market analysis of the level of interest of the Murmansk region in Central Europe. The results of both researches support the notion that there is an interest in the region and that the travelling in Lapland would gain additional potential and attraction, if the Murmansk region would be opening to the travellers.

A quarter of the Finnish summer travellers is interested in the Murmansk region as a travelling destination; 6 % of the travellers were going to travel to the region within a period of two years and 19 % within a period of five years. Taking into account that all intentions will not be realized, the total demand of the Murmansk region, as for Finns, could increase to 15 000–25 000 travellers during the next few years. At the time of the research period, the number was 5 000–6 000.

A market analysis made in Central Europe indicated that the number of travellers coming therefrom to Murmansk could at its best increase to the same numbers. As for Finns and other countries, the interest is directed mainly to the summer time, and the interest in winter travelling has not been clarified.

However, the increases of such a large number of travellers are not realistic, unless the central obstacles of tourism cannot be eliminated. The Finnish summer traveller is a round-trip traveller, who together with the family or in small groups travels from one place to another by own car. So, the main portion of the travellers going to Murmansk wants to travel there by their own car for a couple of days or weeks. This requires the allowing of a free use of cars within the entire region, a gas station network, guidance services in English and possibly also in Finnish as well as signing of the road in Western letters. Obtaining a visa should be made easier or the obligation to obtain a visa should be even totally removed. The roads of the region should be rebuilt in a proper condition. There

is also a need for round tours. Therefore the road connections from Salla to Kandalaksha and from Virtaniemi to Pechenga should be opened.

An important factor for increasing the foreign travelling is the making of tourist products. Along with food and accommodation other program must also be offered. The interest of the Finns in the Murmansk region is directed to the old road from Virtaniemi to Pechenga, cruises, fishing both in the sea and in the rivers, arcticity and to the special nature. Along with the city of Murmansk, interesting objects include Kirovsk, Kandalaksha, Umba and Lovozero as well as Pechenga. In addition to the products, also service has to be developed. As for the services, the Western traveller is used to security, punctuality and rapidness. This system may be designed together with the Murmansk region and Lapland, whereby the knowledge of the region and the professional skill of the Lapland entrepreneurs and travel agencies can be combined.

In Salla, estimates have been made related to the border crossings occurring in Kellosekä assuming that the border crossing point is available to international traffic and that the road connection from Kellosekä to Kandalaksha is in a sufficient condition for most of the year. As the traveller traffic for the first operative year has been estimated 75 000 crossings. Of these, about 70 000 trips would be directed to the old Salla in Kuolajärvi. The travellers would mainly be current and former residents from Salla as well as Germans. The Germans are interested in the cemetery located in the region, in which 18 000 Germans have been buried.

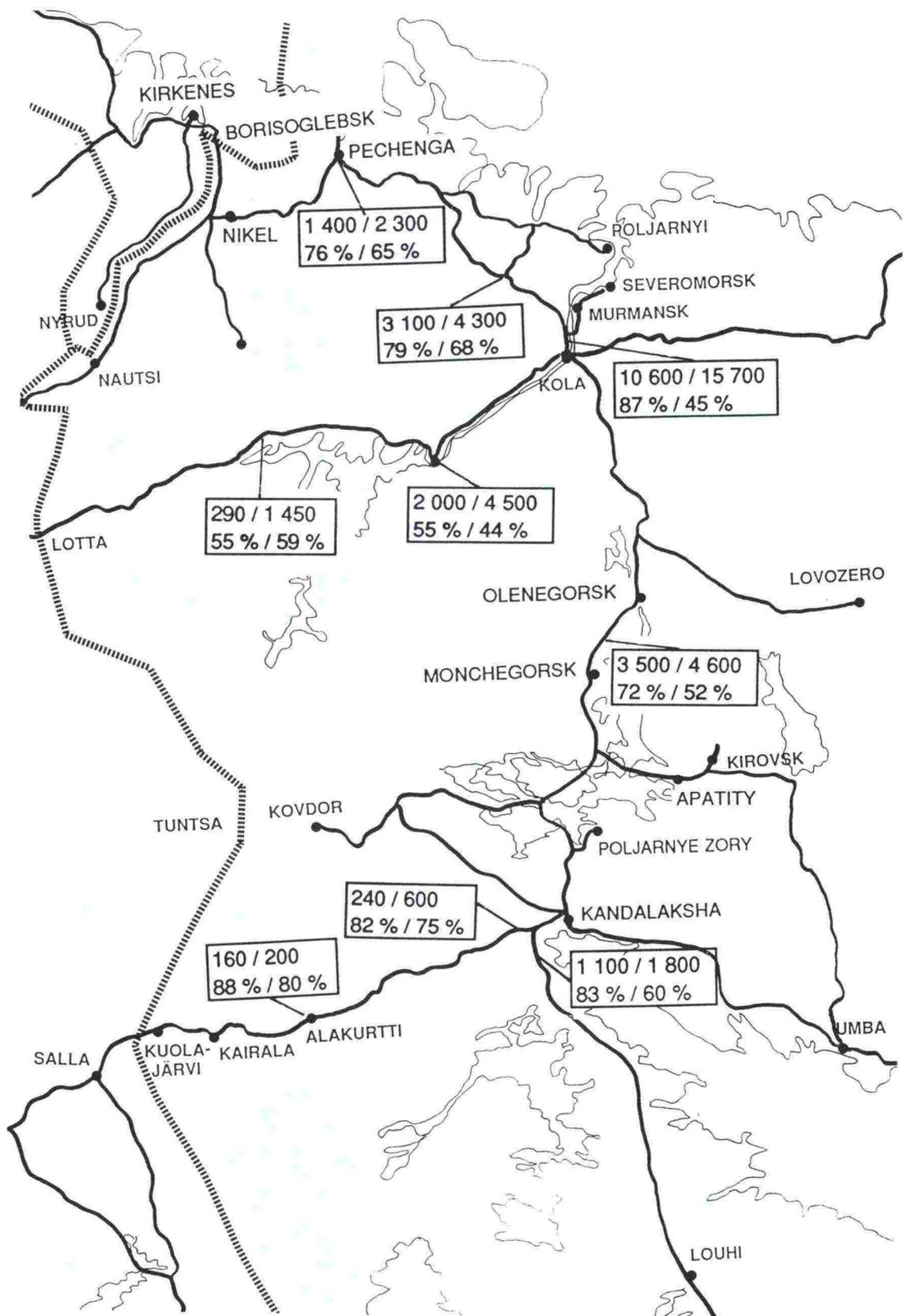
#### 5.4 Roads and traffic in the Murmansk region

The most significant public roads in the Murmansk region

Road	Length within the Kola region	Traffic volume ADT 1991	Traffic forecast by Avtodor ADT 2010
St. Petersburg—Murmansk	328 km	1 100—10 600	1 800—15 700
Kola—Lotta	231 km	290—2 000	1 450—4 500
Kola—Pechenga	134 km	1 400—9 000	2 300—8 500
Kandalaksha—Salla	172 km	160—240	200—600
The road leading to the Borisoglebsk power station	33 km	100	250
Total	898 km		

The share of the heavy traffic on the roads of the Murmansk region varies between 55—88 %, which is extremely high. In Finland, the share of the heavy traffic is 10 % on the average. In the long run the share of the heavy traffic also in the Murmansk region will decrease.

TRAFFIC



The traffic of the main roads of the Murmansk region in 1991 / local traffic forecast for 2010. Share of heavy traffic is shown below



*Lotta—Murmansk road near the Finnish border*



*A bridge on the Lotta—Murmansk road near the Finnish border*



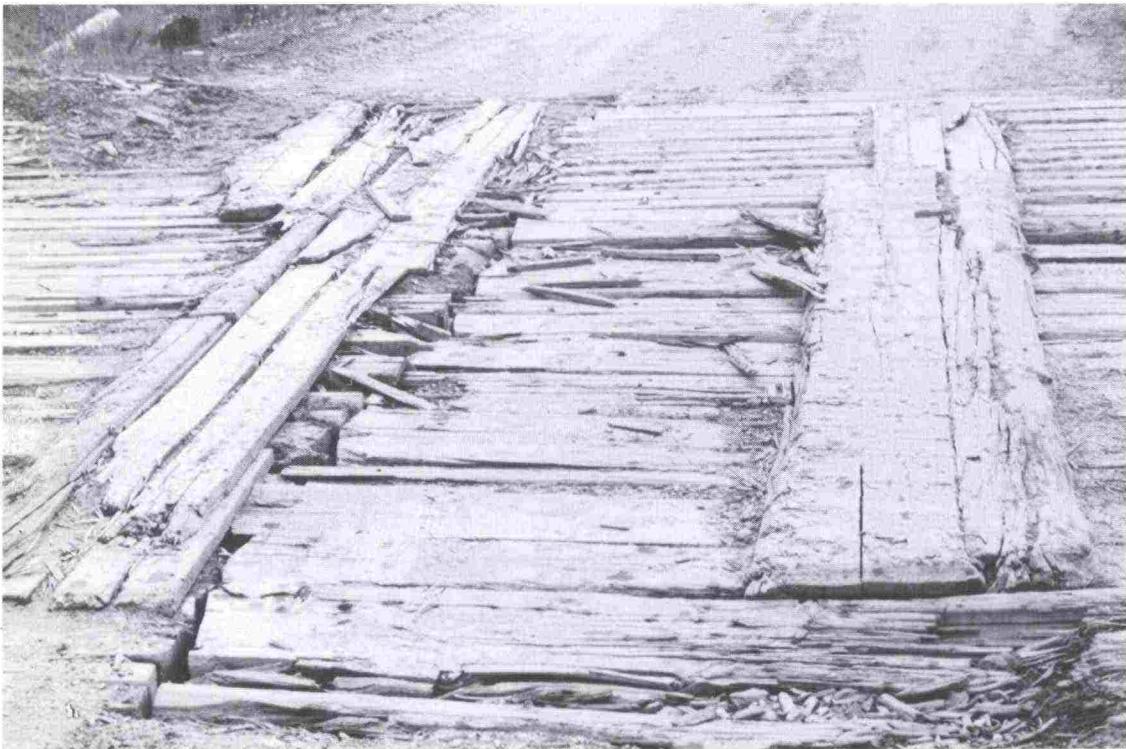
*A site of reconstruction on the Lotta—Murmansk road in the section Finnish border—Ylä-Tuloma*



*The section Ylä-Tuloma—Kola of the Lotta—Murmansk road is paved*



*The Salla–Kandalaksha road near Kuolajärvi*



*Between Salla and Kairala there are several wooden bridges in a bad condition*



*The Kola–Pechenga road near Murmansk*



*The Kola–Pechenga road near Pechenga*

## 5.5 Potential traffic between Finland and the Murmansk region

### Gravity model

The current traffic between Finland and the Murmansk region is non-existent from the point of view of population potential in the Murmansk region. The lack of the interrelationship between the two regions may be clarified by the fact that until recent years, the border has in practise been closed and the road connections have been really poor. However, it has been found in various instances that the development of the road connections is necessary, and indeed several projects have attempted to increase and improve the roads between Lapland and the Murmansk region. However, not much has been accomplished. Nowadays also social and economic changes will increase the possibilities of travelling of the inhabitants in the Murmansk region to Western countries. Thus, extrapolation of the future traffic on the basis of the current traffic is not in this case a very practical method.

It has been calculated for the traffic forecast what the possible current traffic would be between Finland and the Murmansk region. The assumptions are that the social and economic situation in the Murmansk region as well as the road connections and the border formalities into the direction of Finland would be on the level of Nordic countries.

In general, it is assumed that the volume of the traffic flow between two areas has to increase as the size of the regions, or the potential for traffic generation, is increasing and to decrease along with the distance between these areas. According to the gravity model, the traffic flow between the areas  $i$  and  $j$  is as follows:

$$T_{ij} = k * W_i * W_j * f(c_{ij}), \text{ where}$$

- $W$  = size of area
- $k$  = calibration coefficient
- $f(c_{ij})$  = distance function between areas

$$f(c_{ij}) = c_{ij}^{\alpha}, \text{ where}$$

- $c_{ij}$  = distance between areas  $i$  and  $j$  measured as distance, time or costs

In this case, as the size of the region has been used the number of inhabitants, which has then been modified on the basis of the car ownership rate.

As the value of the exponent  $\alpha$  of the distance function has been used the value  $-2$  since an insufficient amount of information has been available for calibrating the value of  $\alpha$ .

Since origin and destination studies related to border crossings have also not been available, average values were calculated for the calibration coefficient  $k$  based on the traffic between Finland and Sweden as well as between Finland and Norway. As average coefficients were obtained figures fairly close to each other, of which the coefficients illustrative of the traffic between Sweden and Finland were larger than the figures describing the attraction between Norway

and Finland. The higher figures related to Sweden may describe a close cooperation in the Tornionjoki Valley, wherein there is plenty of short-distance traffic across the border. Thus, the coefficients of Norway may be the most suitable ones when evaluating the direction of the Murmansk region, since important population centres in the Murmansk region are located at a distance of 100–250 km from the border.

Values of the coefficient  $k$  between different areas:

Northern Finland—Northern Norway	$k = 0.004$
Northern Finland—Northern Sweden	$k = 0.006$
Finland—Northern Norway	$k = 0.001$
Finland—Northern Sweden	$k = 0.003$
Finland—Sweden	$k = 0.0008$

### Zoning of the study area

The Murmansk region and the northern parts of Finland, Sweden and Norway have been chosen as the study area. The area was also separately investigated as expanded with the southern parts of Finland, Sweden and Norway, as may be seen from the definition of the calibration coefficient.

The area to be investigated was divided into zones, for which an average point of concentration was defined, of which the trips to other subareas were measured.

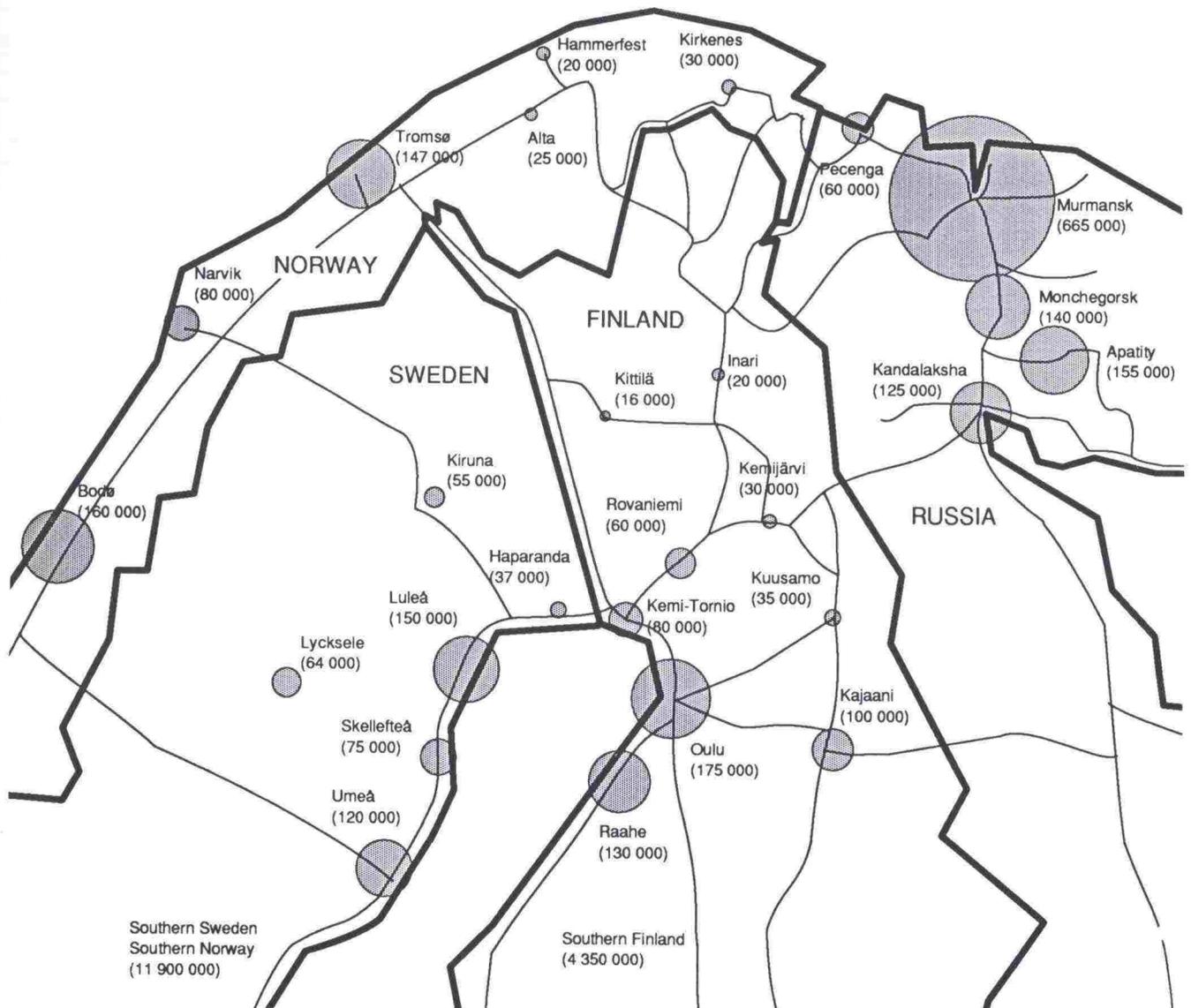
Information about the population in the Kola Peninsula has been available according to the local administrative areas as well as by cities. Since the population has fairly clearly concentrated in cities, a practical zonal division for traffic studies has been easy to obtain. For the traffic studies the Kola Peninsula has been divided into five zones.

In Finland, the land use information can be obtained by municipality, which is yet too fine a division for predicting the traffic crossing the border especially when the size of municipalities both in the Kola Peninsula and in Sweden is considerably larger than in Finland. The provinces of Lapland and Oulu were regarded to be included in North Finland, in which about 650 000 inhabitants are living. The division of area was made such that the province of Lapland was divided into six zones and the Province of Oulu into four zones. The rest of Finland was treated as one area, the concentration point of which is the region of Lahti.

The northern part of Sweden were defined as the provinces of Norrbotten and Västerbotten, the total population of which is 500 000. Six zones were formed of the northern part of Sweden. As the seventh zone was taken the rest of Sweden and South Norway, since the traffic possibly coming therefrom to the Murmansk region passes via Sweden. The total population of the rest of Sweden and South Norway amounts to 11.9 million and the point of concentration was defined to be at a distance of 1 200 km from Kemi in Finland.

As the area of North Norway were defined the provinces of Finnmark, Troms and Nordland, in which altogether 460 000 inhabitants are living. North Norway was divided into six zones.

The zoning is shown in the following figure.



Population concentration in the North Calotte area in 1991. The circles are located in the center of gravity of the population

### Calibration of traffic volume

The possible current traffic on the border between Finland and the Murmansk region was estimated in a situation, where the current road connections from Raja-Jooseppi and Kirkenes to Murmansk are available. The calculations have been made by two calibration coefficient values, whereby the areas "the rest of Finland" and "the rest of Sweden and Norway" are not included in the value  $k = 0.004$  in the attraction calculation. On the coefficient value  $k = 0.001$ , these areas are included in the calculations.

Of the traffic caused by North Norway has been subtracted that portion, which goes to the Murmansk region directly via Kirkenes. As passing via Kirkenes

## TRAFFIC

have been calculated all trips, in which the distance to a destination in the Murmansk region is shorter via that route than via Raja-Jooseppi.

The first estimate has been made such that an extra border impedance and the poor condition of the Lotta–Murmansk road have not been taken into account. With both  $k$ -values, the same result was obtained, 8 000 vehicles per day. The distribution of the trips between the different nationalities corresponds to the actual distribution in Raja-Jooseppi best with the  $k$ -value of 0.004, i.e. when only the population of the northern parts is taken into account as travellers.

Potential present traffic via Raja-Jooseppi (calibration coefficient  $k = 0.001$ )

	vehicles/day	share
Finland–Kola Peninsula	3 640	46 %
Sweden + Southern Norway–Kola Peninsula	4 034	50 %
Northern Norway–Kola Peninsula	324	4 %
Total	7 998	100 %

Potential present traffic via Raja-Jooseppi (calibration coefficient  $k = 0.004$ )

	vehicles/day	share
Northern Finland–Kola Peninsula	4 703	58 %
Northern Sweden–Kola Peninsula	2 079	26 %
Northern Norway–Kola Peninsula	1 298	16 %
Total	8 080	100 %

Similar methods were applied to the estimation of potential traffic via Salla and Virtaniemi, assuming that the said road connection was the only one in use. In addition, an estimation of the traffic was calculated assuming that all connections were in good condition and open to traffic.

The potential volume of traffic on the three road connections were the following:

Road connection	ADT vehicles/day
Raja-Jooseppi	8 000
Salla	9 500
Virtaniemi	7 500

The figures given above describe the theoretical maximum volumes of the traffic between Finland and the Murmansk region. As the assumption was that the Murmansk region and the Nordic Countries would form a homogenous area. However, this is not the case, which means that the figures must be calibrated on the basis of the condition of the road connections, the border situation and the economic situation of the Murmansk region.

When examining the possible current traffic via Raja-Jooseppi, the poor condition of the Lotta–Murmansk road has to be taken into account. This took place such that as the travel speed of the road was determined to be 60 km/h, when the speed of other roads was 80 km/h. 7 000 vehicles per day were thus obtained as an average traffic.

The borders between the states add delays to the trips such that the time to be used for border formalities has to be taken into account. As a border delay between Finland and Russia has been used two hours and on the Nordic borders 15 minutes. When the border obstacles were taken into account, as an average daily traffic was obtained 5 000 vehicles per day.

As a measure of the income level was used the rate of car ownership. In the Nordic countries, it is currently on an average 400 vehicles per 1 000 inhabitants, and in the Murmansk region correspondingly 80 vehicles per 1 000 inhabitants. When taking into account the level of car ownership, the road traffic nowadays possible between Finland and the Murmansk region at Raja-Jooseppi would thus be about 1 000 vehicles per day. In comparison with the figure 2 000 between Norway and Finland and the figure 19 000 between Finland and Sweden, the figure appears to be fairly possible.

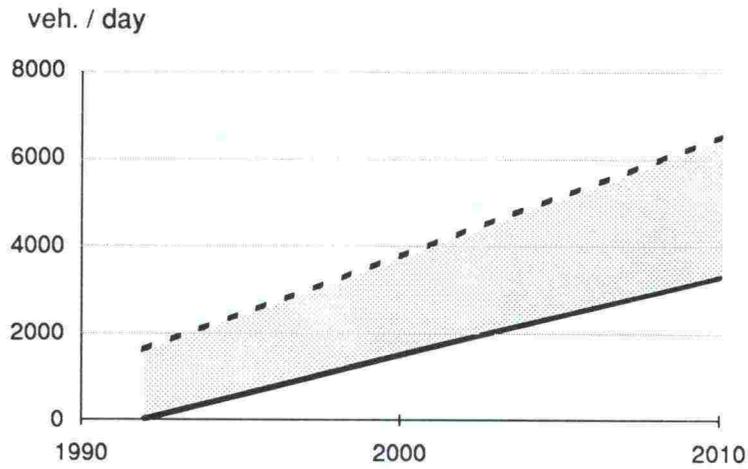
### **5.6 Traffic forecast**

The traffic forecast has been prepared on the basis of the possible volume of traffic shown in the previous section. The maximum forecast assumes that the level of car ownership in the Murmansk region will increase to 260 until the year 2010 and the number of inhabitants will remain as such. In the minimum forecast, the level of car ownership will increase to 170 and the number of inhabitants will decrease by a percentage point per year, i.e. to 900 000 until the year 2010. The estimate on the growth of the level of car ownership is based on the information, according to which the growth in Western countries has been about 10 cars per year and in the Baltic countries about 5 cars per year. The average level of car ownership in the Nordic countries has been estimated to be 500 vehicles per 1 000 inhabitants in 2010.

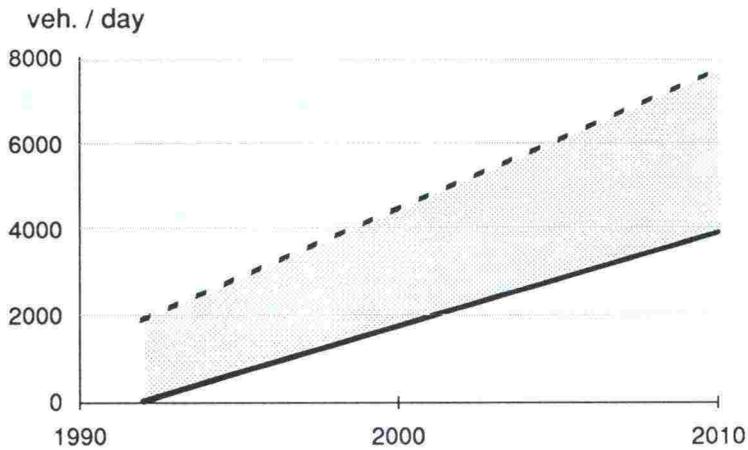
In the following figures the development of the traffic volumes is shown assuming that only the connection concerned is in use, the roads are in the same condition everywhere and crossing the border is equally easy on all borders.

The volumes of traffic shown in the figures are, so to say, natural volumes of traffic, into which the traffic may be expected to grow when the conditions are normal on both sides of the border and passing-through is fairly free. The volumes of traffic at the moment are clearly smaller than those presented, and no long-range traffic forecast can be made based thereon. It is also otherwise difficult to predict the border-crossing traffic, since it is highly influenced by relative economic conjunctures on both sides of the border.

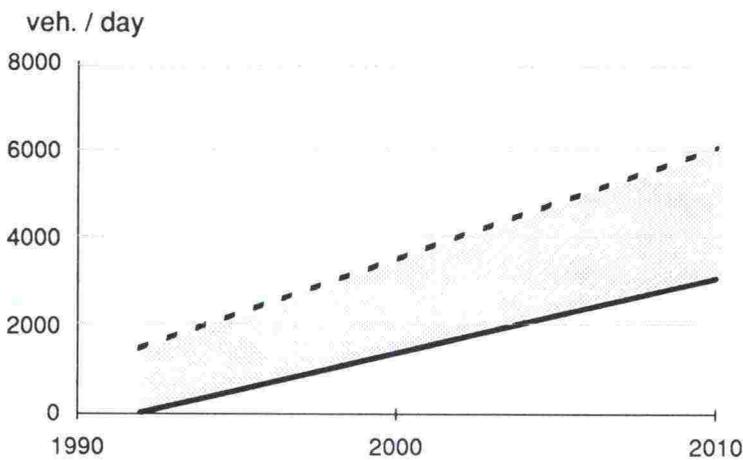
TRAFFIC



*Estimated development of the traffic volumes on the Raja-Jooseppi road assuming that other roads are not in use*



*Estimated development of the traffic volumes on the Salla road assuming that other roads are not in use*



*Estimated development of the traffic volumes on the Arctic Ocean road assuming that other roads are not in use*

## 6 COMPARISON BETWEEN ROAD CONNECTION ALTERNATIVES

### 6.1 Alternatives and their costs

The alternatives of the road connections between Finland and the Murmansk region are fairly clear:

- I Improvement of the Raja-Jooseppi road (Ivalo—Raja-Jooseppi—Murmansk)
- II Construction and improvement of the Salla road (Salla—Kellosekä—Kairala—Kandalaksha)
- III Improvement of the Arctic Ocean road (Ivalo—Virtaniemi—Nikel)

In this study, the road connections are each assumed to be on the travel speed level of 80 km one at a time for making the comparison possible. This requires the upgrading of the existing roads, partial repaving works and construction of missing road sections.

In the following, the actions required by each road connection are shown without separating the fact whether the road section is located in Finland or the Murmansk region. Also the cost estimate of the sections located in the Murmansk region is based on the Finnish price level.

#### I The Raja-Jooseppi road

	Length	Estimated costs
Akujärvi—Raja-Jooseppi Reconstruction of the road into a 7 m oil gravel road	45 km	58 mmk
Lotta—Ylä-Tuloma Reconstruction of the road into a 7 m oil gravel road	app. 150 km	200 mmk
Ylä-Tuloma—Kola Repaving	app. 60 km	15 mmk
	Total	273 mmk

## II The Salla road

	Length	Estimated costs
Kellosekä—border	4 km	6 mmk
Construction of a new road		
Border—Kairala	28 km	34 mmk
Construction of a new road		
Kairala—Alakurtti	32 km	20 mmk
Construction of a new road and paving		
Tuntsa-river bridge		6 mmk
Construction of a new bridge		
Alakurtti—(Kandalaksha)	56 km	14 mmk
Repaving		
	Total	80 mmk

## III The Arctic Ocean road

	Length	Estimated costs
Akujärvi—Virtaniemi	44 km	57 mmk
Construction of a 7 m oil gravel road		
Virtaniemi—Nikel	app. 100 km	130 mmk
Construction of a 7 m oil gravel road		
	Total	187 mmk

### 6.2 Evaluation of transportation economy of alternatives

In the economic evaluation the unit prices of 1991 have been used according to the road user costs defined by the Finnish Road Administration. The same unit prices have been used in the evaluation independently of the fact whether the car is Finnish, Russian or originating from some other country.

#### I Raja-Jooseppi road

When the Raja-Jooseppi road is improved, the travel speed will increase from the current speed of about 60 km/h to about 80 km/h. The time savings within a distance of about 200 km between Akujärvi—Ylä-Tuloma would be 50 minutes without any border delays. In terms of money, this means savings of 54 FIM per vehicle, if the traffic is assumed to be comprised of 80 % of private cars (savings 36 FIM/vehicle/trip) and 20 % of trucks (savings 125 FIM/vehicle/trip).

The total investment of the project amounts to FIM 273 million so that the annual costs will be FIM 24 million on a discount rate of 6 % and evaluation time of 20 years. In order to make the benefit-cost ratio of the project exceed the value one, the traffic volume has to exceed 450 000 vehicles per year or 1 200 vehicles per day.

The economic traffic volume of Raja-Jooseppi presented above is approximately in the middle of the variation interval of the "natural" traffic volume, and the project could thus be by itself economically feasible. However, the increase in

the actual traffic volume to these figures may last for several years. This means that starting the project is not very urgent.

## II Salla road

In comparison with the existing Raja-Jooseppi road, the new Salla road shortens the length of all trips between Finland and the Murmansk region on an average by 160 km. These travel savings per vehicle are 204 FIM (80 % of private cars, whose savings are 118 FIM/vehicle/trip and 20 % of trucks, whose savings are 544 FIM/vehicle/trip).

The shortening of the distance also causes time savings of more than two hours per vehicle. In terms of money, this saving is 130 FIM/vehicle/trip (80 % of private cars, whose savings are 87 FIM/vehicle/trip and 20 % of trucks, whose savings are 300 FIM/vehicle/trip).

The savings of the user costs are altogether 334 FIM/vehicle/trip.

The investment costs of the Salla road are FIM 78 million, i.e. FIM 6.8 million as annual costs. In order to make the benefit-cost ratio to exceed the value one, the volume of the traffic has to be at least 20 000 vehicles per year or 55 vehicles per day.

The benefits of the Salla road are extremely high in comparison with the current Raja-Jooseppi road, and the necessary investments are on the other hand fairly reasonable. Because of this, the required economic volume of traffic is very low, and it seems that it would enter the road immediately after the road is opened. The "natural" volume of the traffic on the road is much larger than the economic volume so that it may be said fairly certainly that the Salla road is quite feasible.

## III The Arctic Ocean road

In comparison with the Raja-Jooseppi road, this road from Virtaniemi to Pechenga increases the length of all trips between Finland and the Murmansk region by 33 km. If the speed on the road is 80 km/h, it may however be calculated that the total travelling time would decrease by 25 minutes. The user costs of the Arctic Ocean road still remain 15 FIM/vehicle/trip larger than when using the existing Raja-Jooseppi road, which means that the project is not feasible on the basis of this evaluation. In this connection, it is assumed that all traffic between Finland and the Murmansk region would use only this connection.

The Arctic Ocean road is local by nature, and it mainly serves the traffic between North Lapland, North Norway and Pechenga. The economy of the project is to be evaluated on these grounds. Smaller investments may then very well be feasible.

### Summary table

	Total cost (mmk)	Annual cost (mmk)	Savings / trip (mk)	Economic traffic/d	Natural traffic/d *)	B / C
The Raja-Jooseppi road	273	24	54	1200	800–1 600	0.7–1.2
The Salla road	78	7	334	55	950–1 900	> 10
The Arctic Ocean road	187	16	-15	—	750–1 500	—

\*) Natural volume of traffic means the volume of traffic that could use the road in ideal conditions.

The traffic shown in the Table refers to the traffic that each road could have, if other connections are not in use. If several road connections are open at the same time, the volumes of traffic on each road will decrease. The distribution of traffic between the roads depends on their usability or the service level, including the customs arrangements. There is a large number of various combinations between the possible service levels of the road connections.

If all roads are in use, more than 90 % of the traffic passes via Salla. Together with the Salla road, the traffic is best served by the Arctic Ocean road, which shortens all distances to the Pechenga region. The Raja-Jooseppi road offers the shortest connection only for the trips from the Ivalo region to the Murmansk region.

## 7 CONCLUSIONS

It is apparent on the basis of the facts described above that the only clearly feasible project is the construction of the Salla—Kandalaksha road. In the economic sense, its construction may be started at any time. The construction of the Salla road is also rational on the basis of the location of important joint projects. Most of these projects will be located in the southern part of the Kola Peninsula, for which the Salla road offers the shortest connection from Finland and the west. At the moment, the Murmansk Road District also on its part invests most in the improvement of the Salla—Kandalaksha road. The road offers a connection to the main highway of the Murmansk region, the Kandalaksha—Murmansk road, the speed level of which is 90 km/h. Also the destinations interesting from the point of view of tourism, such as old Salla, Rohmoivatunturi, Kandalaksha and the Kirovsk region with the Hipinätunturi mountains, may be easily reached from the Salla—Kandalaksha road.

On the other hand, if the Salla road is built, it will attract the main part of the traffic and growth potential of the current Raja-Jooseppi road to Salla. The actions planned for the Raja-Jooseppi road will then become less feasible. In this phase, the limit has not been defined, up to which road investments on the Raja-Jooseppi road can be made. However, economically sound investments may be relatively low. The approach in this direction may be the maintenance of the present condition of the road by means of sufficient maintenance actions. The building of the Lotta border guard station is yet preferred by the Russians over the Salla border guard station and other stations.

The Arctic Ocean road from Virtaniemi to Pechenga is on its part fairly independent of the construction of the Salla road, since it serves more the local traffic needs. The Arctic Ocean road is undoubtedly the best connection to the Pechenga region, and it would also be used by the traffic between Finland and Norway. It also serves a relatively large demand of tourism. Because of that, the opening of the road to international traffic may be well-founded, and a certain amount of basic improvement is also feasible. On the basis of previous studies, it may be possible to allocate investments of FIM 50—100 million on this route of which the share needed in the Murmansk region could be about FIM 35—70 million. A more detailed amount of the investments has to be determined separately.

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## SOURCES

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