



Swedish
Chairmanship
2017-2019

APPENDICES

JOINT BARENTS TRANSPORT PLAN

Appendix 1: Basic Cross-Border Routes/Corridors of the Barents Region

Introduction

The experts have defined main cross-border routes of great importance to the Barents Region development. The transport network in the Barents Region should be branched and provide a sufficient number of efficient transport routes to enhance the competitiveness of trade and industry and to ensure the attractiveness of the Barents Region for living, tourism and entrepreneurship.

It should be noted that some routes, for example, the Bothnian Corridor encompassing road and rail from Helsinki to Stockholm, only partly lie within the Barents Region. The transport plan focuses on the Barents part of the route.

Some of the routes overlap somewhat. In these cases, the overlapping part is included in only one of the route descriptions. Reference is made in discussions of the other route(s) to where descriptions can be found.

The prioritized transports corridors are illustrated in figure 1.1.

The two maps on the opposite page show transport networks prioritized by the EU and the Russian Federation.

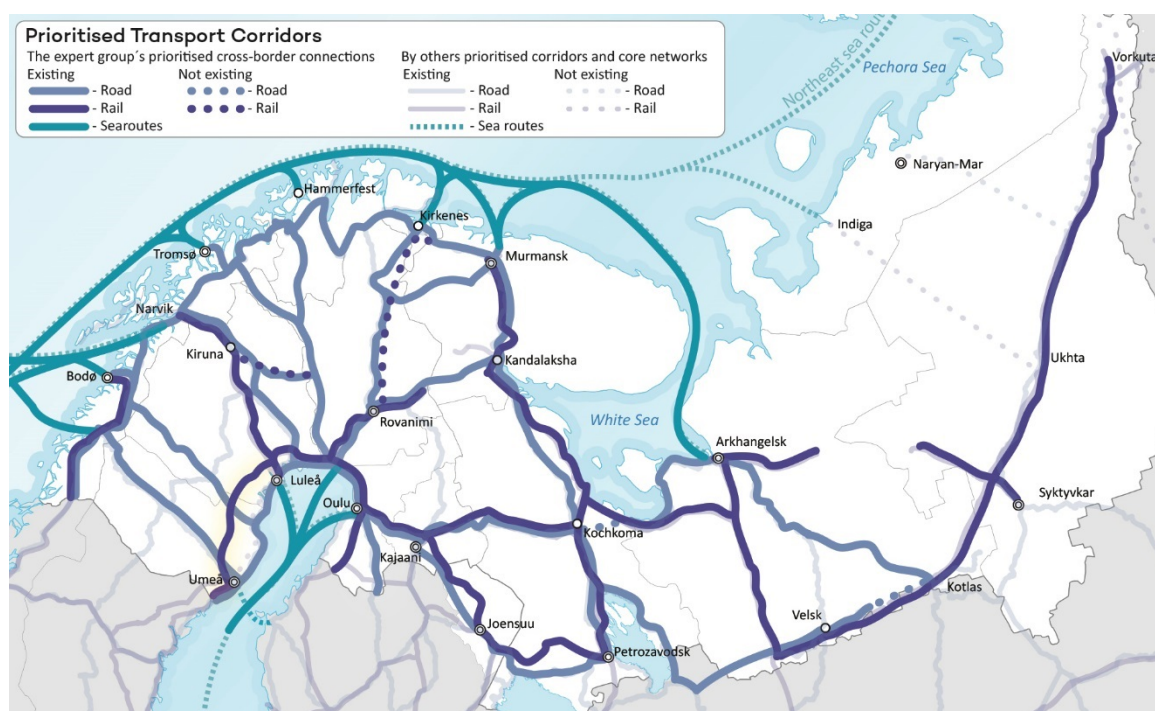


Figure 1.1 Prioritized transport corridors in the Barents region.

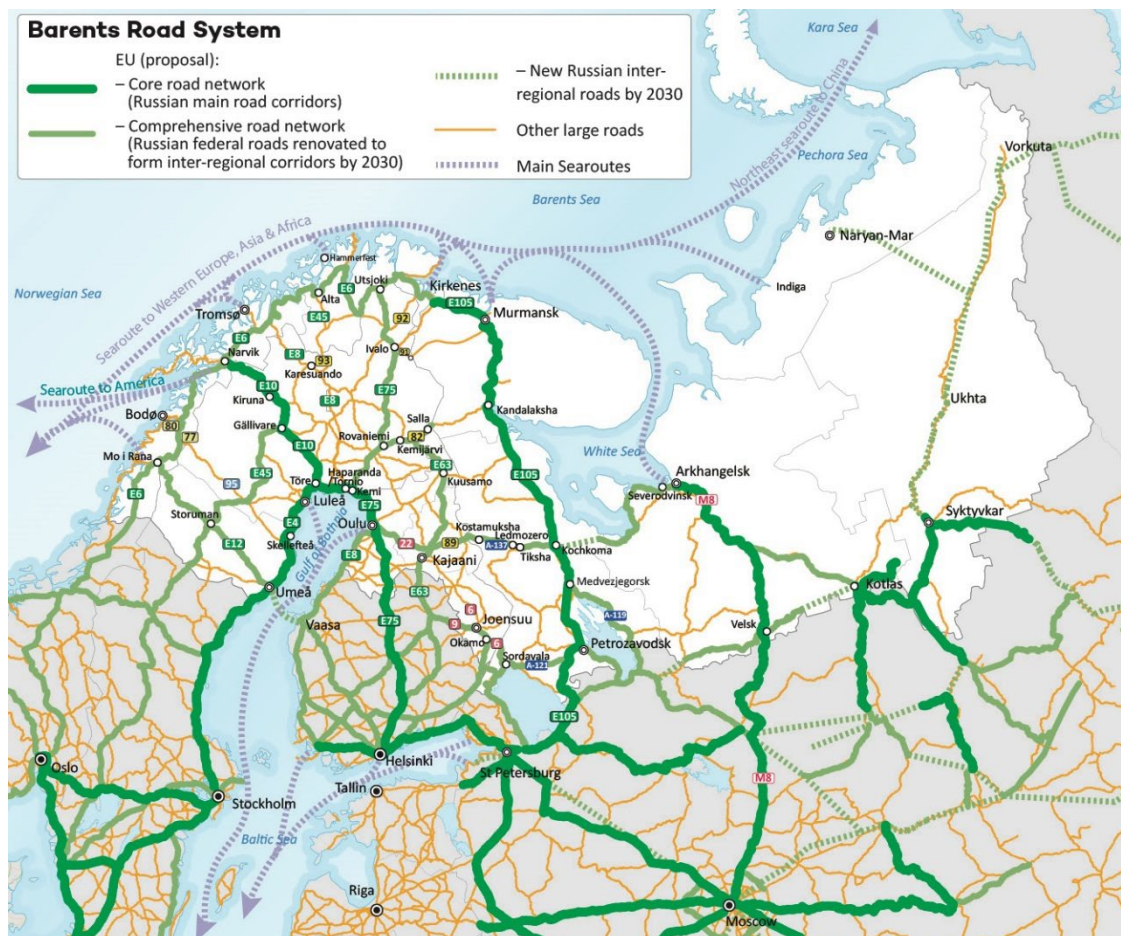


Figure 1.2 Prioritized road network by the EU and the Russian Federation.

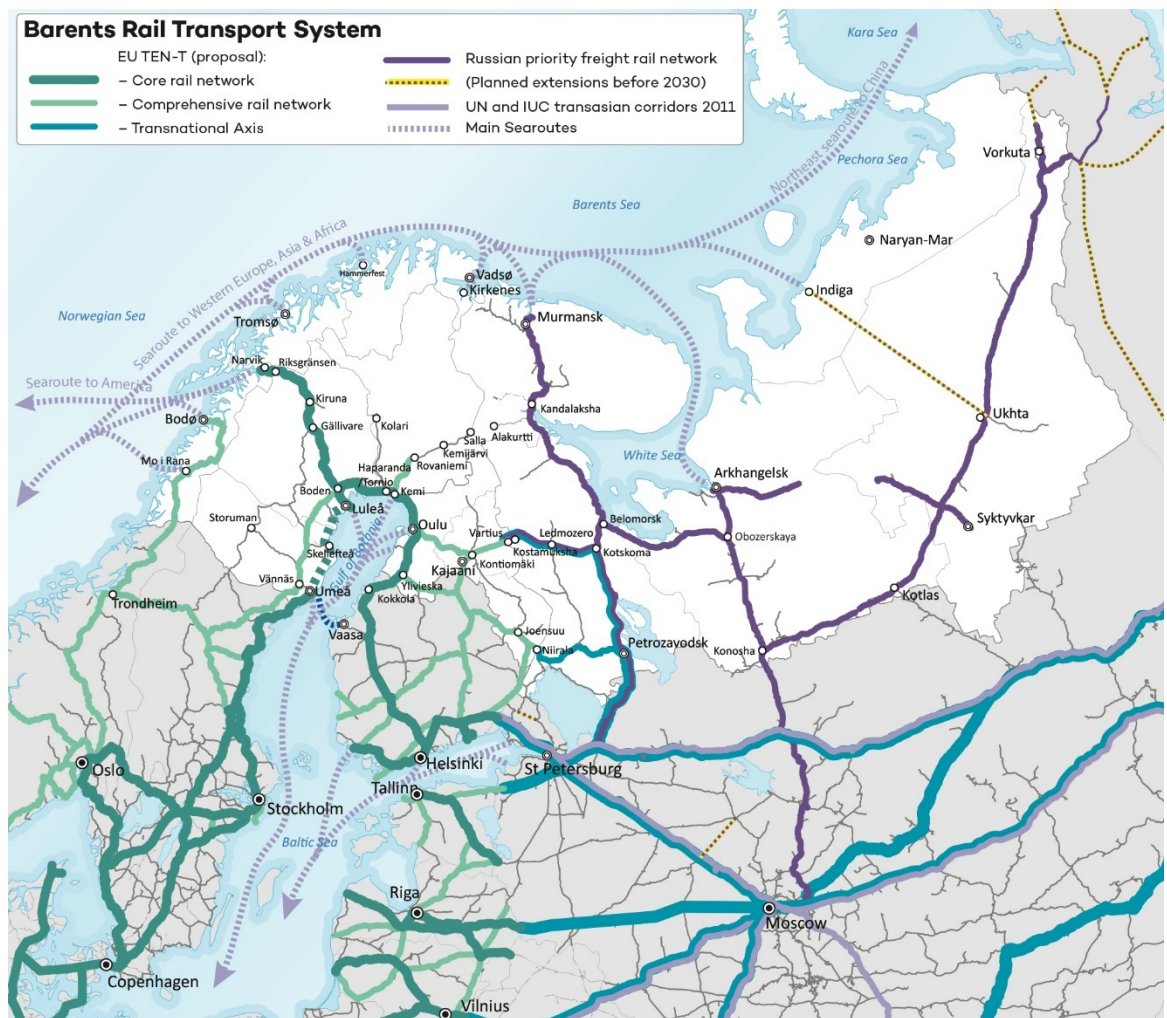


Figure 1.3 Prioritized rail network by the EU and the Russian Federation.

The table below provides a brief presentation of the transport routes considered most important by the experts¹:

From – To	Route name if existing	Name of roads and rail sections	Length (km)
(Helsinki-)Oulu-Haparanda/Tornio – Umeå	The Bothnian Corridor	Road: E8, E4, E75. Rail: Bothnia line, Haparanda line and the Main line through upper Norrland, Tornio – Oulu line (- the Main line to Helsinki)	Road: 766 Rail: ~800
Luleå – Narvik		Road: E10/E6 Rail: The Iron Ore line, the Ofoten line	Roads: 520 Rail: 473
Vorkuta – Kotlas-Syktvykar – Arkhangelsk – Vartius – Oulu		Road: Federal road A-137 automobile road P-21 <<Kola>> -Tiksha – Ledmozero – Kostomuksha – state border Russia/Finland (Automobile border crossing point Lyttä), 89, 22, E8 Rail: line from Vorkuta to state border (Lyttä) – Chum – Synya – Sosnogorsk – Ukhta – Mikun – Kotlas – Konosha – Obozerskaya – Kochkoma – Ledmozero – Kostomuksha line. Branch roads from Obozerskaya to Arkhangelsk; from Mikun to Syktvykar.	Roads: 230 Rail: 1517
Arkhangelsk – Murmansk – The European Continent	The Northern Maritime Corridor	Sea route, therefore no number	Approx. 3,500 NM
Luleå/Kemi/Oulu – the European Continent	The Motorway of the Baltic Sea	Sea route, therefore no number	Approx. 1,500 NM
Petrozavodsk – Murmansk – Kirkenes	-	Roads: E105 (National Road R-21 “Kola” -section state border N/R) – Automobile crossing point “Borisoglebsk” – Pechenga – Murmansk – Petrozavodsk Rail: Oktyabrskaya railway – Murmansk – Petrozavodsk line	Roads: 1140 Rail: 850 km
Rovaniemi-Salla – Kandalaksha	-	Roads: E75, 82, Regional Road Kandalaksha – Alakurtti – Salla, automobile crossing point, E105 (R-21 Kola) Rail: Kemi – Rovaniemi – Kemijärvi line	Roads: 355 Rail:
Kemi – Rovaniemi-Kirkenes	-	Roads: E75, 92	Roads: 702
Kirkenes – Mosjøen	National routes through Northern Norway	Roads: E6 Rail: The Nordland line, The Meråker line	Roads: 1634 Rail: 803
Haparanda/Tornio – Tromsø	The Northern Lights Route	Road: E8, E6, 99 Rail: Tornio – Kolari railway	Roads: 620 Rail: 183
Karesuando Palojoensuu? – Alta		Road: E45	Roads: 272
Vaasa – Umeå – Mo i Rana	The Blue Road	Roads: E 12 Rail: Storuman – Hällnäs line	Roads: 492 Rail: 167
Skellefteå – Bodø	The Silver Road	Road: 95, 77, E6, 80	Roads: 378 Rail: 140
Murmansk – Raja Jooseppi – Ivalo		Roads: Regional Road “Kola” – Verkhnetulomsky – Automobile border crossing point Lotta, 91	Roads: 300
Svappavaara – Pajala – Kolari		Road: E10, E45, 395, 99	Roads: 160
Kajaani – Petrozavodsk:		Roads: A-121, E 105 (R-21 “Kola”), Regional Road Olonets – Värtsilä, 9, 6 Rail: The Kajaani – Niirala line, the Värtsilä – Petrozavodsk line	Roads: 559 Rail: 283
East-West flight services in the Barents Region			

The routes are divided by three types of transport: road, rail and sea. Air transport is considered separately, as it is difficult to include it in the specified routes.

¹ The routes are not listed in order of priority

Technical and functional standards of the routes differ significantly, both within one route and between routes. In some cases, the standard of the routes near the state borders is poor. Furthermore, the volume of traffic varies considerably both within one route and between routes. The traffic volumes of the border crossing routes are also at a minimum level near the national borders.

The experts would like to stress the importance of the following three transportation routes:

- The Iron Ore line/The Ofoten line (Chapter 3)
- The Northern Maritime Corridor with Murmansk as a central hub (Chapter 5)
- The Bothnian Corridor (Chapter 2)

The following Chapters will describe each route in detail.

2 The Bothnian Corridor

Brief facts

This corridor consists of the following roads and railways:

- **Roads:** E4, E8, E75
- **Railways:** Bothnia line, Haparanda line, Main line through upper Norrland and Helsinki – Tornio line

Roads

Sweden (E4) Border Västerbotten/Västernorrland - Border Sweden/Finland

Length:	452 km
Width:	9 – 21.5 m
Speed limit:	90 – 110 km/h

Number of vehicles crossing the border per day: (Haparanda/Tornio): 7,750

Finland (E75, E8) Border Sweden/Finland – Border Pohjois-Pohjanmaa/Keski-Suomi

Length:	314 km
Width:	10 – 12.5 m, about 70 km in Kemi and Tornio and in Oulu it is motorway. Percentage of the road with a width of 8 m or more: 100 %.

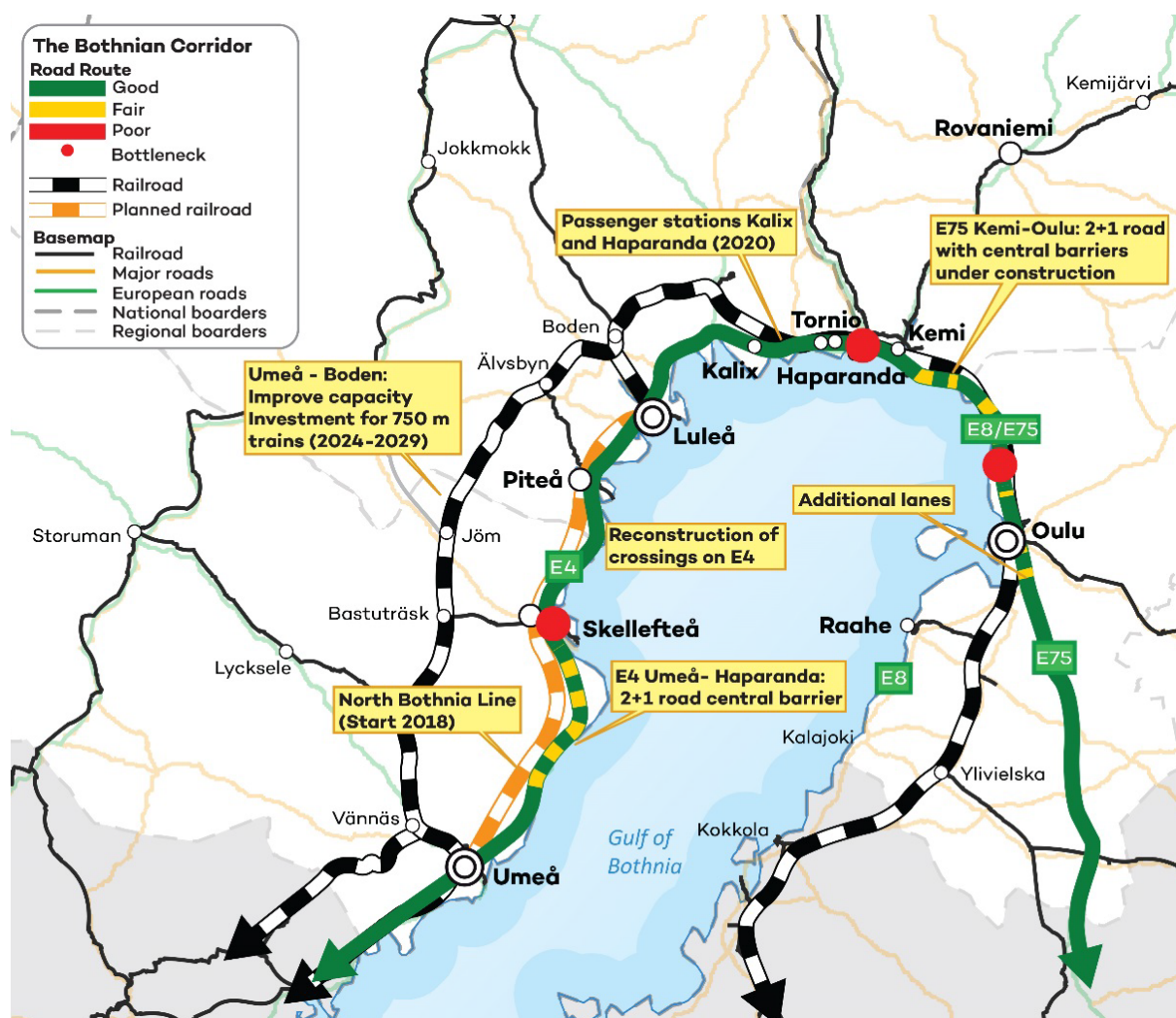


Figure 2.1 The Bothnian Corridor

Road traffic

City/town	Average number of vehicles per day at peak traffic
Umeå	8,200
Skellefteå	5,300
Piteå	8,900
Luleå	9,400
Kalix	5,100
Haparanda	5,700
Tornio	11,000
Kemi	12,500
Oulu	47,500

Railways

Length

Sweden:

Main line through upper Norrland	626 km (Bräcke-Umeå-Boden)
Bothnia line	185 km (Nyland-Umeå)
Haparanda line	161 km (Boden-Haparanda)

Finland: The total length of the Bothnian Corridor primary rail network in Finland is 812 km. About 40 percent of this distance is in the Barents Region.

Rail traffic

	Average number of passenger trains per day	Average number of cargo trains per day
Umeå – Vännäs:	32	24
Vännäs – Boden:	12	32
Boden – Haparanda:	0	4
Tornio – Kemi		4
Kemi – Oulu:	14	6
Oulu – South:	20	14

Maximum permitted axle load

Sweden: 25 tonnes

Finland: 22.5 tonnes

Gauge

Sweden: 1,435 mm

Finland: 1,524 mm

Speed limit

Sweden: 250 km/h

Finland: 140 km/h² (there are sections with higher speed limits, 140 is the min.)

Signaling system

Sweden: ATC/ERTMS³/EBICAB 900

Finland: ATP-VR/RHK

Electrified/Not electrified

Sweden: Electrified

Finland: Electrified except for Tornio- Laurila (Kemi)

Single or double track

Sweden: Single track

Finland: Single track (Double track between Kokkola and Ylivieska)

² Maximum speed on most of the Bothnian Route is 140 km/h, 120 km on the short non-electrified section Kemi-Tornio/Haparanda

³ Automatic Train Control/European Rail Traffic Management System

Ports (See Chapter 5)

Airports

Number of passengers per year

Umeå	1,000,000
Skellefteå	400,000
Luleå	1,200,000
Kemi	105,000
Oulu	923,000

General information

Number of inhabitants in cities along the Corridor

Umeå	125,000
Skellefteå	72,000
Piteå	42,000
Luleå	77,000
Kalix	16,000
Haparanda	10,000
Tornio	22,000
Kemi	23,000
Oulu	131,000

General Description

The Bothnian Corridor encompasses road and rail from Helsinki to Stockholm. In this document, only the part of the Corridor that is within the Barents Region is described.

The Bothnian Corridor is a strategically important link within the transnational transport system of goods in Northern Europe. The Corridor is included in the TEN-T Core Network for both rail and road and is proposed to be included in the TEN-T Core Network Corridor by the European Commission. Sweden and Finland have a common initiative to adopt the Bothnian Corridor into the TEN-T Core (ScanMed and North-Sea Baltic) corridors. It stretches out on both the Swedish and the Finnish side of the Gulf of Bothnia and connects east-westbound and north-southbound transnational links in Sweden, Finland, Norway and Russia.

The Corridor is the artery connecting the north of Sweden with the rest of the country and the continent. Northern Sweden supplies much of Europe and even the world with raw materials, of which a large part goes through the Bothnian Corridor. The Corridor also encompasses 85 percent of the population of Norrbotten and Västerbotten, or about 300,000 people, which means that the corridor is vital for regional and national passengers. In Northern Finland the population is not as concentrated in the Bothnian Corridor as in Sweden, but major industrial centers are located on the coast of the Corridor. Also, in Finland the Corridor is the main link between Northern Finland and the rest of the country. The road is very important for transports between Northern Finland and the main ports in the south.

The Corridor is the functional connection and serves an important function:

- For commuting, healthcare-related travel and education-related travel
- For business travel (particularly the airports).
- For recreational travel and the tourism industry.
- For regional freight and long-distance freight traffic to/from Norrbotten/Västerbotten counties.
- For transit traffic to/from Norway, Finland, Eastern Europe and the rest of the Barents Region.

The Bothnian Corridor is already of great importance for transnational goods flows within the EU and to/from the EU. As European integration continues to expand, its importance will increase further. It is important for the economy and growth of the Barents Region and it connects its main industrial areas, main cities and hubs.

The coastal region of the Gulf of Bothnia is very industrialized, both on the Swedish and Finnish side. There are large stainless-steel factories, large forest industry mills, paper mills and other important industries.

Infrastructure and standard

Roads

The E4 is Sweden's most important road, connecting the whole country from North to South. It follows the coastline from Stockholm through the main cities up to Haparanda (1,020 km). The road E4 has the same designation as it continues across the border to Finland, then as the E8 between Tornio and Kemi and finally as the E75 from Kemi via Oulu to Helsinki. Since the E4 is of both national and international importance its standard is quite high. In Sweden, most of it has been upgraded to at least 13 meters with a central barrier for higher traffic safety and accessibility, but there are still some parts, especially in the north, that are only 9 meters wide. In Finland most of the road is 10 meters wide, while so far only one section has been upgraded with a central barrier. 70 km of the northern part of the E75 road is four-lane motorway between Tornio and Kemi and in Oulu. Tornio-Haparanda border crossing is one of the Scandinavia's busiest land border crossing. There are construction works ongoing to improve E75 in Oulu region into 6 lane highway and between Oulu and Kemi into highway with bypass lanes. New pulp mill investment in Kemi creates a need for further improvements of the E75.

Railways

The entire Bothnian Corridor primary railway network is not electrified, since there are some shorter parts missing. It has an automatic train protection system - ATC or better. In Sweden both the Bothnia line and Haparanda line have ERTMS installed.⁴ The maximum permitted axle load is 25 tonnes in Sweden and 22.5 tonnes in Finland. The average speed limit is low, and the railway network is steep in some parts, which together cause problems for freight transport operations.

In Sweden the railway from Härnösand up to Umeå is of good standard, thanks to the new Bothnia Line. North of Umeå the Main line through upper Norrland has a lower standard and capacity. The Haparanda line between Boden and Haparanda/Tornio was opened for traffic in early 2013.

In Finland the Seinäjoki–Oulu rail section has several line sections over 10 kilometers without crossing sections, but this 335-kilometer rail section still has about 100 level crossings which are mostly equipped with safety equipment. The northernmost Oulu-Tornio rail section has about 70 crossing sections, most of which do not have safety equipment.

In Finland the railway standard is not adequate on the first 20 km from the border with Sweden. The railway is not electrified between Haparanda/Tornio and Laurila (Kemi). In Haparanda/Tornio the facilities to handle the rail gauge difference are inadequate. The Haparanda rail gauge changer is no longer functional.

Most European countries use a standard gauge of 1,435 mm, whereas in Finland the gauge is 1,524 mm. Therefore, trains cannot cross the border in Haparanda/Tornio without a change of wheel sets or lifting cargo from one wagon to another. The Russian rail gauge is 1,520 mm, which makes it possible to use the same wagons on Finnish and Russian railways.

From Kemi to Oulu the railway has a single track. More than 300 km of the rail to the south of Oulu has been under reconstruction for many years and the work has been completed. Some 100 km of the reconstructed railway will be double-track between Kokkola and Ylivieska.

The building of a new railway track from Umeå to Luleå, the North Bothnia line, started in 2018. The first part between Umeå and Skellefteå is estimated to be done by 2033. The second part, Skellefteå - Luleå, has yet to be considered regarding finance by the government before construction can begin. The complete North Bothnia line will contribute to solve the rail capacity challenges in this part of the Bothnian Corridor.

⁴ European Rail Traffic Management System is a standardized system for signaling, control and train protection to enhance cross-border interoperability.

Transports

Roads

The traffic volumes fluctuate throughout the corridor. Road traffic volumes varied between 3,500–7,500 vehicles from Haparanda to Umeå, except for the road section Luleå–Piteå, which had 9,000 vehicles. The E4 pass through Umeå and Skellefteå, where daily volumes also are higher, almost 16,500 respective 25,000 vehicles at the most congested places. The share of heavy vehicles was about 15-20 percent of the total traffic volume from Haparanda to Stockholm.

In Northern Finland the highest traffic volumes in the road network are on the E75 in Oulu with annual daily traffic volumes of almost 50,000 vehicles in 2011. Between Kemi and Oulu, the traffic volumes are generally from 6,000 to 11,000 vehicles per day, of which 1,000 heavy vehicles. Traffic volumes in Lapland are growing all the time due to tourism and investments.

Railways

The number of freight traffic operations exceeds the number of passenger traffic operations in the northern part of the Bothnian Corridor. The Bothnian Corridor primary rail network mostly consists of single-track rail sections except for a few double-track rail sections. The Bothnian rail corridor constitutes the primary freight corridor in Sweden and is especially important for Swedish primary industry, such as the steel, forest and paper industry.

Freight transport volumes reached about 5 million tonnes according to the most recent commodity flow survey. A significant share of the freight volumes is transported through the corridor from the northern part of Sweden to the ports on the west coast and in the south, from where transport volumes continue to other parts of Europe. Transports of steel are especially significant between Luleå and Borlänge. The main line through upper Norrland is today one of the most congested single-track line in Sweden.

The highest freight traffic volumes in the Bothnian Corridor primary rail network in Finland are in the northern part of the Ostrobothnian rail line. The significant freight traffic volumes on these rail sections are primarily the result of heavy transit traffic from Russia to the Port of Kokkola.

In the remaining northern part of the Bothnian Corridor primary rail network, freight traffic volumes of 3.2-3.8 million tonnes and 2.4-2.9 million tonnes were in the northern part of the main line and southern part of the Ostrobothnian line, respectively. Freight traffic volumes on the rail sections north of Oulu were about 1.6 million tonnes in 2010.

Key Challenges

Roads

- Increase accessibility (speed) and traffic safety.
- Accessibility for freight transports where the road passes through cities (Umeå, Skellefteå, Kalix and Haparanda)
- Improve the horizontal and the vertical curves in some places.
- Reach the environmental quality standards in Skellefteå.
- Risk for flooding in some vulnerable places due to climate change and increased precipitation

Railways

- There is a serious lack of track capacity, carrying capacity and limited speed standard along the railway systems in the Corridor. In Sweden especially between Umeå and Boden.
- Find an effective solution for the different gauges between Sweden (1,435 mm) and Finland (1,524 mm).
- Electrify the railway section between Tornio/Haparanda and Kemi.

Planned development

Roads

- 2+1 road with central barrier on some sections of E4 between Umeå and Haparanda. Currently, there are 36 km of road that have yet to be considered finance, the remaining part is either done, planned or under construction.
- Reconstruction of crossings on E4.
- Improve the capacity of the E75 in Oulu by upgrading the road to six-lane motorway (ongoing).
- 2+1 road with central barriers on several sections of E75 between Kemi and Oulu (ongoing)

Railways

- North Bothnia line Umeå-Skellefteå, construction started in 2018 (Umeå-Dåva)
- Measures to improve the capacity Umeå – Boden including investments for 750 m long trains 2024-2029
- New stations for passenger traffic in Kalix and Haparanda 2020
- Upgrading of stations in Sweden

Future potential

The Corridor is important today and its importance will grow in the future due to the expansion of the industries in the northern areas of the Barents Region. The forecast in Sweden and Finland shows a significant growth in the northern areas due to the industrial expansion.

On the Swedish side there are plans for the near future to start commuter trains Luleå-Boden and regional trains Luleå-Haparanda. There is a potential to connect the Bothnian Arc, Luleå-Oulu, in the future with border crossing train service to create a larger functional region.

3 Luleå - Narvik

Brief facts

The corridor consists of the following roads and railways:

- **Roads:** E10
- **Railways:** The Iron Ore line and the Ofoten line

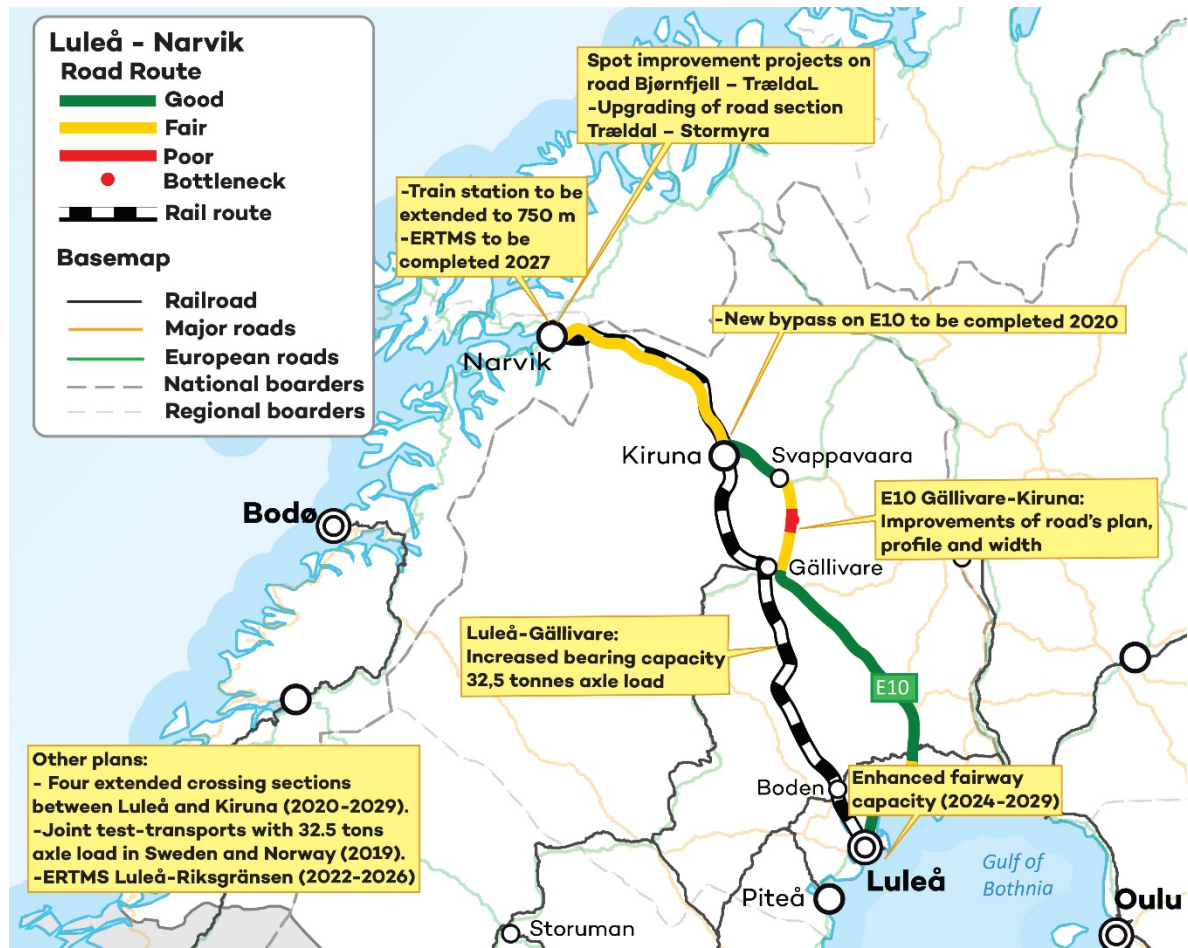


Figure 3.1 Luleå-Narvik

Roads

Length: 520 km

Width: 6-13 m (Sweden) Width: 6-8.5 m (Norway)

Speed limit: 50-100 km/h, in Sweden: 90/100 km/h, in Norway: 60/70/80 km/h

Number of vehicles crossing the border per day at Riksgränsen/Bjørnfjell: 965 (2017)

Number of heavy vehicles >12,5 meters crossing the border per day at Riksgränsen/Bjørnfjell: 80

Average number of vehicles per day where traffic is at its peak: 4,000 (Kiruna) and 3,600 (Rombakken)

Railway

Length: 473 km

Average number of passenger trains per day: 7 (4-10)

Average number of cargo trains per day: 19-50 depending on which part

TEU at Narvik rail terminal: 55,000⁵

Maximum permitted axle load: 30 tonnes

Gauge: 1,435 mm

Maximum speed: 135 km/h

Signaling system: ATC/FATC⁶

Electrified/Not electrified: Electrified

Single or double track: Single track

Ports

See Chapters 4 and 5.

Airports

Number of passengers per year

Luleå	1,200,000
Gällivare	27,000
Kiruna	280,000
Harstad/Narvik	715,000

General information

Number of inhabitants in cities along the Corridor

Luleå	77,500
Boden:	28,100
Övertorneå	3,400
Gällivare	18,000
Kiruna	23,100
Narvik	18,000

General Description

The corridor consists of both road and rail. It stretches from Luleå in the north of the Baltic Sea to Narvik, located on the Atlantic coast in northern Norway. The route consists of varying landscapes and climates. It begins and ends at the sea, stretches from coast to coast and passes through sparsely populated forest and mountain areas.

The corridor is important for the economy and growth of the Barents Region while it connects industrial areas, cities and hubs. The corridor serves and connects mining fields and industries in the area between the coast and ports of Luleå and Narvik. The corridor has large freight volumes, since about 90 percent of the European iron ore production in this part of Northern Sweden. It is also important for the local communities due to the border trade and businesses.

The corridor serves an important function:

- For regional freight and specifically ore traffic from the mining areas to ports.
- For transit traffic:
 - transport of consumer goods (rail), general cargo (rail) and fish (rail and road) between Southern and Northern Norway through Sweden.
 - rail/sea between the Barents Region and the European continent and between Asia and America on rail and sea.

⁵ Statistics for the year 2012

⁶ Full Automatic Train Control

- For recreational and tourism industry.
- For local and regional commuting, healthcare-related travel (Gällivare and Luleå hospitals) and education-related travel.
- For business travel.

Important nodes: Luleå (port, rail freight terminal), Boden, Gällivare, Kiruna, Narvik (port, rail freight terminal)

Both road and rail lack alternative routes for freight traffic in the corridor in the occurrence of infrastructure breakdowns or vehicle accidents. The railway is especially sensitive to disturbances north of Gällivare since there are no re-routing options for trains. South of Gällivare the Inland railway can be an alternative although then with the restriction of lower loads and only with diesel locomotives.

Heavy vehicles are more sensitive to disruption since they can only choose alternative routes that have an adequate load-bearing capacity. For example, a blockage between Gällivare and Svappavaara results in a route extension of 70 km. A blockage between Kiruna and Svappavaara results in a route extension of 700 km.

Infrastructure and standard

Roads

The E10 is one of Sweden's, Northern Norway's and the Barents Region's main cross-border routes for long-distance passenger and freight transport. The road is included in both the national road networks and the Trans-European Networks (TEN-T). The E10 also acts as an important artery for passengers and freight to industries, workplaces, municipal and regional centers. The road follows the route Luleå-Töre-Överkalix-Gällivare-Kiruna-Riksgränsen-Narvik. The length is altogether 520 km.

Steep sections on the E10 in combination with a narrow road make it difficult for heavy vehicles to pass and ascend the hills. Improvements of E10 at Kulleribacken will be ready in 2019 and improvements on some more sections are planned.

The custom office is only open in daytime.

The road is temporarily closed several times per year due to winter storms. In high-risk periods the road is closed for safety reasons at night. In the winter time the traffic quite frequently has to be accompanied by a snow-clearing vehicle.

In Norway the construction work for the new bridge over the Rombaksfjord is finished (the E6 Hålogaland bridge) and the bridge opened for traffic in December 2018. The distance from the border to the port is reduced by 7 kilometres.

Railways

The Iron Ore line/The Ofoten line is an electrified, single-track line divided into three sections due to the iron ore transports: the northern circuit (Narvik to Kiruna), the middle section (Kiruna to Gällivare) and the southern circuit (Gällivare to Luleå). The gauge is 1,435 mm. The rail line has an ATC/FATC signaling system. There are 47 crossing sections in Sweden and six in Norway. About one third of these are too short and need to be rebuilt, especially due to the 750-meters iron ore trains.

The Ofoten line, which stretches from Narvik to Riksgränsen, is Norway's northernmost railway. The line has no other connection to the Norwegian rail network, it only connects to the Iron Ore line. The Ofoten line is 42 km long, and the track is steep and curvy. The height difference between Narvik and Riksgränsen is 520 m over a stretch of 42 km, giving an average gradient of 12.3 ‰.

The Iron Ore line extends between Boden and Riksgränsen, where the Ofoten line begins. The Iron Ore line is known as Sweden's most beautiful railway and is a major transit route to mountain facilities for those arriving by night train from the southern parts of Sweden. It is the only railway in Sweden that allows 30 tonnes axle load and trains with a weight of 8.600 tonnes.

In the ports of Luleå and Narvik there are needs for infrastructure investments on land to be able to increase the freight volumes. Luleå also requires major investments within the fairway for larger vessels to operate.

Transports

Roads

The average number of vehicles per day varies between 850 and 4,000, cargo transport between 160 and 500 vehicles per day. The highest values are between Kiruna and Svappavaara. The average number of vehicles per day varies between 965 vehicles at the border and 3,600 vehicles close to Narvik. The average number of heavy vehicles/day at the border are 80 vehicles (>12,5 m).

Railways

The Iron Ore line/The Ofoten line is Sweden's most heavily trafficked railway due to iron ore trains. Northern circuit (Kiruna-Narvik) has 4-6 passenger trains per day depending on season and it carries approximately 20 million metric tonnes of ore per year. Middle section and Southern circuit (Luleå-Boden-Gällivare-Kiruna) has 10 passenger trains per day and it carries around 7 million metric tonnes of ore per year. Between Kiruna and Narvik there are 24 ore trains per day in both directions. Between Malmberget and Luleå there are 10 ore trains per day in both directions.

In 2018 Kaunis Iron started their transports between Svappavaara and Narvik which is estimated to reach 2 million metric tonnes of ore per year and four trains per day in both directions in the year of 2019.

The other freight transport by rail is largely related to the container services "Arctic Railway Express" and "North Rail Express" between Narvik via Sweden to Oslo. The volumes for non-ore commodities are not large compared to the ore volumes, but they serve as an important supply line for consumer goods, fish exports and other manufactured goods throughout Northern Norway north of Narvik. And it counts for about 90 percent of the rail and road freight transport volumes between Oslo and Northern Norway.

The traffic requirements along the 470 km long track have increased since both longer and heavier trains will operate on the track. Since the Iron Ore line is single-track, crossing sections have a key role for efficiency and capacity.

Forecasts show a huge increase in cargo flows, especially from the mining and seafood industries. The highest increase will take place on the northern circuit between Kiruna and Narvik, since most mining companies are planning for shipments from Narvik. There are also plans for increased regional passenger traffic, commuter trains between Luleå and Boden and increased investments in tourism.

All these plans will result in significantly more trains on the line, high capacity utilization, and difficulties in operating and maintaining the line.

Key Challenges

Roads

The common challenges for the E10 are:

- Narrow road sections that cause problems for the heavy traffic.
- Curves with small radius in horizontal and vertical curves in some places.
- Steep gradients in some places with steep hills
- Traffic safety risks, including for inhabitants where the road passes through villages
- Maintaining accessibility and availability when road sections in Sweden with more than 2.000 vehicles per day without central barriers will get a maximum speed of 80 km/h due to adaptation of speed to safety standard of the road
- The road is a barrier for reindeer herding and other wild life and accidents involving reindeers and other animals occur frequently
- Insufficient regularity due to drifting snow in the winter season.
- Winter maintenance
- The custom office is only open in daytime

Railways

- Improve robustness and reliability to an acceptable standard.
- Improve punctuality to an acceptable standard
- Increase capacity. Possibly, in the future double track will be necessary along the entire length of the railway. Expected demand from the mining fields in Northern Sweden is 31 train pairs in 2020, an increase of 50 percent.
- Increase capacity of the power supply to the infrastructure
- Ensure increased maintenance without affecting traffic
- Prepare for 750 meters trains including extending crossing sections.
- Develop the passenger traffic on one of Europe's most beautiful railways in combination with serving important bulk and container flows.
- Coordinate the planning as the development of the railway is closely interlinked with that of the port of Narvik and Luleå. Port capacity in Narvik is very limited after a new mining company in Kaunisvaara started using the port as its export gateway.

Planned development

Roads

In the Swedish Transport Administration's current long-term plan for existing infrastructure investments 2018-2029, the following is planned for the E10:

- New bypass in Kiruna, due to mining expansion and movement of the city, completed fall 2020
- E10 – Improvement of the road's plan, profile and width between Gällivare and Kiruna in the following sections: Avvakko – Lappeasuando 2+1 lanes (2024), Kauppinen – Kiruna 2+1 lanes (2026) and Muorjevaara (2020).

On the Norwegian side, the recommendation is to start planning spot improvement projects on the road section from the national border/Bjørnfjell – Trældal and upgrading of the section Trældal – Stormyra. This is planned 2018-2023 and budgeted to € 3 million as part of an action programme.

Railways

Sweden and Norway have a joint development project where test transports with 32.5 tonnes axle load will be conducted during 2019. The objective is to investigate the effects of iron ore transports with the increased axle load on the infrastructure and to identify necessary measures for a permanent increase. It is crucial to have an agreement on the increase and financing of the measures for the next revision of national transport plans in both countries for 2022-2033.

Sweden

In 2018 railway plans for doubletrack sections in Kiruna-Bergfors and Kopparåsen-Vassijaure was completed. The construction of the double track sections is currently not financed. There is also a mission assigned by the government to propose suitable measures to ensure the availability for passengers to the new city center in Kiruna.

The Iron Ore line Luleå-Riksgränsen in the Swedish Transport Administration's current long-term plan for existing infrastructure investments 2018-2029:

- Four extended crossing sections between Luleå and Kiruna 2020-2029
- ERTMS 7system – 2022-2026
- Increased bearing capacity 32.5 tonnes axle load Gällivare-Luleå
- Reconstruction of catenary system and track sections Boden-Kiruna 2018-2022

Norway

Planned investments:

⁷ The European Rail Traffic Management System (ERTMS) will be the new standard for the European railway system. A common standard is necessary to ensure interoperability and the system comprises all aspects of management, safety and communication. ERTMS will first be implemented on all high-speed lines, transit routes and eventually on all European railways.

- Narvik station will be extended to 750 m part of transport plan.
- New signal/safety system at Narvik station. ERTMS is planned to be completed 2027.

Sea/Ports

Sweden

The port of Luleå and the fairway to the port will be enhanced to allow for ships with Baltic Sea Max around the years of 2024-2029. This will increase possible ship size to up to 160,000 tonnes.

Future potential

This is an important corridor and its importance will grow in the future due to the expansion of the industries in the northern areas of Barents. The forecasts in Sweden and Norway indicate a significant growth in the northern areas due to the industrial expansion. It might also be an important route for Finnish mining in the future, since they will have access to the ice-free port in Narvik, via the corridor.

In addition to the important role of the railway for bulk transports for the mining industry, the railway is important for transport of containers.

There is a potential for transport of larger volumes of seafood on the railway in future years.

4 Vorkuta-Syktyvkar-Kotlas Arkhangelsk-Vartius-Oulu

Brief facts

The corridor is mainly rail. The road part on the Russian territory passes on route sector from the Finnish city Oulu, through the Automobile border – crossing Point Lyttä on the territory of the Republic of Karelia by federal road A-137: automobile road R-21 «Kola» - Tiksha - Ledmozero - Kostomuksha - border with the Republic of Finland (hereinafter- automobile road of federal jurisdiction A-137) to the Federal road P-21 "Kola"⁸.

The corridor consists of the following roads and railways:

- **Roads:** In Russia- Automobile federal road A-137. In Finland- National Road 89, National Road 22, E8.
- **Railways:** In Finland- from Vartius to Oulu. In Russia- from Vorkuta to Kostomuksha (Chum – Synya – Sosnogorsk – Uhta – Mikun – Kotlas – Konosha – Obozerskaya – Kochkoma – Ledmozero). Branch roads from Obozerskaya to Arkhangelsk; from Mikun – to Syktyvkar.

Roads

Length: 480 km, of which 230 km in Russia and 250 km in Finland (Vartius - Oulu)

Width: 7 m – 12.5 m

Speed limits: 80 – 120 km/h, 50-60 km/h in urban areas

Average number of vehicles per day at the border: 700 (Russia – Finland)

Average number of vehicles per day where traffic is at its peak: 10,000 in Oulu

Railways

In Finland

Length: 261 km

The freight transport volumes of the rail section Oulu–Kontiomäki were 5.26 million tonnes in 2014.

Average number of cargo trains per day Kontiomäki-Vartius: Three pairs of cargo trains per day (5.5 million tonnes/year)

The passenger traffic volumes of the rail section Oulu–Kontiomäki were 110,000.

Average number of passenger trains per day: 12 between Kontiomäki and Oulu, none to Russia.

The rail route is electrified in Finland.

Single track and Automatic Train Control (ATC) in Finland.

The rail section of Oulu–Kontiomäki is equipped with the section blocking system, the centralized traffic control system and the ATP. The section Oulu–Kontiomäki is under renovation and in general the track meets the requirements of the current traffic.

In Russia

Length: 2,025 km

There is a developed network of passenger traffic, connecting Arkhangelsk, Syktyvkar, Vorkuta and other cities in the region with the largest cities of the Russian Federation.

Single-track lines, with double-track inserts.

The railway is not electrified except for the section Konosha – Belomorskaya – Kochkoma.

⁸ The route of the automobile federal road R-21 <<Kola>> Saint Petersburg — Petrozavodsk — Murmansk — Pechenga — the border with the Kingdom of Norway.

Ports

See Chapter 5.

Airports

Number of passengers per year at main airports

Oulu	1,100,000
Kajaani	80,000
International airport "Arkhangelsk" (Talagi)	803,000 (2015)
Kotlas (Arkhangelsk Region)	
Syktyvkar (Komi Republic).	

General information

Number of inhabitants (municipalities)

Oulu	131,000
Arkhangelsk	356,900
Syktyvkar	260,000
Kotlas	62,000
Vorkuta	75,000



Figure 4.1 Vorkuta-Syktvkar-Kotlas Arkhangelsk-Vartius-Oulu

General Description

Route Vorkuta–Vartius–Oulu consists of railway and road. The road and the railway are included in the proposed TEN-T comprehensive networks.

Infrastructure and standard

Roads

The road route starts from the Bothnian Corridor in Oulu as road 22 to Kajaani. The paved area of the road is at least 8 meters wide. About 150 km from Oulu the route continues for another 100 km as road 89 to the Russian border in Vartius and the Automobile border crossing point Lyttä. Road 89 has a paved width of 6.3 meters for about 20 km, while for the remainder the paved area is 7.5 to 8 meters wide.

On the Russian side the route continues for about 240 km via to Petrozavodsk by automobile public federal road A-137 and adjoins the public National Road R-21 Cola. The road is paved to a width of 7 – 12 metres.

Railways

The 166 km long railway line between Oulu and Kontiomäki is old, and still has wooden sleepers. Railway line from Kontiomäki to the state border with Russia on Finnish territory was completed in 1976. The railway is an electrified single-track railway. The railway has an automatic train control system, but the technology is over 20 years old.

The Russian section of the railway from Vorkuta to Malenga is part of the Severnaya Railway (Northern Railway) infrastructure – a branch of the Russian Railways, JSC.

The Russian section of the railway from Malenga to Kostomuksha is part of the Oktyabrskaya Railway (Oktyabrskaya Railway) infrastructure – a branch of the Russian Railways, JSC.

The Kostomuksha – Kochkoma section is practically not involved in the international transport of goods.

Border-crossing points

This route on the Finnish-Russian border has rail and automobile border-crossing point “Lyttä” (Kivijärvi station (Russia), Vartius station (Finland)). It works 24 hours a day.

Air travel

Reconstruction of the airport complex is underway in the Arkhangelsk International Airport. The airport has regular flights to Moscow, St. Petersburg, Murmansk, Syktyvkar and Petrozavodsk.

In 2014 the Komiaviatrans airlines opened a regular passenger service on the Syktyvkar - Kotlas - Arkhangelsk section with a frequency of flights three times a week.

Transports

Roads

Average number of vehicles per day is almost 10,000 in Oulu, between 3,000 and 1,300 on national road 22 and between 300 and 700 on national road 89. The average daily number of border-crossing vehicles in 2012 was 662 passenger cars and 55 lorries or buses. The number of border crossing vehicles has remained stable for the last few years.

On the Russian side average number of vehicles per day is 1.200 on the road section Kostomuksha –Lyttä, and 400– 600 on the road section from Kostomuksha, Ledmozero and Tiksha to Kochkoma.

Railways

In Finland the Oulu-Kontiomäki railway serves both cargo and passenger transports. The freight transport volumes of the rail section Oulu–Kontiomäki were 5.26 million tonnes in 2014. Kontiomäki – Vartius serves only cargo transports, with three pairs of cargo trains per day transporting 5.5 million tonnes per year.

In Russian city Kostomuksha 30 km from the state border, iron ore is produced and processed into pellets. Pellets are transported by rail, mainly to Russian consumers. On the Russian part of the route oil, coal, ferrous

metals, timber, construction materials, fertilizers, and paper are transported. The major carriers are: PJSC "Severstal", JSC "Vorkutaugol" and others.

Key Challenges

Roads

In Finland:

- Congestion problems on national road 22 in the urban Oulu region (major improvements have been made 2017)
- Poor road safety close to Oulu (major improvements have been made 2017, E8 construction ongoing)
- Need for improvements of road conditions of the road sections passing through the municipal centers
- Need for improvement of the conditions for cyclists

In Russia:

- Restrictions for international transports near Kostomuksha in Russia
- Need for reduction of the section 11 km – 44 km of federal road A-137 (Automobile crossing point Lyttä) in a standard transport and operational status.

Railways

In Finland:

- Modernization is needed
- Outdated safety equipment, wooden sleepers on the western section

In Russia:

- Improvement of transport service and development of the capacities of the railway lines

Planned development

Roads

In Finland:

- Some bypass lanes with central barrier will be created in the rural area close to Oulu;
- Improved safety in municipal centers;
- Improved safety for cyclists;

In Russia:

- In order to develop the automobile road along the Kochkoma-Tiksha-Ledmozero-Kostomuksha – state border route, it is included to the list of public federal roads with the identification number A-137. After completion of the procedure of transfer of the specified road to the federal property, necessary activities will be taken to bring it to standard transport–operational status at the expense of the federal budget.
The strategy of the socio-economic development of the Arkhangelsk region provides modernization of the system of roads in the Arkhangelsk region, including the reconstruction of the Arkhangelsk-Onega-Nadvoitsy and Ust-Vaga-Yadrikha automobile road until 2035, with their subsequent connection with the federal road R-21 <<Kola>> and road A-137 "Kola - Tiksha - Ledmozero - Kostomuksha - the border with the Republic of Finland."

Construction of railways in Russia

- Konosha – Medvezhya Gora, public railway tracks with a length of 370 km (Kargopol, Konosha, Medvezhiegorsk, Pudozh Districts).
- Karskaya – Kharasavey, public railway tracks 83 km long (Yamal District);
- Vorkuta (Khalmer-Yu) – Ust-Kara, public railway tracks 210 km long (Vorkuta, Priuralsky District);

- Sosnogorsk – Indiga, public railway tracks 610 km long.

In order to increase capacity, the construction of second tracks is planned on the following sections:

- | | |
|-----------------------------|--------|
| • Obozerskaya - Arkhangelsk | 46 km |
| • Obozerskaya - Belomorsk | 353 km |
| • Chum-Inta – Konosha | 268 km |

Arkhangelsk Airport

In 2020-2024, federal budget will provide the reconstruction of the runway with 2500 meters artificial turf.

Future potential

The construction of the railway line section of Vorkuta - Ust-Kara settlement with a length of 210 km will allow to start the development of new deposits of solid minerals of the Eastern part of the Timan-Pechora province of the Komi Republic and the Nenets Autonomous district, will connect the Arctic coast with the European part of Russia. Project initiator: administration of the Nenets Autonomous district, the Government of the Republic of Komi. Term of realization: 2016-2030.

The project is included in the Strategy of the Development of Railway Transport in the Russian Federation until 2030, approved by order of the Government of the Russian Federation, dated June 17, 2008 877-p.

5 The Northern Maritime Corridor- Arkhangelsk-Murmansk-The European Continent

Brief facts

Brief facts in terms of freight and passenger turnover in the Corridor etc. are presented in the table below.^{9,10}

Country	Port	Cargo, 1000 tonnes ¹¹	TEU ¹²	Passengers (except cruise) ¹³	Cruise passengers ¹⁴¹⁵	ISPS terminals ¹⁶	Depths ¹⁷	Inhabitants ¹⁸
Russia	Murmansk	60,687	101,5				18	295 400
Russia	Arkhangelsk	2 770,5	27,7				10,2	356 900
Russia	Kandalaksha	2 201,6	0	0	0		10	31 300
Russia	Vitino	0	0	0	0		10	700
Russia	Varandey	7 011	0	0	0		15,2	50
Russia	Naryan-Mar	105,7	0,46				4,6	24 800
Russia	Onega	85,9	0				8,5	19 000
Russia	Mezen	15,1	0				5,2	3 300
Norway	Kirkenes	133	-	71,778	2,800	6	14	10,100
Norway	Honningsvåg	-	-	13,732	127,146	6	15	3,200
Norway	Hammerfest	5,395	-	76,447	16,021	6	15	10,500
Norway	Alta	601	-	50,000	21,000	5	12	20,600
Norway	Tromsø	980	17,641	288,272	125,455	17	15	75,600
Norway	Harstad	613	5,697	631,627	2,632	8		24,800
Norway	Narvik	21,233	-			3	26	18,600
Norway	Bodø	375	-		11,452	7	12	51,600
Norway	Mo i Rana	4,233	-	-	-	5	12	26,200
Norway	Mosjøen	1,370	421,784			2	8	13,400
Norway	Sandnessjøen	216	-			6	20	7,500

9 The statistics on the Russian ports is provided by the Ministry of Transport of the Russian Federation as of January 1, 2019, based on the "Survey of cargo transportation via sea ports of Russia, the Baltic States, Ukraine for 2015" and "Survey of cargo traffic and passengers by water transport of Russia 2015".

10 Port Vitino activity is suspended in 2014.

11 Statistics Norway

12 Statistics Norway, data of the Ministry of Transport of Russia, including reference loads

13 Ports and County Administration

14 Statistics Norway and Ports

15 The data should be specified in the state control bodies.

16 Kystinfo

17 BarentsWatch, Russian data from the mandatory regulations from the captains of sea ports on the maximum draught of the vessel, taking into account the reserve of 1 metre

18 Statistics Norway

General Description

Maritime transport is involved in a major proportion of international trade. International transport mainly takes place through the international maritime transport corridors. The northern maritime corridor has increasing significance for the transport of consumer goods and raw materials. The ports in the corridor together handles around 70 million tonnes. The transport volume in the adjacent Northern Sea Route (NSR) is also increasing. In 2018, the total volume of traffic in the water area of the Northern Sea route was 20.2 million tonnes (in 2017 - 9.9 million tonnes), including transit cargo of 0.5 million tonnes (in 2017 - 0.2 million tonnes). The growth of traffic in the corridor is primarily due to gas exports from Yamal.

The ports in the Northern Maritime Corridor has a great potential for further growth. There is a significant market for the shipping of containers from countries in Southeast Asia to the countries in Europe and the east coast of North America. The ports in the Northern Maritime Corridor are strategically located with regard to receiving goods for the Barents Region and other European countries. In this context it is worth mentioning that the NMC was tested in September 2018 by the ship *Venta Maersk*. Maersk is the world's largest container shipping company. The test was carried out between South Korea and St Petersburg.

Such Arctic transits are expected to increase in the future, but there are still climate challenges that must be solved to achieve a commercially sustainable route all year round.

Rich deposits of minerals, oil and gas as well as other raw materials make the High North attractive. Sea transport is cost-efficient for exports on long routes, and the corridors in the North (the NMC and the NSR) must be prepared and enhanced to ensure safety, traffic flow and environmental protection.

The international seafood market is growing, and this contributes to decentralising port structure in Norway. Both traditional fisheries and a growing fish farming industry lead to growing activity in the ports. In Norway, the value of seafood exports is expected to exceed NOK 100 bn. in 2019. The main part of the growth in the fish farming industry is planned to take place in the northern part of Norway.

Fairway standards are considered satisfactory on both the Norwegian and Russian sides in the NMC. Still, it is necessary to maintain a strong focus on safety as traffic increases. The consequences of accidents may be serious because there are rich marine resources along the corridor in the North, and the area is rich in wildlife and birds. The combination of vulnerable areas and tough climatic conditions with disruptions to traffic flow as a consequence, emphasises the significance of focusing on safe transport. In 2011, the Traffic Separation System (TSS) between the Russian border and Røst was extended southwards in Norway as shown in the picture below.

The deep-water ports of the Northern Maritime Corridor (primarily Murmansk and Narvik) have significant potential for growth and for shipment of cargo by sea.

There is a significant market for container shipping from the countries of Southeast Asia to the European market. The ports of the Northern Maritime Corridor could support imports of goods to the BEAC countries and other European countries.

Another factor that favors the development of the ports located in this corridor is the abundance of seafood in the Barents Region, given the expected growth in worldwide demand for seafood.

The Northern Maritime Corridor is conventionally connected to the Northern Sea Route in the east.

The water area of the Northern Sea Route is understood to be the aquatic space adjacent to the northern coast of the Russian Federation, covering internal waters, territorial sea, the contiguous zone and the exclusive economic zone of the Russian Federation and bounded by division lines across maritime areas with the United States and the parallel Cape Dezhnev in the Bering Strait, west meridian of the Cape of Desire to the Novaya Zemlya archipelago, eastern coastline of the Novaya Zemlya archipelago, and the western boundaries of the Matochkin, Kara, and Yugorsky Straits.

The Northern Maritime Corridor and the Northern Sea Route shorten the transport route between Asia and Europe by as much as 40 percent compared to the route via the Suez Canal.

Russian ports Northwestern federal district of the Russian federation

There are eight sea ports in the District; the ports of Murmansk, Arkhangelsk, Kandalaksha, Vitino, Varandey, Naryan-Mar, Onega and Mezen in the Barents Region.

Port of Murmansk

The port of Murmansk is the northernmost deep-water ice-free port in Russia. In 2018, the Port of Murmansk transshipped 60.7 million tonnes of cargo. Major handled cargoes are: coal, petroleum products, chemical and mineral fertilizers.

The Arctic icebreaker fleet is based in the port. In addition, within the framework of sub-programme “Maritime transport”¹⁹ the reconstruction of distant lines berth was completed, the bank of the passenger area of Murmansk Port has been protected, and the passenger ship terminal building has been reconstructed.

The port can be considered as the point of transshipment of commodity flows to the Central Europe from Southeast Asia.

Port of Arkhangelsk

The port of Arkhangelsk is situated on the delta of Severnaya Dvina river and is essential and integral part of the Arctic transport system of Russia. In 2018 the Port of Arkhangelsk transshipped 2.2 million tonnes of cargo. Major handled cargoes are: coal, timber, petroleum products.

Port of Arkhangelsk is a port of year-round navigation, where ice conditions are roughly equivalent to those of the Gulf of Finland. Ice escort is needed during winter.

Port of Kandalaksha

The sea port of Kandalaksha is located in the northern part of Kandalaksha Bay in the White Sea. In 2018, the port transshipped 2.2 million tonnes of cargo. Major cargo is coal.

The waters around the port are protected from winds on all sides by islands, the port is only open to Kandalaksha Bay to the southeast. The port operates year-round, the waters of the port freeze in early December and melt in early May.

Port of Vitino

The port of Vitino is located at Kandalaksha Gulf of the White Sea and is specialized for transshipment of bulk petroleum cargo, including gas condensate. Ice escort is needed during winter. Currently, cargo handling in the port is not carried out.

Port of Naryan-Mar

In 2018, the port of Naryan-Mar transshipped 0.11 million tonnes cargo. Major handled cargoes are coal and bulk cargo. From the port of Naryan-Mar transports can continue inland along the Pechora River from May to October.

Port of Varandey

The seaport of Varandey, built in 2000, is aimed for oil export by sea. In 2018, the cargo turnover of the port was 7 million tonnes.

Port of Onega

In 2018, the cargo turnover of the seaport of Onega was 0.09 million tonnes. The cargo consisted mainly of timber.

Port of Mezen

The cargo turnover of the port of Mezen was 0.02 million tonnes in 2018.

¹⁹ Subprogramme of the Federal Targeted Programme “Development of Russia’s Transportation System (2010-2020)”

Northern Norwegian ports

Because of long distances and a population that is sparsely distributed over the whole region, it has proven difficult to direct the cargo and passenger flows to a smaller number of hub ports in Northern Norway. In the three northern Norwegian counties, there are 76 municipalities connected to the sea and most of them have their own port. The ports described below are therefore numerous and small compared to the ports described in the neighboring countries. However, many of the smaller Norwegian ports play an important role in domestic, and to a certain extent also in international, logistics. The total freight turnover of the ports in Northern Norway is 43 million tonnes (Nordland county 33 million tonnes, Troms county 2 million tonnes and Finnmark county 8 million tonnes).

There is a regular passenger service calling at 25 ports in Northern Norway twice a day, operated by the shipping company Hurtigruten (the Norwegian Coastal Express).

The island of Spitsbergen is strategically located in terms of search and rescue in the Barents Sea.

Port of Mosjøen

The port is the largest in Northern Norway with regard to containers for industrial goods, as a consequence of the metal industry located here. Since the previous plan was issued, the port has entered into a major port cooperation at Helgeland. Four municipalities - Alstahaug (port of Sandnessjøen), Vefsn (port of Mosjøen), Leirfjord and Dønna - have now become Hegeland IKS ("inter-municipal enterprise"). The aim of the new establishment is to unite the port resources to provide improved services.

Port of Mo i Rana

The port of Mo i Rana handles general cargo and containerized export products from the local iron ore and metal industry. A volume of 3.3 million tonnes of iron ore is annually transported by rail on the Nordland line from Krutfjell to the port of Mo i Rana for further transport to the processing sites.

The port of Mo i Rana is located at the intersection between the trunk roads E6 and E12, railway and sea routes in central Norway.

The port has a total of seven different sections, which in 2017 handled a total freight of 4.3 million tonnes. The two largest terminals, Rana Gruber and Rana industrial terminal had a port freight traffic of 1.6 million and 1.8 million tonnes respectively. Since 2016 the port has taken part in the E12 Atlantica Transport project, which works with strategies for east-west transports in the region. Mo i Rana is one of the prioritized ports in Norway and part of the EU TEN-T Comprehensive Network.

Port of Bodø

The port of Bodø is the center of Nordland County, and significant as a hub for the transport of goods and passengers north-south. By the port you also find the end station of the national rail transport in the north, where goods arriving in containers by rail from Oslo are transferred onto ships. There are transport connections by air from Bodø, and there are ferry and speed boat services towards Lofoten and Helgeland. The port of Bodø has extended its port capacity in recent years with a new terminal that was completed in 2016. The port now has a maximum depth of 10 meters and can receive ships up to 260 meters. Bodø is also experiencing a growth in cruise traffic - in 2017 there were 11 500 cruise passengers and 11 cruise calls. The port of Bodø is a high-priority port for national authorities in Norway.

Port of Narvik

The port of Narvik consists of four port sections: LKAB's bulk terminal, the central port area with piers, the deep-water quay at Fagernes with intermodal facilities, and Northland's Skarvenes quay. 18-20 million tonnes of cargo are shipped annually from the port of Narvik. Most of this is ore from the Swedish mines in Kiruna and Kaunisvaara, but the port's strategic location and excellent infrastructure makes it suitable for all types of container-based cargo. In Narvik a project has been initiated to expand the port with a new and significantly larger port section of up to 45,000 m². The area is planned to be used for the handling of containers.

Since 2005, the port of Narvik has had the status of a TEN-T Core Network Port and is connected to the "Motorways of the Sea" network in the EU system. The port is also a high-priority port for the national

authorities and linked to Sweden through the E10 and the important train connection of the Arctic Rail Express (ARE).

Port of Tromsø

Trunk network port with connection to the E8, Langnes airport.

In Tromsø there are public ports both in the city center and at Breivika where the trunk network terminal is located. In recent years, there have been a number of investments in port infrastructure. With the passenger terminal for high-speed ferries and the Coastal Route transport service as well as bus services, it is a transport hub for passenger transport that is estimated to have around 1 million passengers per year (both boats and buses). The fishing port at Breivika is being extended with 4 hectares for logistics and business purposes. For industry and offshore activities, a new port section of 150 hectares has been built at Grønsund, 10 km north of the city.

At Eidkjosen, 10 km west of Tromsø there is a business cluster for shipbuilding and repairs. 25 km south of the town there are also port facilities at Olavsvern in Ramfjorden.

Port of Alta

Trunk network port with connections to the E6 and E45, Alta airport

The port of Alta was the northernmost container port in Norway until the transport route from Bodø was closed. The route may be reopened, and Alta will then be important with regard to distribution of consumer goods in Finnmark. Port of export for slate.

Port of Hammerfest

EU TEN-T Comprehensive Network Port, trunk network port with connection via the RV 94 to the E69, STOLport.

Apart from the LNG from Melkøya (5 million tonnes annually), Hammerfest is a relatively small port. The remaining port traffic consists of the fishing fleet, some cruise ships and one important segment - supplies to the petroleum activities in the Barents Sea. Development work is going on to meet the needs of the increasing petroleum activities in the Barents Sea.

Port of Honningsvåg

Trunk network port with connection to the E69, STOLport.

Due to the Nordkapp plateau, which is the largest tourist attraction in Northern Norway, the port is one of the country's largest cruise ship destinations, with around 100 calls per year and 150,000 passengers. STS transfer of petroleum products from Northwestern Russia on Sarnesfjorden just west of Honningsvåg. For 2019, the estimate is that up to 9 million tonnes of LNG will be transshipped. The port also serves the fishing fleet.

Port of Kirkenes

EU TEN-T Comprehensive Network, trunk network port with connection to the E6 and Høybuktmoen Airport.

It is expected that petroleum from the eastern Barents Sea and Northwestern Russia, as well as an ice-free Northeast Passage, will trigger a need for the establishment of new port areas. In addition to the possible establishment of a railway Kirkenes-Rovaniemi (-Helsinki-Tallinn - Central Europe), the place can be seen as a point for transshipment of commodity flows to Central Europe from Southeast Asia. The railway will also be used for the shipment of Finnish minerals and timber.

Chaired by the Norwegian Public Roads Administration, zoning plan work is currently going on with regard to a new trunk network port, taking into account the plans for a railway extended from Finland (Rovaniemi), a container terminal, bulk terminal, shipbuilding area, supply area and a public port with a total area of around 100 hectares. In addition, there are several private initiatives for the future establishment of port areas and terminals in the area.

Iron ore has represented the main bulk at Kirkenes, but due to a standstill in the mines, today's volume is only around five percent of previously reported activity. The mines will probably reopen as soon as it becomes economically feasible.

There are facilities for STS transfer of oil in Korsfjorden at Kirkenes. Transshipment is an activity that comes and goes. In 2015 the volume exceeded 15 million tonnes, whereas in 2017 no transshipments were made.

Connections between ports in northern Norway and Russian ports in the Northern basin

The number of sailings between the port of Murmansk and Arkhangelsk and the ports in Northern Norway is about 125 each way per annum according to Automatic Identification System (AIS) statistics (some of these sailings call at several ports in Northern Norway).

There are only sporadic freight vessel or container ship transits between Kirkenes and Murmansk. Since the summer of 2018, weekly transits by freight vessel from the south have stopped at Hammerfest and not at Kirkenes as before. Freight to Finnmark east of Hammerfest is now being transported by road except if units are so large that they must be carried by sea. For sea transport and this corridor, this must be considered negative.

Infrastructure and standard

The fairway standard

No common fairway standard exists for the Russian and Norwegian part of the Northern Maritime Corridor, but there are no big challenges related to this since the standards in both the countries are considered good. A common fairway standard maybe considered in the future. The capacity in the Northern Maritime Corridor is unlimited.

- TSS (high-risk vessels and high-risk cargo) and Main Route (within territorial waters and mainly inside the baseline)
- Main route and trunk network ports
 - Analyses and studies for NTP 2022-2034, measures by route
 - Harstad-Tromsø
 - Tromsø- Skjervøy
- Lighthouses and beacons, transition to IALA standard in the period 2019-2025

Work is being done to improve safety and traffic flow on the main route, both by identifying obstacles and planning to remove these, as well as by optimising the navigation assistance system.

Safety at sea

The expected increase of activity in Barents within the petroleum, metal and mineral industries, as well as increased transit transports, makes it important to ensure a sufficient level of safety and sustainability in the northern waters. Shipments of petroleum could multiply under favorable conditions.

After the start-up of LNG production at Sabetta, there is once again an increase in the number of ship transits and the volume shipped through the corridor. It should be mentioned that in 2019, LNG is to be transhipped in Honningsvåg for further transport from there.

The number of high-risk vessels (an environmental risk in themselves) from Europe has been at an even level close to 1 900 in the years 2015-2017 and of these, the number of vessels carrying high-risk cargo (petroleum, radioactive etc) has remained at around 400 in the same years ²⁰.

Maritime activity covers a vast geographical area with harsh climatic conditions. Challenges such as icing, winter darkness, summer fog, remoteness, a limited access to infrastructure and communication require

²⁰ Source: VTS-NOR

custom-designed solutions for maritime safety, emergency preparedness and search and rescue response for these waters.^{21,22,23}

The experts group point in particular to the following:

- The need to develop a functioning system of communication (broadband satellite communications) in polar waters
- The need for more hydrographical surveys and development of complete charts, improvement of infrastructure for navigation and improved forecasts related to weather, waves and ice conditions.
- The need for a joint traffic monitoring system. The establishment of a joint Barents VTMS (Vessel Traffic Monitoring and Information System), including seamless sharing of traffic data from AIS, Satellite AIS and other relevant sources.
- Harmonization of national rules, regulations and procedures in the area, to achieve greater predictability and lessen the administrative burden on mariners.
- Extension of the newly established Barents Ship Reporting System (Barents SRS) to cover the entire Barents Sea Region
- The need for an improved system for search and rescue to ensure:
 - Early warning
 - Efficient detection equipment
 - Efficient mobilization and availability of rescue resources
 - Efficient coordination and execution of rescue operations
 - Efficient personal rescue equipment
 - Efficient use of non-governmental (non-SAR) ships for emergency situations.
- The Polar Code implemented from 1 January 2017. The Polar Code contains rules for the design and construction of ships, for equipment, operations, training and environmental protection. When it comes to training requirements referred to in the safety chapter, changes have been made to the STCW Convention. These will come into force after the SOLAS amendments and the Polar Code (1 July 2018).

Transports

See above under Brief facts and General Description.

Key Challenges

See above under Infrastructure and standard.

Planned development

Russian ports Northwestern federal district of the Russian federation

Port of Murmansk

For further development of the Port of Murmansk it is planned to construct a coal terminal on the western shore of Kola Bay, at the mouth of the Lavna River with the design capacity of 18 million tonnes. Currently the railways on the eastern and western shores of the Kola Bay are under construction.

In addition, on the western shore of the Kola Bay it is planned to construct an offshore field supply base of OJSC "NK "Rosneft" and the center of the large marine structures construction of OJSC "NOVATEK".

Northern Norwegian ports

Port of Bodø

Development of the port is directed towards improving both passenger and freight capacity and service.

²¹ Source: Report on opportunities and challenges in connection with increased sailings in the Polar Sea of the Expert Group of the Ministry of Interior of Norway ("Økt skipsfart i Polhavet – muligheter og utfordringer for Norge"), Utenriksdepartementets faggruppe, April 2013

²² Source: Preliminary project report, Russian – Norwegian Barents Logistics and Transport, June 2013

²³ Source: Project report SAR operations in the Norwegian part of the Barents Sea and Polar Sea, Dec 2012

Port of Narvik

The expansion of the port is expected to continue. Studies are ongoing in the port of Narvik to increase the port's capacity.

Port of Tromsø

The expansion and development of the port is ongoing and comprises both a new port section to serve the petroleum industry, increased cargo capacity and improved facilities for cruise liners starting and finishing their cruises in Tromsø.

Port of Honningsvåg

There are draft plans for a landing terminal for petroleum from the Barents Sea, but as of December 2018 the signals are that the solution may be one of three options: 1) A downscaled terminal, i.e. in-port STS transfer, 2) STS at sea or 3) A pipeline southward.

Port of Kirkenes

Today's port in Kirkenes does not have development opportunities. There is a planning work regarding the development of the main port in Kirkenes, Høybukta west. The draft zoning plan for the area is planned to be completed in the autumn of 2019. The new port will account for the development for 50 years ahead, and provide space for both the public harbor, the supply base for the petroleum industry, the bulk port and the container port connected to the railway from Finland. The port is a prerequisite for railway development which aims to ship Finnish mineral and timber and reloading of container/goods from the northern sea route in transit to the continent through Finland and the Baltics. Rough cost estimates have been made that vary between NOK 8 and 11 billion, but the costs will be allocated among several actors and over several decades.

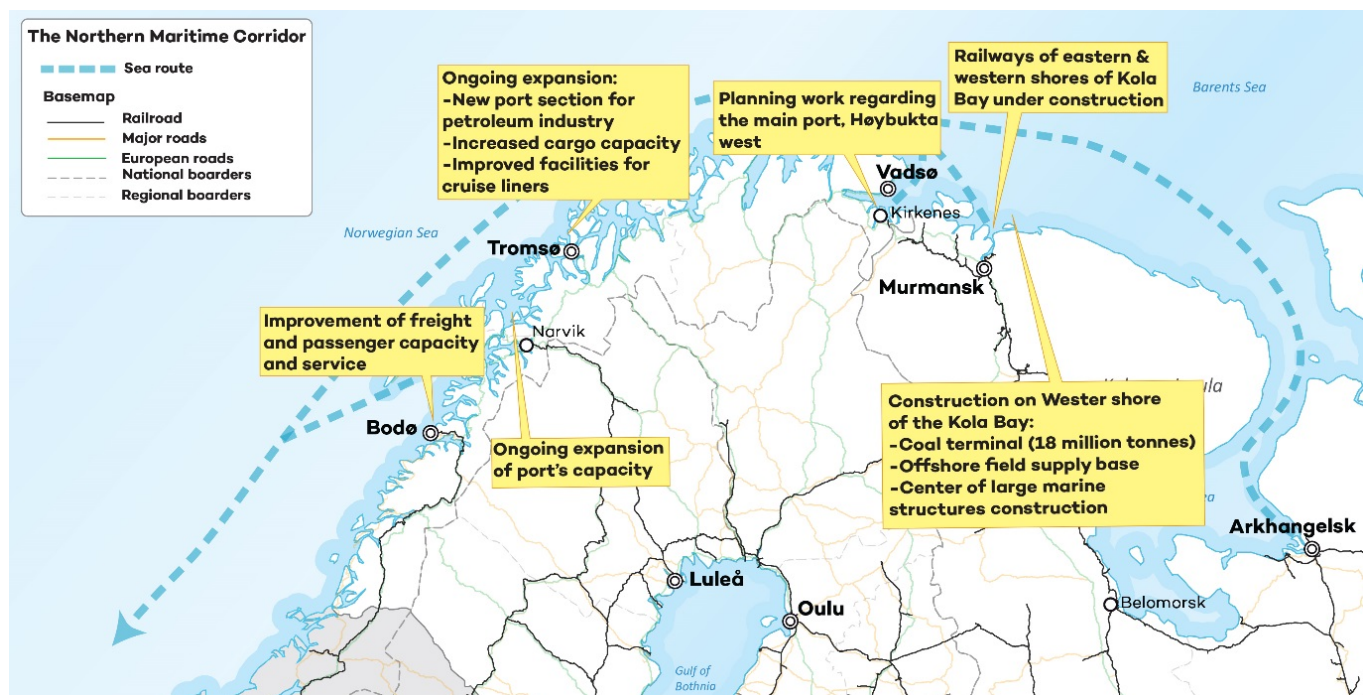


Figure 5.1 The Northern Maritime Corridor- Arkhangelsk-Murmansk-The European Continent.

Future potential

Russian ports Northwestern federal district of the Russian federation

Capacity development of the Russian ports of the Northwestern federal district of the Russian federation is associated with the development of the Northern Sea Route.

Potential development of the port of Murmansk is associated with the implementation of the project for the development of the Murmansk transport hub with a modern deep-water port, which are focused on the processing of liquid and bulk cargo, large-capacity containers, construction cargo on the western shore of the Kola Bay, integrated into the North-South International Transport Corridor.

Realization of the project for the development of the Murmansk transport hub provides for a large-scale reconstruction of railway approaches to the port, the construction is about 100 km of railway tracks from 2020 to 2025, the extension of redirection routes, the strengthening of power supply devices

Northern Norwegian ports

Port of Honningsvåg

The port of Honningsvåg has future development potential with respect to serving petroleum fields.

Port of Kirkenes

Several private Norwegian initiatives exist to develop the port of Kirkenes and industrial areas in Kirkenes (KILA/Tømmerneset/Pulkneset). The rationale for these initiatives is an expected rise in traffic of petroleum, ores, minerals and containers through the Northern Sea Route (if the acceptable prices, safety and quality are ensured), an expected increase in Norwegian and Russian petroleum activity in the Barents Sea.

Although Kirkenes is a small port compared to Murmansk, it is still a possible future transshipment port for international cargo originating in or destined for Northwest Russia or between Asia and continental Europe. Between Yokohama and Rotterdam about 3 million containers are transported per year²⁴, and some of these volumes may be transported via the Barents Region in the future. There is currently no dedicated container terminal in Kirkenes. A future international container terminal would require large investments, but water depth in Kirkenes ensures profitability of container shipment.

Connections between ports in northern Norway and Russian ports in the Northern basin

There is a potential to develop maritime relations between Russia and Norway both in respect to cargo and passengers. There is currently no passenger traffic between these neighboring countries.

²⁴ Source: Ocean Shipping Consultants

6 The Motorway of the Baltic Sea Luleå/Kemi/Oulu – the European Continent

Brief facts

Brief facts in terms of freight and passenger turnover etc. in key ports are presented below.

Country	Port	Cargo (1000 tonnes)	TEU	Passengers	Depth	Population
Finland	Raahe	5,526	4,500	0	10	23,000
Finland	Oulu	2,825	35,000	0	12.2	131,000
Finland	Kemi	1,950	12,000		10	23,000
Finland	Tornio	1,959	21,000	0	9.1	22,000
Sweden	Umeå	2,300	19,000	100,000	10,2	125,000
Sweden	Skellefteå	1,800	0	0	8.5/13	72,000
Sweden	Piteå	1,700	19,000	0	11.5	42,000
Sweden	Luleå	9,000	0		11.9	77,000
Sweden	Kalix	269	0	0	5.6/6.6	16,000

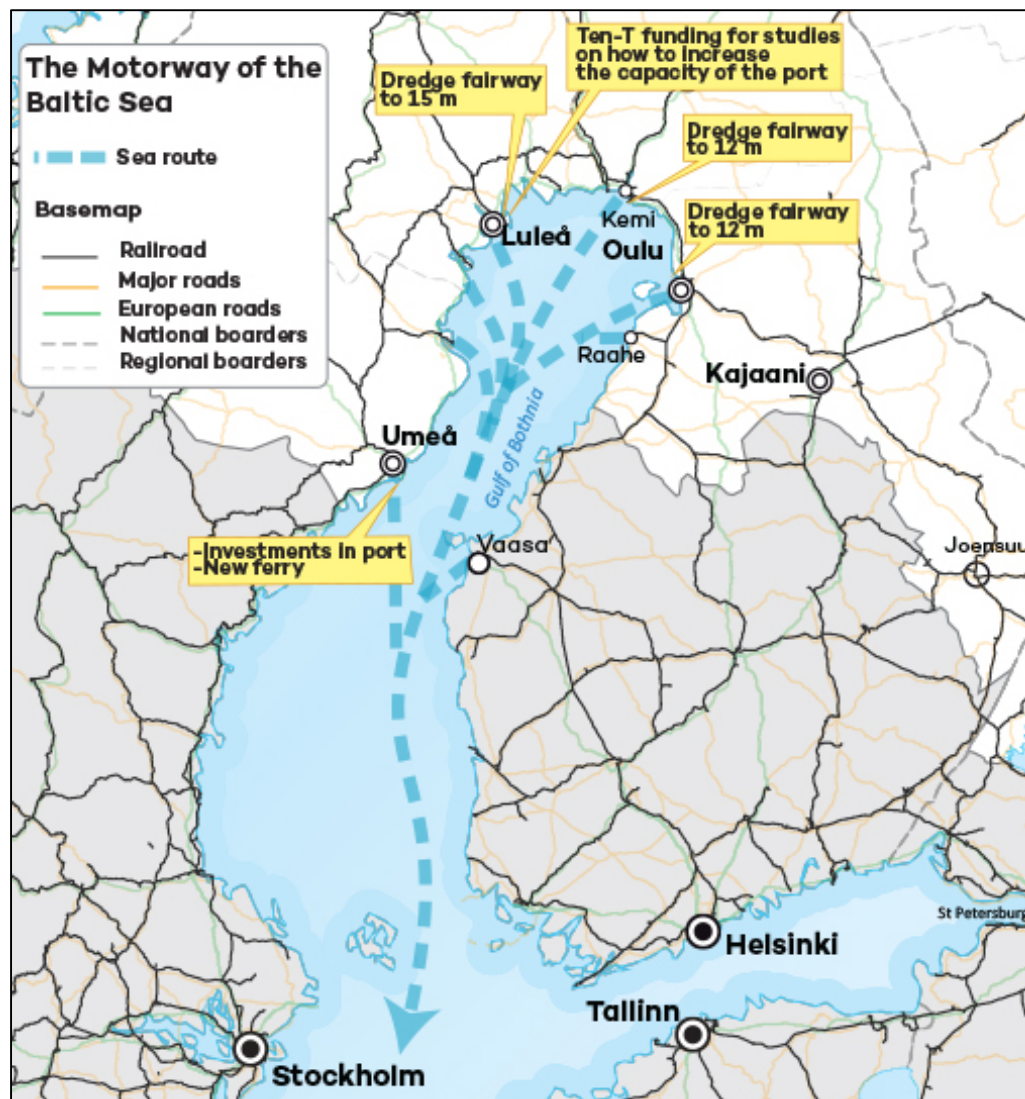


Figure 6.1 "The Motorway of the Baltic Sea" Luleå/Kemi/Oulu – the European Continent

General Description

The sea corridor in the Gulf of Bothnia is essential for the transports of raw materials and especially the products of the industries situated along the Bothnian Corridor. The Baltic Sea offers a direct connection southward to the rest of Europe.

The traffic volumes in the Bothnian Corridor transport network in the short term (until the year 2020), include mining products, timber, chemicals and other commodities produced in the area. The main transport in the corridor is cargo.

The corridor is very important for the industries situated along the Bothnian Corridor. Most of the customers of these industries are located in Europe or on other continents and are impossible to reach otherwise. It is not economically feasible to use long distance railway transports from the industries along the Bothnian Corridor to ice-free Atlantic ports.

The Northern Swedish ports

A large proportion of Sweden's foreign trade goes via shipping and the ports have an important share in this link. Sweden, with its long coastline, has a good potential to use maritime transport relatively close to the customer. The freight volumes handled by these ports vary significantly and some of the ports have specialized in handling only certain types of goods.

Port of Luleå

Luleå is the port in the Gulf of Bothnia with the strongest position in the TEN-T network (TEN-T Core). A large proportion of the cargo through Luleå consists of foreign volumes.

The port of Luleå handles large volumes of bulk cargo, mainly iron ore pellets from Malmberget and incoming coal as well as oil and petroleum products. TEN-T funding has been granted for studies in Luleå to increase capacity.

Project Malmporten is an initiative to expand the port and is estimated to be done by 2020 and would have a direct connection to Malmbanan. By increasing the depth in the routes leading in to the harbour, heavier ships can access the port which means that the carrying capacity can be increased from 55,000 tonnes to 200,000 tonnes per ship.

Port of Skellefteå

The port of Skellefteå handles mainly bulk, forest products, smelting materials and finished products to and from the Rönnskär, as well as smelter, and slabs, scrap and lumber. The port also handles liquid bulk and oil.

Port of Piteå

The port of Piteå handles mainly forest products, paper products such as kraftliner and pulp. The port also handles mineral oil products.

Port of Umeå

The port of Umeå primarily handles forest products (half the volume) and general goods (about 25 percent of the volume). The RoPax connection over the Kvarken strait to Vaasa in Finland is important both for freight and passenger traffic. The port also handles container traffic.

The Northern Finnish Ports

Maritime transport is important both for domestic transport, foreign trade and international passenger traffic. Both the long coastline and the scattered production/settlement have contributed to the development of a large network of ports. The two ports of most importance are Kemi and Tornio. These two ports handle about 10 percent of Finnish exports. Paper, wood products and minerals constitute the main commodities through the Northern Finnish ports.

Port of Kemi

The port of Kemi serves mainly the forest industry, mines and chemical transports. It is currently planned that the port will also handle shipments for the initial phases of mining operations in Kolari and perhaps also in the

long-term shipments from other mines. MetsäBotnia is planning the renovation of their pulp mill. The new pulp mill will double the use of timber and therefore double the production. There is a clear need to deepen the passage to 12 meters.

Port of Tornio

The port of Tornio mainly handles steel products and supplies for the steel industry. Tornio mainly serves the Outokumpu stainless steel mill.

Port of Oulu

The port of Oulu handles oil and bulk, paper, pulp and cement. The passage will be deepened to 12 meters.

Port of Kokkola

About half of the cargo handled in the port of Kokkola consists of transit traffic from Russia. The passage will be deepened to 14 meters.

Port of Raahе

The port of Raahе handles large volumes of bulk cargo, including steel from the Ruukki steel mill and iron ore from Gällivare going out via the port of Luleå, and other minerals, steel products and sawn wood products.

Transports

See above under Brief facts and General Description.

Key Challenges

The Government has presented a national freight transport strategy or efficient, high-capacity and sustainable freight transport – the first of its kind. The strategy focuses on the modern freight transport systems of tomorrow, where freight transports are efficient and smart, and utilize the full potential of railways and a larger share of shipping capacity.

Shallow waters

A general problem for navigation in the region is that the Gulf of Bothnia is very shallow. And as the land is rising at the rate of about 1 meter in 100 years, the fairways and ports must be dredged regularly to keep them navigable. There are plans to dredge the fairways to the port of Oulu and Kemi to 12 meters and in Luleå the planning and financing to dredge the fairway 15 meters will start in 2024. In the port of Umeå plans are also made to make the fairway deeper.

Icebreaking

One of the key challenges for navigation, in addition to the shallow waters, is winter ice. The Baltic Sea, including the Gulf of Bothnia, is subject to icy conditions every winter. Therefore, all ships calling at the ports need to be ice-classified during the stipulated conditions and/or time periods. Ice-breaking ships tend to be slower or less fuel efficient than ordinary ships, which implies higher transport costs and therefore has a certain impact on trade and on the competitiveness of the industries in the region.

Icebreakers have to be used to keep the fairways open during the winter season. The ice-breaking service is delivered by Swedish and Finnish authorities as equal counterparts and under one command. The number of vessels not required to wait exceeded 90 percent in 2011. For the vessels that had to wait, the average waiting time was 3.16 hours.

Planned development

Port of Luleå

TEN-T funding has been granted for studies in Luleå to increase capacity.

Dredging of fairways to ports of Oulu, Kemi and Luleå

There are plans to dredge the fairways to the port of Oulu and Kemi to 12 meters and in Luleå to 15 meters.

Port of Umeå

Text Investments in the port and a new ferry.

Future potential

Despite some challenges, the future potential of the corridor is positive.

7 Petrozavodsk – Murmansk – Kirkenes

Brief facts

The corridor consists of the following roads.

Roads: Norway: E105 (9 km)

Russian Federation: E105 (National Road R-21 “Kola” (section state border N/R - Automobile border crossing point “Borisoglebsk” - Pechenga - Murmansk – Petrozavodsk))

Railway: The Russian section of the railway from Petrozavodsk to Murmansk is part of the Oktyabrskaya Railway infrastructure - a branch of the Russian Railways, JSC.



Figure 7.1 Petrozavodsk – Murmansk – Kirkenes.

Roads

Total length: 1,140 km, of which Petrozavodsk – Murmansk: 925 km and Murmansk to Kirkenes: 215 km (9 km in Norway).

Width: 8.5 m (Norway) and 11–12 m (Russia)

Speed limit: 60–80 km/h (Norway) and 60–110 km/h (Russia)

Number of vehicles crossing the border per day: 1032 (2017) (338 in year 2014)

Number of heavy vehicles >12,5 meters crossing the border per day at Riksgrensen/Storskog: 10

Average number of vehicles per day where traffic is at its peak:

Kirkenes:	7,100
Murmansk	11,000
Petrozavodsk:	14,000

Railway

Murmansk – Petrozavodsk line

Length: 850 km

There is a developed network of passenger traffic, connecting Murmansk, Petrozavodsk and other cities in the region with the largest cities of the Russian Federation.

Average amount of cargo per year: 27.2 million tonnes

Electrified, single-track lines, with double-track inserts.

Kirkenes – Bjørnevatn line

Single track

Length: 8.5 km

Ports

The freight flow coming from Central Russia by rail to Murmansk, then routed through the port of Murmansk by sea to the point of destination.

Airports

Number of passengers per year

Kirkenes	315,000 (2017)
Murmansk	751,000 (2015) (+12.6% compared to 2014)

General information

Number of inhabitants in main cities

Petrozavodsk	279,000
Kandalaksha	31,000
Murmansk	295,400
Zapolyarny:	15,000
Nikel:	11,400
Kirkenes:	10,000

General Description

The route is the only border crossing between Russia and Norway and is very important for the regional “people to people” cooperation in this part of the Barents Region. The route therefore plays an important role in the northern political cooperation and in the growth of business and industry in the border area and in Northern Norway in general. The route encompasses National Road R-21 “Kola” (section state border N/R - Automobile border crossing point “Borisoglebsk” - Pechenga - Murmansk - Petrozavodsk) in Russia and the road section Kirkenes — Elvenes — Automobile crossing point “Storskog” in Norway.

E105 is the major transportation route connecting Scandinavia and Asia. This route runs from north to south (from Kirkenes through St. Petersburg, Moscow to the Black Sea) and has access to transport systems of several countries, as well as Pan-European transport corridors NoNo. 2 and 9, the international transport corridor North- South and the corridor Europe - Western China which is currently under construction.

The railway section Murmansk- Petrozavodsk is one of the most important directions of the transport system of the north-west of the Russian Federation.

There are civil airports in Petrozavodsk, Murmansk and Kirkenes.

Infrastructure and standard

Roads

In the Norwegian section of E105, the reconstruction works between Storskog and Kirkenes were completed in 2018. On the Russian side the reconstruction works between the border and Murmansk were completed in 2017. This has been a bilateral cooperation project over many years between Russian and Norwegian road authorities.

Railways

This section of the October Railway runs from St. Petersburg in the south via Petrozavodsk and Kandalaksha to Murmansk city and the coast of Murmansk in the north. The total distance between St. Petersburg and Murmansk is 1,140 km, and the section between Petrozavodsk and Kola has a length of 1,054 km. It has 52 stations. The railway was electrified in 2005. In 2016-2017, the reconstruction of buildings and facilities of the station complex of Petrozavodsk, as well as the reconstruction of the railway infrastructure with a capacity of 420 passengers per day have been carried out. In 2018-2019, JSC "Russian Railways" continued the implementation of measures for the reconstruction of buildings, facilities of the passenger rail terminal complex, and the reorganization of the railway infrastructure in Petrozavodsk.

Border-crossing points

This Route has the International automobile border-crossing Point through the national border “Borisoglebsk” at the Russia-Norway border. Work schedule: 07.00 – 21.00 (Norwegian time).

Airports

Petrozavodsk Airport has one runway with a length of 2500 meters. In 2016-2020 a construction of the airport complex with a capacity of at least 300 passengers per hour is conducting.

The Murmansk Airport has one runway with a length of 2500 meters. In 2019-2023 reconstruction of the network of taxiways, apron, parking lots of aircrafts, rescue station, perimeter fences and airport patrol road are planned to be conducted.

The Kirkenes Airport has one runway with a length of 2,115 meters. The runway will be extended 200-300 meters not later than 2021.

Transports

Road transport

Murmansk – Kirkenes

The export of goods from Norway to Russia via Storskog has varied from year to year, but it has decreased in the past years. It has been between 6,000 and 7,000 tonnes per annum. Import of goods from Russia to Norway via Storskog reached 6,600 tonnes in 2007. In later years this has decreased to only 1,800 tonnes. The main types of goods transported by road over the border are fish, timber products, products for the mining

industry and maritime equipment. Russian road transport in the route is primarily general cargo, food products and passenger transport between the cities in the region. There are several Russian bus companies offering transport between Murmansk and Kirkenes.

The route is very important for passenger transport between Kirkenes, Murmansk and the other towns just over the border on the Russian side. Border crossings via automobile border crossing points Storskog/Borisoglebsk increased from 142,000 passengers in 2010 to 313,000 in 2014. In the last years border crossings have decreased and in 2017 there were 268 829 passengers.

In September 2017, in the Murmansk region, after the reconstruction, a 16-kilometer stretch of the R-21 “Kola” was opened, which goes to the crossing point across the border with Norway <<Borisoglebsk>>. The work, which had been carried out, allowed to reduce not only the distance and travel time, but also to reduce transport costs for the transportation of international transport companies and to make the road between two countries safer and more comfortable.

There is a visa free regime for residents of both the countries residing within a radius of 30 km from the border. The total number of vehicles crossing the border at the International automobile border-crossing point “Borisoglebsk” increased from 44,800 in 2010 to 109,700 in 2018.

Rail transport

The volume of cargo transportation by rail through the port of Murmansk in 2014 amounted to 20.1 million tonnes. The freight flow consisted primarily of coal exports. In accordance with the General Scheme of Railway Development, the volumes of freight transportation by rail via the port of Murmansk are projected to reach 26.9 million tonnes by 2020.

Air transport

Petrozavodsk

Petrozavodsk has a regional civil airport with services to St Petersburg and Moscow. International airport “Petrozavodsk” is part of the national core Russian aerodrome-airport network and is considered as an option for an alternate airport for airports of the Northwestern Federal District: Saint-Petersburg, Murmansk and Arkhangelsk. Aerodrome “Petrozavodsk” is a joint civil and military aerodrome. In 2019, flights will be operated from “Petrozavodsk” Airport to Moscow, Arkhangelsk, Cherepovets, Simferopol, Sochi, and Anapa.

Murmansk Airport

Murmansk Airport is an international airport which is operated by several airlines. The airport has regular domestic air service to Moscow, St. Petersburg, Arkhangelsk and Cherepovets; In summer, additional flights open to several Russian cities southwards.

As of 2019, there are no regular connections to Finland and Norway due to low passenger demand. From October 2014 air flights on route Tromsø – Murmansk were cancelled. Starting in May 2015, the airport has been providing summer regular charters flights on the route Murmansk – Helsinki.

Kirkenes Airport

The airport has regular domestic routes direct to several domestic destinations, amongst whom Oslo, Tromsø and Vadsø are the most important. Kirkenes serves as a hub for traffic between the eastern part of Finnmark and the remaining part of the country. As of today, the airport has no direct scheduled flights to destinations in the other countries in the Barents Region.

Key Challenges

The introduction of the visa free regime for the residents of the border area has simplified border crossings for the local population. Customs and visa procedures and rules must, however, still be viewed as a main challenge for transport in the route. Additional factors are limited capacity and long waiting times at the Storskog/Borisoglebsk Automobile border crossing point. There are plans to extend and streamline the border stations on both Norwegian and Russian sides to cope with future growth.

The road quality on the Norwegian side have a good-standard status and is open to modular vehicle combinations (25.25 m / 60 t) from the border down to Kirkenes and to the border of Finland (Neiden). On the Russian side, the permitted total weight for heavy goods vehicles is 44 tonnes (for road-trains with six or more axles) with special permits over 44 tonnes (except divisible goods). The permitted length is 18 m. Differences in vehicle regulations for heavy goods vehicles between the two countries might hamper the development of international cargo transport over the border.

The transport service of the railways of the Murmansk- Petrozavodsk section needs to be improved and the crossing capacity of the railway tracks needs to be developed.

A need to extend the runway at Kirkenes Airport to 2,200 m has been identified in order to accommodate larger aircraft.

Planned development

The planning of a new international trunk network terminal for the port of Kirkenes with an access road and a potential railway connection from Finland was started in 2018. The planning is expected to be completed in 2019. As of today, there are uncertainties concerning the construction and financing of the project.

On the Russian side, the improvement works have been in progress since 2008 and have encompassed the entire 230 km stretch between the Norwegian border and Murmansk. The general volume of the funding is EUR 60-55 million.

The state program of the Russian Federation “Development of the transport system”, approved by the Decree of the Government of the Russian Federation on 20 December 2017 No. 1596, provides “Integrated development of the Murmansk transport hub”.

The implementation has 2 stages:

Stage I - railway line – station Vykhnodny - bridge over the river Tuloma - station Murmashi 2 - station Lavna (at the expense of the federal budget);

Stage II - dredging of the water area and water approaches for the coal terminal (at the expense of extra-budgetary funds).

In order to increase its capacity, it is planned to build the second track on the Murmansk - Petrozavodsk section with a length of 327 km (Medvezhyegorsk District, the city of Petrozavodsk, Prionezhye District, Segezha District, Polyarnye Zori, Olenegorsk, Kondopoga District, Segezha, Kondopoga, Kem, Belomorsk District, Kandalaksha, Louhi District, Kola District, Murmansk, Kem District, Apatity).

The Government of the Murmansk Region is considering the possibility of organizing ferry service on the route Kirkenes - Murmansk - Kirkenes. One of the prerequisites for the project realization is a 72-hour visa-free stay of tourists in the Murmansk Region.

The project of reconstruction of the infrastructure in the seaport of Murmansk involves the creation of modern conditions and improvement of the quality of service for passengers of ferry boats plying this route.

The Hurtigruten offers in 2019/20 expedition cruises in the Russian Arctic, Spitsbergen and Greenland.

It has been decided to extend the runway at Kirkenes Airport, Høybuktmoen in 2018-2023. This is linked to the expectations of a significant increase in tourist industry and the Norwegian petroleum activity in the southeastern part of the Barents Sea.

There are also plans for reconstruction of Murmansk Airport.

Future potential

Potential of the existing infrastructure

To some extent, any future development of the Route close to the border will depend on the content and progress of the cooperation between Norway and Russia on business policy in the border regions.

Tourism already plays a significant role in the economy of the Barents Region and it is a sector with great potential for further growth. Cooperation across the borders is, however, a prerequisite for such growth. Developing cross-border infrastructure and reducing bureaucratic barriers along the national borders in the Region will facilitate practical cooperation within tourism sector.

In the nearest future, the potential lies primarily in an increase in private road traffic. Visa-free border crossing and the possible development of a common residence and labor market may give rise to greater transport needs in the Region.

Today, the railway runs as far as Murmansk and onward to the town of Nikel, which is close to the Norwegian border. The distance between Nikel and Kirkenes is approximately 40 km.

The question of the expediency of the railway construction in the area between Nikel and Kirkenes, in the case of further increase in traffic volumes, can be considered taking into account projects and priorities, recorded in the sectoral program documents, in an integrated feasibility study, which shall include:

- Evaluation of the prospective cargo base, which is to involve, in particular, the railway routes under consideration;
- Necessary levels of investment and the list of infrastructure measures;
- Information about potential investors and the expected pattern of the project;
- Evaluation of the commercial and budget efficiency.

At the same time, such initiatives should not lead to the redistribution of existing freight traffic, which are following economically viable routes.

8 Rovaniemi – Salla – Kandalaksha

The Route was adjusted in the Joint Barents Transport Plan in accordance with the proposals of the document “Cross-Border Road Corridors”, discussed at the High-Level BEATA Meeting held in Rovaniemi in 2015.

Brief facts

The corridor consists of the following roads and railways:

- **Roads:** Finland: E75 and National Road 82
Russia: Regional Road Kandalaksha – Alakurtti – automobile border crossing point Salla border crossing point, E105 (R-21 «Kola»), E75.

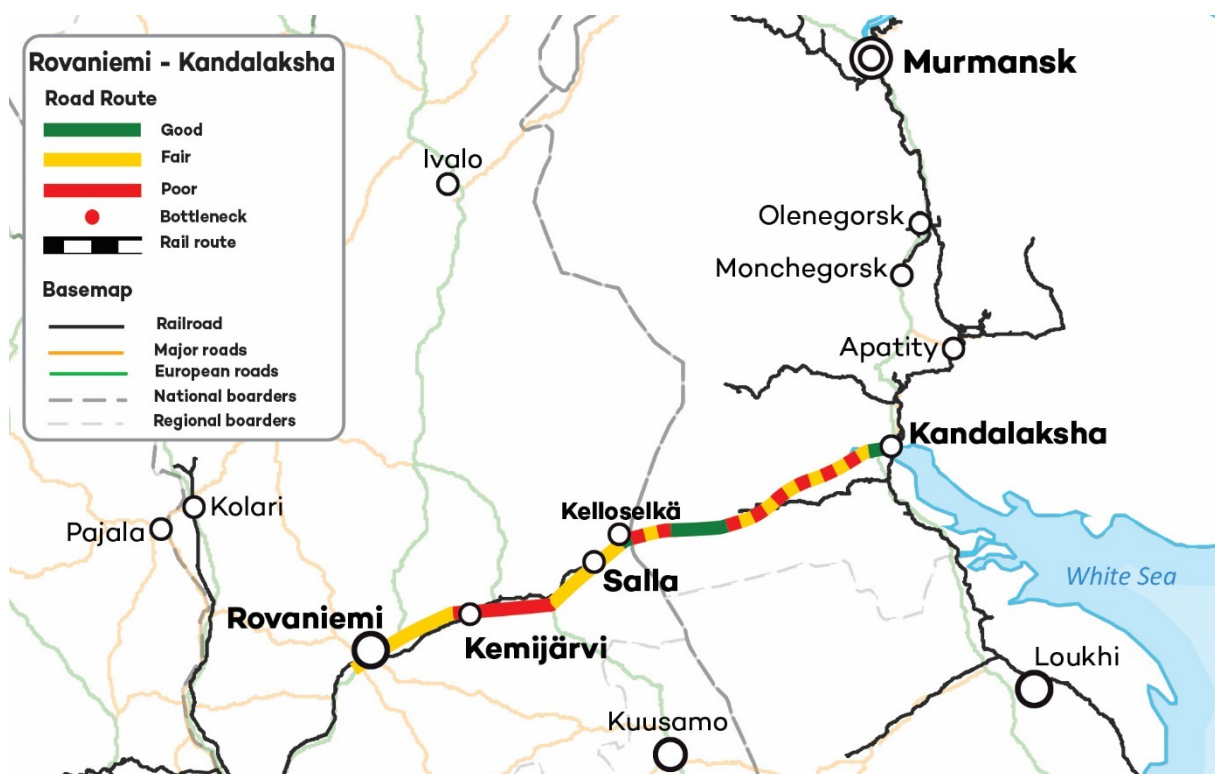


Figure 8.1 Rovaniemi – Salla – Kandalaksha.

Brief facts

Road

Distance Rovaniemi - Kandalaksha: 355 km

Width: 10 m, 6.5 m, 7 m in Russia

Percentage of the road with a width of 8 m or more: 58 percent in Finland: Speed limit: 80 or 100 km/h, 50 to 60 km/h in urban areas and 3-90 km/h on the Russian side

Number of vehicles crossing the border per day: 299 (2014)

Average number of vehicles per day where traffic is at its peak: 21,100 in Rovaniemi, 2,000 in Alakurtti

Railway

In Finland

Distance from Rovaniemi to Kellosoelkä: 82 km

Average number of passenger trains per day: 2 trains between Rovaniemi and Kemijärvi

Average number of cargo trains per day: 3 trains between Rovaniemi and Kemijärvi

No regular trains beyond Kemijärvi.

Electrification as far as Kemijärvi is planned. Single track Gauge - 1,524 mm.

Automatic Train Control

Ports

See chapters 5 and 6.

Airports

Passengers per year

Rovaniemi	>600,000 (2018)
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General information

Population in the cities

Rovaniemi	61,000
Kemijärvi	8,000
Salla	4,000
Alakurtti	3,000
Kandalaksha	31,000

General description

The Route starts in the town of Rovaniemi, passes through Kemijärvi to the municipal center of Salla and to the Russian border-crossing point at Salla. From there, the Route continues via Alakurtti to Kandalaksha.

The Finnish part of the road is included in the proposed TEN-T comprehensive road network. This road is part of the road connection between Bodø and Murmansk, often called the Barents Road.

There is a chinese project to start a new pulp mill in Kemijärvi. This will create a need to improve the roads between Kemijärvi and Rovaniemi as well as other regional road networks.

Infrastructure and standard

Road

The road from Rovaniemi to the Russian border is 173 km long. The road on the Russian side from the Finnish border to Kandalaksha is 166 km. The paved road width varies between 6.5 and 10 m.

The road is somewhat narrow on the Finnish side. On the Russian side, the road is wide enough, but the condition of the pavement on many sections of the road is poor.

In 2014, in Russia the road sections to Kandalaksha were reconstructed and paved with asphalt.

Rails

There is at present a 279 km long railway connection from the Bothnian Corridor to Kellosoelkä, near the Russian Automobile border crossing point at Salla.

The railway is electrified from Kemi to Kemijärvi.

Transports

Road

Average number of vehicles per day reaches 20,000 in Rovaniemi and about 1,000 on the Finnish side close to the border. The average daily number of border-crossing vehicles in 2014 was 293 cars and five trucks or buses. The number of border crossings in 2014 was nearly twice as much as in 2010. The average number of vehicles per day on the Russian side is 440, 30% of which are heavy vehicles.

Railways

There are six daily trains transporting mainly round timber from the terminal in Kemijärvi to the paper mills in Kemi and Oulu. Another six cargo trains transport round timber from the Rovaniemi timber terminal to the same mills.

“One-night” train serves passengers to and from Kemijärvi. The annual number of passengers from Rovaniemi to Kemijärvi is around 30,000.

Key challenges

Roads

- Section Vikajarvi – Kemijärvi is too narrow for the volume of traffic.
- The road standard is poor in some sections between the Finnish border and Alakurtti.

Future potential

Today the use of the Route is limited mainly to tourism and business travel between Russia and Finland. There is quite amount of timber traffic and laminated wood products from the Kemijärvi Keitele saw mill and beam factory.

9 Kemi – Rovaniemi – Kirkenes

The corridor consists of the following:

- **Roads:** E75, National Road 92 and E6
- **Railways:** There are no existing railway although it is an option in the future. There are several options for the route of the new railway. The shortest and cheapest one is to bypass Lake Inari from the south. Kemijärvi can be the starting point of the railway instead of Rovaniemi.

Brief facts

Roads

Length: 702 km

Width: 5.5 m -10 m

Speed limit: 80 or 100 km/h, 50 km/h in some urban areas

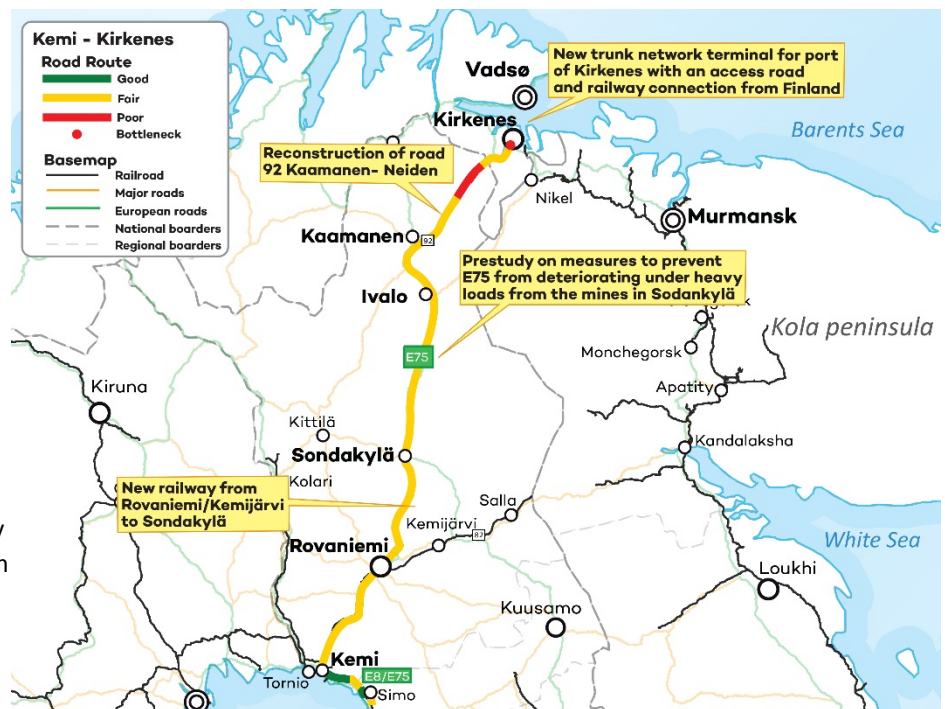
Number of vehicles crossing the border per day: 516 (2017)

Number of heavy vehicles >12,5 meters crossing the border per day at Riksgrensen/Neiden:15

Average number of vehicles per day where traffic is at its peak: 20,000 in Rovaniemi

Ports

See chapters 5 and 6.



Figur 9.1 Kemi – Rovaniemi – Kirkenes.

Airports

Passengers per year

Rovaniemi	600,000
Ivalo	150,000
Kirkenes	315,000

General information

Population of the cities

Rovaniemi	61,000
Sodankylä	9,000
Ivalo (municipality of Inari)	7,000
Kirkenes	10,000

General description

For information on rail see Future potential.

The route is part of the proposed TEN-T comprehensive road network as far north as National Road 971, which is not included in TEN-T.

The road route starts from the Bothnian Corridor in Kemi and runs parallel to the Barents Road to Rovaniemi. From Rovaniemi it runs north as the E75, passes by Rovaniemi Airport and runs through mostly forest-covered countryside to Sodankylä and further to Ivalo and Inari. Those three towns are the only municipal centers and the road runs through all of them. Before Ivalo there is the Saariselkä holiday resort, which during high season has more inhabitants than Ivalo. Between Sakelarides and Ivalo, close to the road is Ivalo Airport, which serves Saariselkä holiday resort and the rest of Northern Lapland. 20 km north of Inari the road route leaves the E75 and becomes National Road 92 to the border crossing in Neiden and from there to the E6 via the town of Kirkenes.

There are two operating mines and several advanced mining projects in Central Lapland north of Sodankylä along the E75. The transports to and from the mines are operated by lorry and are directed mainly to the port of Kemi. A significant amount of timber is transported on the E75 to Rovaniemi, where it is loaded onto trains and transported to paper plants in Kemi and Oulu.

The road route is a lifeline for the northernmost parts of Finland. It is the only road suitable for heavy transports between the municipalities of Utsjoki and Inari and the rest of the country. The lack of railway increases the importance of the road route for all transports between Northern and Central Lapland and the southern parts of Finland. There is also tourist traffic destined for Finnmark including one of the main tourist attraction in Northern Norway, the North Cape Cliff.

The route is part of the transit corridor for goods transport between Southern Norway and Finnmark County.

Infrastructure and standard

The distance from Kemi to the Norwegian border in Neiden is 590 km. The E75 road has an 8 m wide pavement almost all the way from Rovaniemi to Ivalo, but it needs some widening in places. The most urgent need for widening is close to Rovaniemi because of the relatively large number of cars on the road. Between Ivalo and Inari, the E75 is only 7 m wide, and there is a need for widening.

National Road 92 from E75 to Neiden in Norway has only a 5.5 to 6 m wide pavement and therefore must be widened before any significant amount of international transport can use it.

Transports

The highest average number of vehicles per day is near Rovaniemi, with almost 20,000, and the lowest is on National Road 92, with only 250. The number of border crossings has been growing over the last few years. The traffic in Kirkenes is described in chapter 7 Petrozavodsk – Murmansk – Kirkenes. The route is open to module vehicles of 25,25 m and a total weight of 60 tonnes.

Key challenges

In Finland this route is very important for the transport of timber to the forest industry, and for the mines to import the raw materials they need and to export their products. The E75 is of crucial importance to these industries. To keep the transport costs low, the total weight of the cargo must be maximized. There are initiatives for testing 100 tonnes or more on public roads in this route.

The standard of National Road 92 from the E75 to E6 Neiden in Norway is not adequate for cargo transports. The horizontal curvature is particularly poor in many places. The road is also too narrow.

There is a need for reconstructions of E6 between Kirkenes airport and Hesseng.

Planned development

There is an ongoing study which aims to determine the measures needed to prevent the E75 from deteriorating under heavy loads coming from the mines in Sodankylä.

The planning for reconstruction of the National Road 92 from Kamanen in Finland to Neiden on the Norwegian and the Finnish side has just started. The project is financed by the Kolarctic ENI-programme, total approxi. of EUR 5 million.

The planning of a new trunk network terminal for the port of Kirkenes, with an access road and a potential railway connection from Finland, was started in 2018. The planning is expected to be completed in 2019. As of today, there are uncertainties concerning the construction and financing.

In the medium long term, a new railway may be built from Rovaniemi or Kemijärvi up to Sodankylä to serve the new mines in Central Lapland. Both the forest industry and the mines would benefit from the possibility to use train transport in the future. The future railway route from the present railway to the mining area at Sodankylä will be determined in the regional land use plan within the next three years. In the long term, there is an ongoing study of the Arctic railway.

Future potential

In recent years, interest in the Arctic has grown significantly. Economic potential and the opening of new transport routes highlight the strategic importance of the region. In the future, the Arctic Region may become a major energy reserve and transport channel for global trade.

The EU and Finland are currently reliant on road connections to reach the mining areas of central Lapland, the oil and gas fields of Norway and Russia and the western end of the Northern Sea Route. The goal of the Arctic Railway is to develop alternative routes from Asia to the Baltic Sea Region for the goods flows of the future and to improve the competitiveness of mining and other industry by creating new, cost-effective transport possibilities. The Arctic Railway will connect the Baltic Sea Region to the Arctic.

Finnish and Norwegian Ministries of Transport have decided that Arctic Railway route from Rovaniemi to Kirkenes is the most realistic routing for a railway from Europe to Arctic Ocean. A special Task Force group will study this alternative more closely by the end of year 2018.

Much of the freight that will be carried on this railway will be the same ore and minerals that are planned to be transported through the Svappavarra – Pajala – Kolari Route, discussed in chapter 14.

From a Barents point of view, a railway line from Finland to Kirkenes will provide a more complete railway network in the Barents Region. Especially if a connection from Kirkenes to the Russian railway network is constructed.

10 National Route through Northern Norway- Kirkenes- Mosjøen

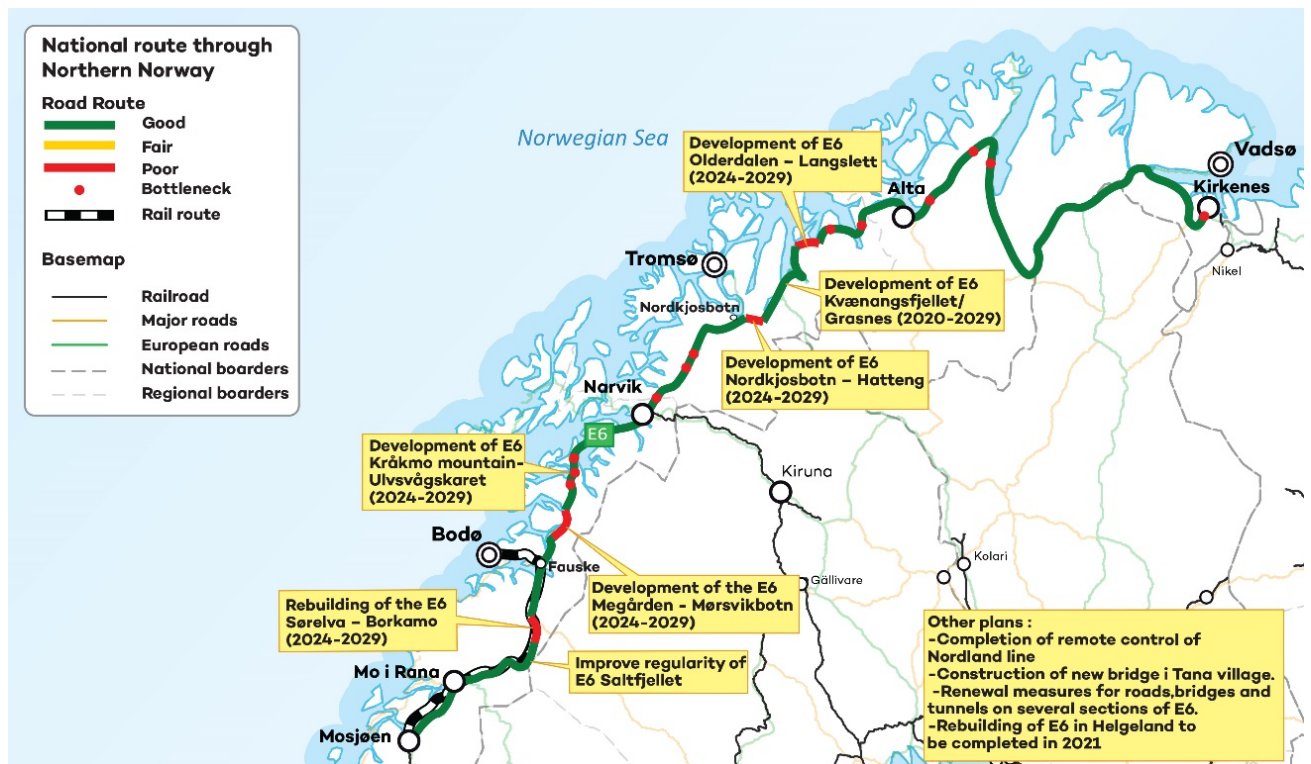


Figure 10.1 National Route through Northern Norway, Kirkenes-Mosjøen.

The route consists of the following road and railways:

- **Roads:** E6
- **Rails:** The Ofoten line, the Nordland line and the Meråker line

Brief facts

Roads

Length:	1,630 km (Nordland, Troms and Finnmark)
Width:	5.6 – 8.5 meters
Speed limit:	Varies between 50 – 90 km/hour
Amount of traffic:	300 – 13,000 vehicles/day

Railways

The Nordland line

Length:	727 km (Trondheim – Bodø)
Propulsion:	Diesel
Number of tracks:	Single track, no CTC, few crossing sections

The Meråker line

Length:	74 km (Hell – Storlien/Riksgrense)
Propulsion:	Diesel
Number of tracks:	Single track

Ports

See chapter 5.

Airports

Number of passengers per year at main airports in the route

Tromsø	2,100,000
Bodø	1,700,000
Evenes	743,000
Alta	368,000
Kirkenes	315,000
Bardufoss	241,000

General description

The route is characterized by long distances and low population density. It is the only national freight haulage route between Northern and Southern Norway and it is very important for regional and local traffic in this part of the country.

The road connections from neighboring countries connect to this national road route, which thus has a distribution effect. Hauliers from the foreign corridors mostly include the E6 in their route to their final destinations.

Parts of the E6 in Helgeland are newly built and open for transport. 6 km shorter distance.

There is a railway in the southern section of the route, the Nordland line, that runs between Trondheim and Bodø. The Nordland line connects to the railway network of Sweden via the Meråker line, which goes in the east-west direction. The Meråker line is about 74 kilometers long and is not electrified. The Meråker line is just south of the Barents Region, but it is included in this route description because of its potential importance for the export of seafood from Nordland.

The Meråker line connects to Mittbanan in Sweden, which is electrified. It is believed that the Meråker line in combination with the Nordland line could constitute an important route to the markets in Central and Southern Sweden and further south to Western Europe.

Transports

Roads

The E6 route has low traffic volumes except for traffic through cities and towns. Long stretches of the route have an average number of vehicles per day of below 1,500 vehicles.

Traffic increases towards the cities of Mosjøen, Mo i Rana, Fauske, Narvik and Alta where the traffic volume rises to over 8,000 vehicles per day. The proportion of heavy vehicles varies. It is the highest on the low traffic sections of the E6, where it is up to 25 percent.

Railways

The railway that runs to Bodø transports both freight and passengers. Total rail freight to and from Bodø amounts to about 350,000 tonnes annually.

Infrastructure standard and Key challenges

Roads

Road width is of great importance for the accessibility of industrial haulage vehicles. Sections where the asphalted surface is less than 6 meters, are prioritized for improvement. The same applies to bottlenecks. Several tunnels and bridges are of such poor quality that they will have to be improved within a few years. Road-strengthening, and surface renewal works will be carried out. The high level of industrial freight imposes rigorous requirements on the road with respect to its traffic regularity. To achieve this, sections that are exposed to avalanches must be secured, and problematic mountain passes must be improved.

Railways

The Nordland line is currently serviced by three pairs of trains daily, each approx. 425 meters long. Freight trains provide the design criteria for the development of the railway. It is an objective to substantially increase the quantity of goods carried by rail by 2030. The railway will be further developed to allow for freight trains of up to 600 meters long. New, longer crossing sections will be built. Completion of remote control of the railway will make the train service more efficient and reduce the vulnerability to knock-on delays on long sections. Assessing electrification, or other energy carriers, from an overall national and environmental perspective will be an important task.

The Meråker line has some major shortcomings today, but it is now prioritized for upgrading by the Norwegian government. Currently, the Meråker line lacks electrification and has low axle load. It is not equipped with automatic train control. The line has too few crossing sections and a steep slope, which necessitates the use of two locomotives.

There is also a lack of triangle-track for efficient transportation of cargo from Northern Norway. All these factors make the Meråker line an unprofitable option for cargo owners. Currently 2-3 passenger trains normally run in each direction. Planning for electrification is in progress.

The Meråker line is interesting from a wider Barents point of view. The Ofoten line connection to Sweden will be utilized almost 100% from now onwards. The Nordland line and Meråker line in combination may therefore be a better routing for seafood in the future.

Planned development

Upgrading is planned for several sections of the E6. The largest ongoing and future projects are:

- Development/rebuilding of the E6 in the area of Helgeland, will be completed in 2021.
- Development/rebuilding of the E6 Sjørelva – Borkamo, 2024-29.
- Development of the E6 from Megården to Mørsvikbotn, 2024-29.
- Development of the stretches south of E6 Kråkmo mountain and Ulsvågskaret, 2024-29.
- Development of the E6 Nordkjosbotn – Hatteng, 2024-29.
- Development of the E6 Olderdalen – Langslett, 2024-29.
- E6 Kvænangsfjellet/Grasnes, 2020-2029
- Construction of a new bridge in the village of Tana, 2019.

Renewal measures for roads, bridges and tunnels are also planned on a number of other sections of the E6.

Completion of remote control on the Nordland line will make the train service more efficient and reduce the vulnerability to knock-on delays on long sections.

Future potential

The route is of great importance for transports between Northern and Southern Norway. An efficient national route will be a key factor for connecting Northern Norway to national and international markets.

11 The Northern Lights Route- Haparanda/Tornio–Tromsø

The route consists of the following roads and railways:

- **Roads:** E8 and National Road 99
- **Railway:** There is no transit railway traffic from Tornio to Tromsø. The Tornio – Kolari line is operating.

Brief facts

Roads

Length

Tornio - Tromsø	620 km (470 km in Finland and 150 km in Norway)
National Road 99, Haparanda - Karesuando	364 km (In Sweden)

Width

Width varies between 6.5 – 8.5 m on the E8 and 6 – 10 m on National Road 99.

Speed limit

In Norway: Mostly 80 – 90 km/h, but down to 60 km/h over shorter distances

In Finland: mostly 100 km/h (80 km/h in winter)

Sweden 80-100 km/h

Traffic

Number of vehicles crossing the border per day: on the E8 about 690 vehicles of which 80 are heavy vehicles >12.5 m.

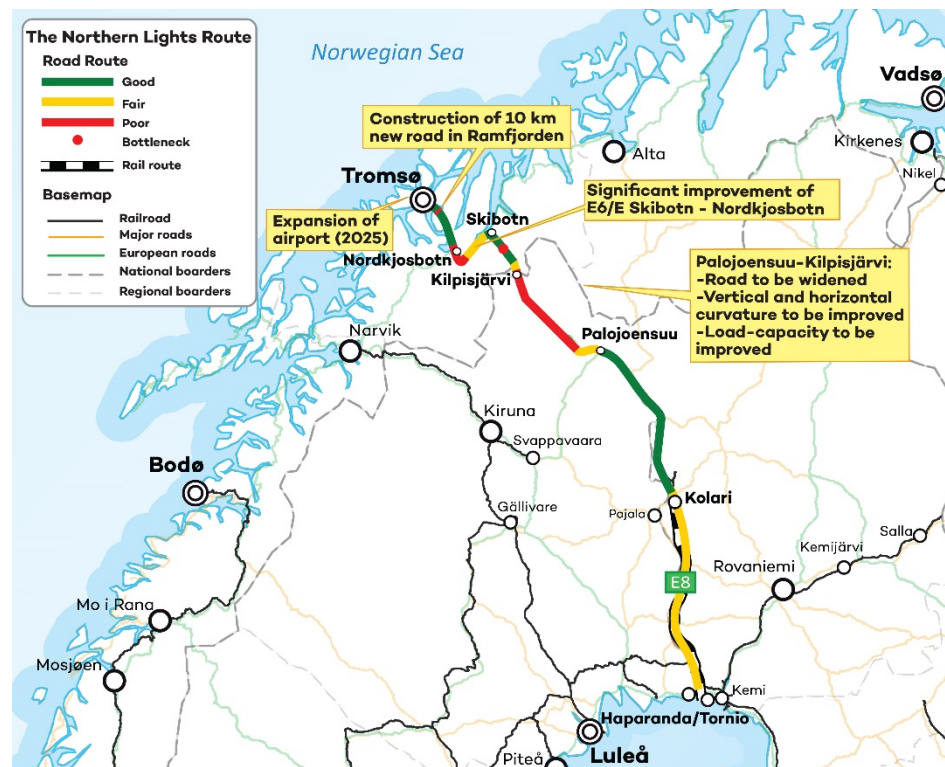


Figure 11.1 The Northern Lights Route- Haparanda/Tornio–Tromsø.

Border- crossing Sweden/Finland National Road 99 in Karesuando: 560

Average number of vehicles per day where traffic is at its peak: 10,000 vehicles close to Tromsø.

Railway

Length Tornio – Kolari: 183 km

Average number of passenger trains per day: three in a tourist season

Average number of cargo trains per day: 2

Non-electrified, Single track, Automatic Train Control

Ports

See chapters 5 and 6.

Airports

Number of passengers per year

Tromsø	2.100.000
Kittilä	350.000

General information

Population in cities

Tromsø	74,000
Tornio	22,000

General description

The Route connects to the Bothnian Corridor at the Gulf of Bothnia on the border between Sweden and Finland. From here, the Route goes north to the Norwegian Sea and the coast of Troms.

Furthest to the south, the Route consists of parallel roads on both sides of the river Torne which forms the border. On the Finnish side this is the E8, while on the Swedish side it is National Road 99. The fact that this Route has six (6) border crossings between Sweden and Finland makes it unique. National Road 99 in Sweden and the E8 in Finland must be viewed as one road which functions as an interconnected unit.

There is extensive cooperation between transport authorities on border crossings. Also, the local cooperation on a community level between the countries is strong and affects the movements and transports across the border.

The E8 runs northwards through the river Torne (Tornedalen) on the Finnish side to Kilpisjärvi. Immediately after Kilpisjärvi, the E8 crosses the border with Norway, and the road runs down to Skibotndalen until it meets the E6 and continues further along the coast to Tromsø.

The roads in the Route generally are insufficiently wide. Upgrading of the E8 in Skibotndalen has been started; parts of this road section were upgraded in 2017. On the Norwegian side the E8 is open for modular vehicle combinations up to 25.25 meters in length and a total weight of up to 60 tonnes.

On the Finnish side, the northern parts of the route are difficult for heavy transports because of the insufficient width and high horizontal and vertical curvature. The section between Palojoensuu and Kolari has been upgraded all the way. Also, some bridges and shorter permafrost areas have been renovated in the Northern part, for example in Kilpisjärvi area. The border crossing and toll station and transport areas have been renovated.

The road is prone to accidents, especially in winter.

There is also a railway in the Route from Tornio on the Finnish side, located close to the Swedish border, up to Kolari. The railway was originally built to meet the needs of mining transport, but currently it is used for the transport of timber and for tourism.

There is an advanced iron-ore mining project in Kolari and this railway will probably be used by the mine when it opens. The mines usually require transports of large and heavy cargo. An optimal route for such cargo is difficult to find because of weak bridges and some bottlenecks in the road network.

There are reasonably large airports at both ends of the Route in Kemi, Tornio and Tromsø. Just outside the Route there are airports both in Kittilä on the Finnish side and Pajala on the Swedish side.

The towns of Tornio/Haparanda and Tromsø lie at the end of the Route. Apart from these, there are no towns in the Route, but there are several villages such as Ylitornio, Pello, Pajala, Kolari, Muonio, Kaaresuvanto and Skibotn.

Kolari serves as an important regional transport hub.

The Norwegian pilot project from Skibotn to Kilpisjärvi has been named "Borealis". Finland has a corresponding project for the next road section from Kilpisjärvi to Kolari, which has been named "Aurora". The three-year agreement on the Finnish-Norwegian cooperation project "Aurora Borealis" was signed in the Finnish town of Muonio in February 2016.

Transports

The E8/National Road 99 is important for both cargo and private transport. The lack of a rail service in the Route gives the roads an added importance. The roads are important both for long-distance transport between several countries and for regional and local transport within the individual countries.

Since there are six border crossings between Sweden and Finland connecting the local communities, there is a lot of local traffic over the border river. The border crossing between Finland and Norway at Kilpisjärvi is open 24/7. E8 is an important export route for goods in/out of Troms County.

All border crossings can be used by vehicles up to 76 tonnes, except the one in Ylitornio. That bridge will be strengthened latest 2021.

From the Norwegian side, seafood products are transported through the Route. These products are destined for the Swedish and Finnish markets, but also more and more often these products are destined for Russia and Southern European countries.

From the Finnish side, timber and other construction materials are transported to Norway.

The Route is important for travelers to and from several main tourist resorts that lie close to the Route on the Finnish side (Levi and Ylläs).

The Route is important for travelers visiting tourist attractions such as the Northern Lights. The Port of Tromsø is a turnaround port for cruise ships.

The Route also has a function as a transit corridor for transports between the counties of Troms and Finnmark and the southern part of Norway. Freight is transported via Finland and Sweden since roads are of better quality and the speed limits are higher than on the domestic north-south corridor in Norway.

Key challenges

The route has no lack of capacity. The main challenge for transport of people and goods is an unacceptable road standard. The deficiencies in road standard are generally as follows: narrow roads, an excessive horizontal and vertical curvature on certain stretches, difficult gradients on some sections and a poor load-bearing capacity on certain stretches.

There are also challenges on a local level in terms of facilitating the smooth movement of both residents and tourists over the six border bridges.

The mountain crossings between the east and west regions can be subject to adverse weather conditions during winter, which again can create problems of accessibility and regularity of traffic. There are few possible alternative roads and significantly longer driving distances will be required.

The airport in Tromsø requires expansion of the terminal to be able to facilitate an increase in air travelers.

Planned development

The E8 has a high priority from the Norwegian side, especially as the road is a national test laboratory for new technology.

- Close to Tromsø on the E8, construction of about 10 km of new road in Ramfjorden is planned.
- Significant modification/improvement of the E6/E8 at the southernmost part of the stretch between Skibotn – Nordkjosbotn is expected during the same period. This will provide considerable improvement in accessibility and reduced travel time.

Planned Finnish measures are mainly focused on the northernmost section between Palojoensuu and Kilpisjärvi. The road should be widened and both vertical and horizontal curvature improved. In many places the load-bearing capacity should also be improved. The costs are estimated to be EUR 50 million, but no decision has been made concerning the financing.

There are plans to expand the airport terminal in Tromsø, starting in about six years.

Future potential

During the past five years there has been an increase in the number of heavy goods vehicles crossing the borders. Nothing indicates that this growth will diminish in future years. It is expected that transport for the seafood industry will increase significantly in the next 30 years. Tourism is an important industry both in Northern Finland and Northern Norway. Preparations are being made for greater collaboration between tourist organizations in all three countries, which will lead to the growth of traffic in the Route.

Strategic discussions between the road authorities in Sweden and Finland about the role of National Road 99 and the E8 must take place, since there are two parallel roads in the southern part of the Route, which are connected to six border bridges.

There is one major mine in the Route in Kaunisvaara, Sweden and an advanced iron ore mining project in Kolari, Finland. Several other mining projects are expected to start during the next decade. The mining industry will create additional transports in the Route, both on the railway and on the roads.

In the long term, a new railway along this Route may also be put on the agenda, but currently there is no rationale for a railway.

Through the research and development project of Borealis, the 40-km-long road along the E8 in Skibotndalen to a national test laboratory for new technology. Here, the Norwegian Public Roads Administration is testing and developing Intelligent Transport Systems (ITS).

12 Palojoensuu – Alta

The route consists of the following roads:

- **Road:** E45

Brief facts

Roads

Length

235 km (63 km in Finland and 172 km in Norway)

Width

Width varies between 5.5 – 8.5 m.

Speed limit

In Norway, mostly 80 – 90 km/h but down to 60 km/h over shorter distances
In Finland mostly 100 km/h (80 km/h in winter)

Traffic

Number of vehicles crossing the border per day: 422 (2017)

Number of heavy vehicles >12,5 meters crossing the border per day at Riksgrensen/ Kivilompolo:70

Average number of vehicles per day where traffic is at its peak: 3600

Ports

See chapter 5.

Airports

Number of passengers per year

Alta Airport	368,000
Kittilä Airport	350,000

General information

Population of the cities

Alta	20,000
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General description

The Route connects to “The Northern Lights Route” (chapter 11) in Palojoensuu and goes north to Alta where it connects to the E6.

The Route is important for both cargo and private transport. The lack of a rail service in the Route gives the road an added importance. The road is important both for long-distance transport between several countries and for regional and local transport within the individual countries.

After the port of Hammerfest has received status as a port in the TEN-T Comprehensive Network, the corridor would be extended all the way to Hammerfest. This means that the roads E6 Alta-Skaidi and Rv94 Skaidi-Hammerfest, as well as Hammerfest airport, will be included as a new transport network in the corridor.

In the review of NTP 2022-2033, upgrading between Alta and Hammerfest is being considered.



Figure 12.1 Palojoensuu – Alta

Transports

Average daily traffic in the Route is less than 500 vehicles with the exception of the section close to the city of Alta where traffic increases. The border-crossing at Kivilompolo is the most important crossing point for transport in/out of Finnmark county. It is open 24/7.

The E45 in Norway is not open to modular vehicle combinations of 25.25 m and a total weight of 60 tonnes.

Goods transports on the E45 out of Finnmark comprise fresh fish and other seafood products, general cargo and waste. Fish and seafood transports are carried through Finland and Sweden to Alnabru/Oslo or directly to Europe. Transports into Finnmark consist of consumer goods and foodstuffs as well as general cargo and input goods for business and industry. Wood and building materials are important products that are imported from Sweden or Finland.

Key challenges

The challenges of the Route have nothing to do with the lack of capacity. The main challenge is an unacceptable road standard. The deficiencies in road standard are as follows: narrow roads, an excessive horizontal and vertical curvature on certain stretches, difficult gradients on some sections and a poor load-bearing capacity on certain stretches. The Norwegian part of the route has fair standards except for an approximately 15 km section from the canyon of Kløfta to Suolovuopmi which is classified as a bottleneck. There are few possible detours if the roads are to be closed due to weather conditions, accidents or vehicle breakdowns, especially in the northern part of the Route. It is important for transit transport that the E45 can be used by modular vehicle combinations of up to 25,25 meters and a total weight of up to 60 tonnes on the Norwegian side. In Sweden and Finland, the E45 can be used by modular vehicles.

On the Finnish side there is one bridge on the E45 that constitutes a bottleneck for the use of 76 tonne trucks. The Finnish E45 is not wide enough to accept an increase in transports.

The border crossing and toll station and transport areas are being renovated (ongoing).

Planned development

In the period 2024-2029 there are plans to remove the bottleneck close to Kløfta. The bottleneck bridge on the Finnish side will be replaced by a new bridge.

Other measures to improve the road standard must be planned simultaneously.

Future potential

During the past five years there has been an increase in the number of heavy goods vehicles crossing the border in this Route. Nothing indicates that this growth will diminish in future years. On the contrary, it is expected that transport for the seafood industry will increase significantly in the next 30 years and the increased activity in the petroleum industry in the Barents Sea can be expected to increase the volume of goods transported along the Route. Tourism is an important industry both in Northern Finland and Northern Norway. Continuing the E45 numbering up to the E6 in Alta would be logical.

13 The Blue Road – Vaasa – Umeå – Mo i Rana

The route consists of roads and railways:

- **Roads:** E12
- **Rails:** There is no transit railway traffic from Umeå to Mo i Rana. The Hällnäs – Storuman line is operating.



Figure 13.1 The Blue Road – Vaasa – Umeå – Mo i Rana

Brief facts

Roads

Length

Total length Umeå - Mo i Rana: 492 km, of which 452 km in Sweden (National border–Umeå/Holmsund) and 40 km in Norway (Mo i Rana – National border)

Width

6–14 meters (Sweden), 7.5 – 8.5 meters (Norway)

Percentage of the road with a width of 8 m or more:

Speed limit

90-100 km/h (Sweden), 50-80 km/h (Norway)

Traffic

Number of vehicles crossing the border per day: Sweden/Norway: 815 (2017), Sweden/Finland: Ferry traffic

Number of heavy vehicles >12,5 meters crossing the border per day at Riksgränsen/Umbukta:30

Average number of vehicles per day where traffic is at its peak: 10,000 Umeå, 7,500 Mo i Rana

Railway

Sweden (Storuman – Hällnäs line)

Length

Sweden: 167 km Storuman-Hällnäs, 47 km Vännäs-Holmsund

Traffic

Average number of passenger trains per day: 8

Average number of cargo trains per day: 6

Railway standard

Maximum permitted axle load	22.5 tonnes
Gauge	Sweden: 1435 mm
Maximum speed	90 km/h
Signaling system	System M, ATC
Electrified/Non-electrified	Non-electrified
Single or double track	Single track

Ports

See chapters 5 and 6

Airports

Number of passengers per year

Mo i Rana	114,000
Umeå	1,000,000

General information

Population of the cities (municipalities)

Mo i Rana	26,000
Umeå	125,000

General description

This Route consists of both road and railway (separate sections). It begins in Mo i Rana, Norway, traverses Sweden via Umeå and ends in Vasa, Finland, with a ferry link between Sweden and Finland.

“The Blue Road” is sometimes described as going through Finland and all the way to Karelia. The eastern part is, however, mainly a tourist route. The importance of the eastern part is considered negligible for it to be included in this description.

The E12 road is included in the TEN-T comprehensive networks and is about 910 km long. The section within Finland is Finnish National Road 3. The road follows this route: Mo i Rana (Norway) – Storuman (Sweden) – Lycksele (Sweden) – Umeå/Holmsund (Sweden) – (ferry) – Vaasa, (Finland) – Tampere (Finland) – Hämeenlinna (Finland) – Helsinki.

On a local and regional level, the E12 acts as an artery for passenger/freight transport to larger industries, workplaces, and municipal and regional centers.

The ferry line has one departure per day. It risks being withdrawn because a commercial company operates it, and it is unprofitable due to the low passenger number.

There is no government support, since this is only available for domestic connections. It is a principle, especially in Sweden, that international travel should not be supported by taxpayers. However, the city of Vaasa supports the ferry route.

There is a 260 km railway line between Storuman and Hällnäs. In Hällnäs, it connects to the main railway through upper Sweden and continues to the port of Umeå. The missing rail link between Storuman and Helgeland (Norway) is approx. 280 km.

Infrastructure and standard

Roads

E12

The E12 has fair standards, but there are some sections with steep slopes, which combined with the narrowness of the road make it difficult for heavy vehicles to pass and to get up the hills. This becomes a bottleneck also for other traffic. There are some problems concerning regularity across the mountains in wintertime on the Norwegian side.

Rails

The line between Storuman and Hällnäs is of a low standard, but it is proposed to be upgraded in the years to come in the proposal for a new national transport plan 2014-2025. One section, Lycksele-Hällnäs, has recently been upgraded, which made it possible to increase the speed up to 90 km/h.

Transports

The main volume of transport in the Route consists of goods from Norway to Sweden and Europe. The freight consists largely of fish and steel reinforcement bars. There is a small proportion of industrial items from Sweden to Norway.

The road has a traffic volume of approximately 620 vehicles per day at the border between Norway and Sweden, of which 10 percent are heavy vehicles. Modular vehicle combinations of up to 25.25 m and a total weight of up to 60 tonnes are permitted. Heavy vehicles >12.5 meters are 30 per day and the number has been stable the last five years.

The route is very important for the tourist industry. There are no scheduled flights between the towns along this route.

Key challenges

The traffic volumes vary considerably between different sections of the road. The traffic is the heaviest towards the cities of Mo i Rana, Umeå, Vaasa and Helsinki. The lightest traffic is at the border crossing between Norway and Sweden. The capacity of the road is generally sufficient, but the geometrical standard varies considerably. The current traffic safety situation is acceptable.

Planned development

A bypass in Umeå to decrease traffic within the city where E4 connects with E12 is under construction.

Spot improvement projects are planned on the Norwegian part of the E12.

A new airport at Mo i Rana is being planned that will be able to serve larger aircraft (Boeing 737), along with a new access road to the airport. The project is expected to start up towards the end of the period 2018-23, with completion within the period 2024-29.

For the period 2024-29 there are plans to deepen the seaward approach to the port of Mo i Rana, as well as the area in front of the trunk network terminal of Toraneskaia. The port terminal will then be able to serve larger vessels and develop an efficient terminal with access to large business areas.

Future potential

It is expected that transport for the seafood industry will increase significantly in the next 30 years. Tourism is an important industry both in Northern Sweden and Northern Norway and it is expected that tourist industry will expand.

If in the future ore transport is established from mines in Rönnbäcken in Sweden to the port of Mo i Rana, it may be relevant to widen the road to 8.5 metres and strengthen it to allow a total weight of 74 tonnes.

14 The Silver Road- Skellefteå – Bodø

The corridor consists of the following roads and railways:

- **Roads:** National Road 95, National Road 77, E6 and National Road 80
- **Railways:** No direct railway connection from Skellefteå to Bodø. The Bastuträsk – Skelleftehamn line, The Jörn – Arvidsjaur line, and The Nordland line Saltdal - Fauske – Bodø are operating.

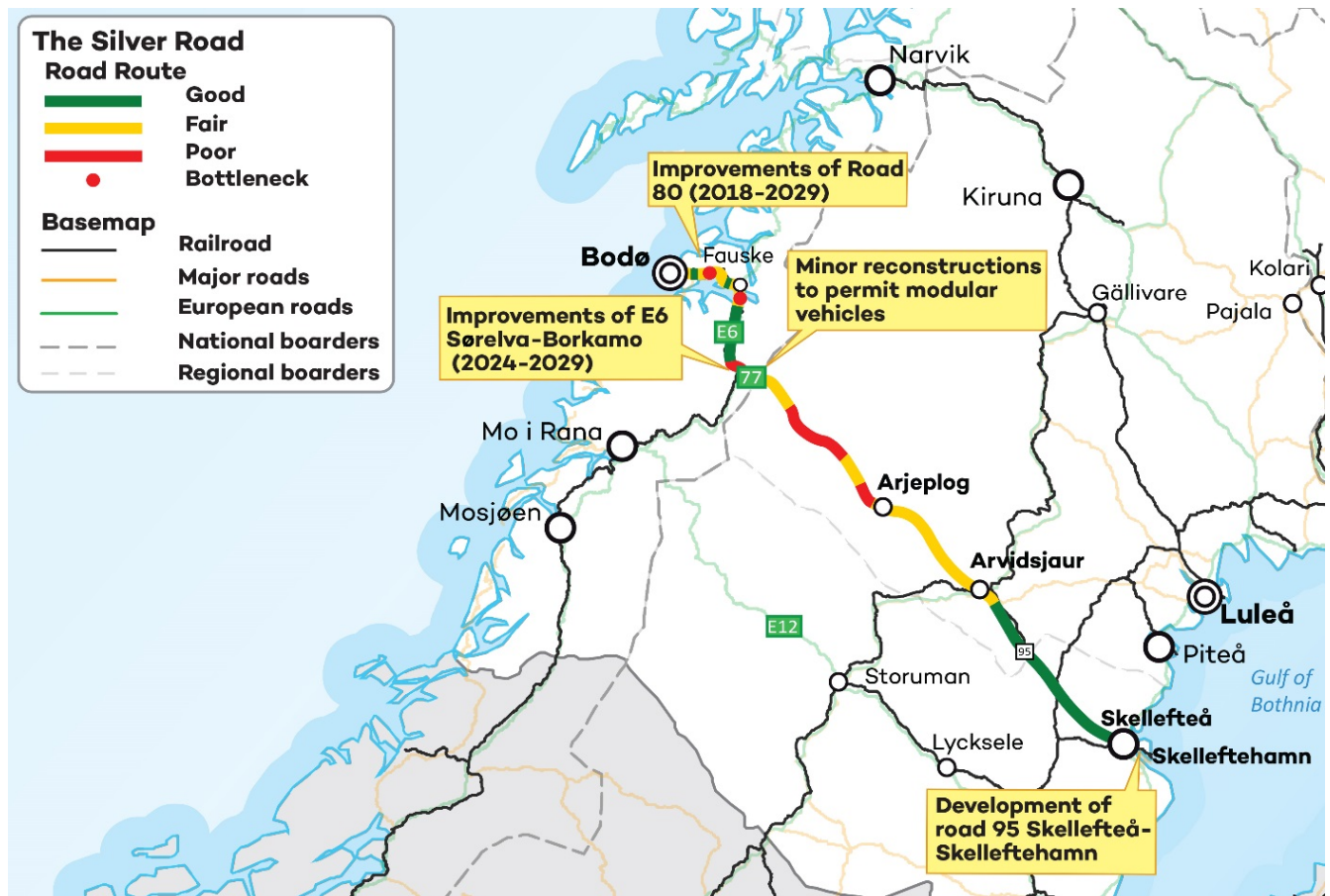


Figure 14.1 The Silver Road- Skellefteå – Bodø.

Brief facts

Roads

Total length: 379 km

Sweden: Skellefteå (E4) – Swedish/Norwegian border, National Road 95

Length: 355 km

Width: 6-9 meters, narrowest section near the border.

Speed limit: 90-100 km/h

Number of vehicles crossing the border per day: 220, 40 heavy vehicles

Average number of vehicles per day where traffic is at its peak:

Skellefteå	6,700
Arvidsjaur	6,400
Arjeplog	3,500

Swedish-Norwegian border – E6, National Road 77

Length: National Road 77: 23 km (140 km Swedish/Norwegian border – Bodø)

Width: 6.5-7.5 m

Speed limit: 80-90 km/h

Number of vehicles crossing the border per day: 422 (2017).

Number of heavy vehicles >12.5 meters crossing the border per day at Riksgrensen/Graddis:30

Average number of vehicles per day where traffic is at its peak:

Bodø	31,000
Fauske	10,000

Railways

Bastuträsk-Skelleftehamn	66 km electrified
Jörn – Arvidsjaur	75 km not electrified, no maintenance or traffic today Average number of passenger or cargo trains per day: 0

Partly electrified, Single track

Ports

See chapters 5 and 6

Airports

Number of passengers per year

Skellefteå	225,000
Bodø	1,700,000

General information

Population (municipalities)

Skellefteå	72,000
Arvidsjaur	6,000
Arjeplog	3,000
Rognan	3,000
Fauske	10,000
Bodø	50,000

General description

This route consists of both road and railway (short sections in the Swedish coastal area). It starts in Bodø and ends in Skellefteå, passing Arjeplog and Arvidsjaur municipalities. It is an important east-west link between the Atlantic coast and the Bay of Bothnia, and also has an important role for the communities along the road. There is little cross-border traffic today, but there is a substantial potential for increase in export/import when the tunnel through the Tjernfjellet mountain is built in 2019. The current standard is quite uniform.

There are two short railway stretches on the Swedish side. They are of minor importance and will not be described further in this document. On the Norwegian side the Nordland line runs next to the E6. The Nordland line is the Norwegian national railway North - South. Cargo for export on the Nordland line crosses the border in Southern Norway. In the future there is also a potential for a border crossing in Central Norway if the railway here (the Meråker line) is upgraded. Such upgrading is already planned. See chapter 10 for more information on the Nordland line and the Meråker line.

Infrastructure and standard

Road

National Road 95

The road has a low geometrical standard and is narrow in some sections.

National Road 77

In terms of geometry, the alignment of the road is very poor, especially the section (Tjernfjellet) close to the E6. The gradient is very steep, which is combined with sharp horizontal and vertical curves. In winter, heavy vehicles face severe problems. In bad weather, drifting snow may be a problem.

Transports

The traffic volumes between different sections of the road vary considerably. The traffic volume is the highest towards the towns of Bodø, Skellefteå and Arvidsjaur. The lightest traffic is at the border crossing between Norway and Sweden.

It is important for commuting between Arvidsjaur and Arjeplog and between Boliden and Skellefteå. The capacity of the road is generally sufficient, but the geometrical standard varies considerably.

Key challenges

- To obtain a satisfactory geometrical standard
- Measures to reduce the effect of drifting snow in bad winter weather conditions
- In Norway the route is not open to modular vehicle combinations of up to 25,25 m and a total weight of up to 60 tonnes.

Planned development

- It is planned to develop National Road 95 the road between Skellefteå and Skelleftehamn.
- National Road 77: The construction of the tunnel through Tjernfjellet will be completed in 2019. This will greatly improve the geometrical standard. The length of the road will be reduced by 0.8 km.
- E6: The Norwegian Transport Plan suggests the improvement of the E6 section down the northern slope of Saltfjellet between Sjørelva and Borkamo in 2024-2029. The cost is estimated at EUR 100 million.
- National Road 80: The Norwegian Transport Plan²⁵ provides for the funds to the amount EUR 140 million to improve National Road 80 in 2018-2029, incl. the project Sandvika-Sagleva.
- Minor reconstructions to permit modular vehicles.

Future potential

There is little cross-border traffic today, but there is a potential for increase, especially for freight services, when the tunnel through Tjernfjellet is completed. This applies in particular to transport of fish from Norway to Sweden and Europe.

The building of a new airport gives the city of Bodø 360 acres for new Smart-City development, based on new technology and sustainability. This represents a unique opportunity to establish a laboratory for trying out solutions for the cities of the future.

²⁵ Including the “Bypakke Bodø” project with several sources of financing.

15 Murmansk – Raja–Jooseppi – Ivalo

The corridor consists of the following roads:

- Russia: Regional road «Kola»- Verkhnetulomsky –Lotta automobile border crossing point
- Finland: National Road 91



Figure 15.1 Murmansk – Raja – Jooseppi – Ivalo.

Brief facts

Roads

Length

Total length: 300 km (4h 45 min), of which 53 km in Finland and 247 km in Russia

Width

Width (max-min): 7 m in Finland, 11–12 m in Russia

Percentage of the road with a width of 8 m or more:

Speed limit

Speed limit (max-min): 100–50 km/h in urban area of Ivalo and 60–110 km/h (Russia)

Traffic

Number of vehicles crossing the border per day: 124 (2014)

Average number of vehicles per day where traffic is at its peak:

Ivalo	2,600
Murmansk	6,100

Ports

See chapter 5

Airports

Number of passengers per year at main airports:

Ivalo	230,000
Murmansk	751,000 (2015)

General information

Population of the cities

Ivalo	7,000
Murmansk	295, 000

General description

This road route consists of National Road 91 starting from the E75 in Ivalo and ending at the international border- crossing point of Raja-Jooseppi on the Russian border and then continuing to Murmansk.

Infrastructure and standard

The road on the Finnish side is 53 km long and on the Russian side 232 km long. The pavement is 7 m wide on the Finnish side and 11 m on the Russian side. On the Russian side there are some dangerous curves.

Separate road sections on the Russian side were reconstructed in 2013. Currently, no defects have been found on the road sections reconstructed in 2013.

In 2014, some road sections were re-constructed, and the full length of the road surface was paved.

Transports

The average daily number of border-crossing vehicles in 2012 was 153 cars and 7 trucks or buses. The number of border crossings has been growing over the last few years. The Finnish section of the road is used solely to reach the border.

The average number of vehicles per day on the Russian side is 530, 25 percent of which are heavy vehicles.

Key challenges

The road standard in the Russian part of the Route, especially the surface of the pavement, is inadequate in many places.

Planned development

There are no plans for road investments in Finland. The border-crossing facilities at Raja-Jooseppi are planned to be upgraded within the next few years. The border crossing and toll station and transport areas are being renovated within EU project (planning ongoing).

Future potential

Three other roads connecting the Murmansk Region with the neighboring countries - one from Norway (E105) and two from Finland through the Salla and Lotta border crossing points.

The regional population seem to appreciate the advantage of having several border-crossing opportunities and this connection will stay important in the future.

16 Svappavaara – Pajala – Kolari

The corridor consists of the following.

- **Roads:** E10, E45, 395, 99
- **Railways:** No existing railway but an option in the future.

Brief facts

Roads

Total length: 160 km

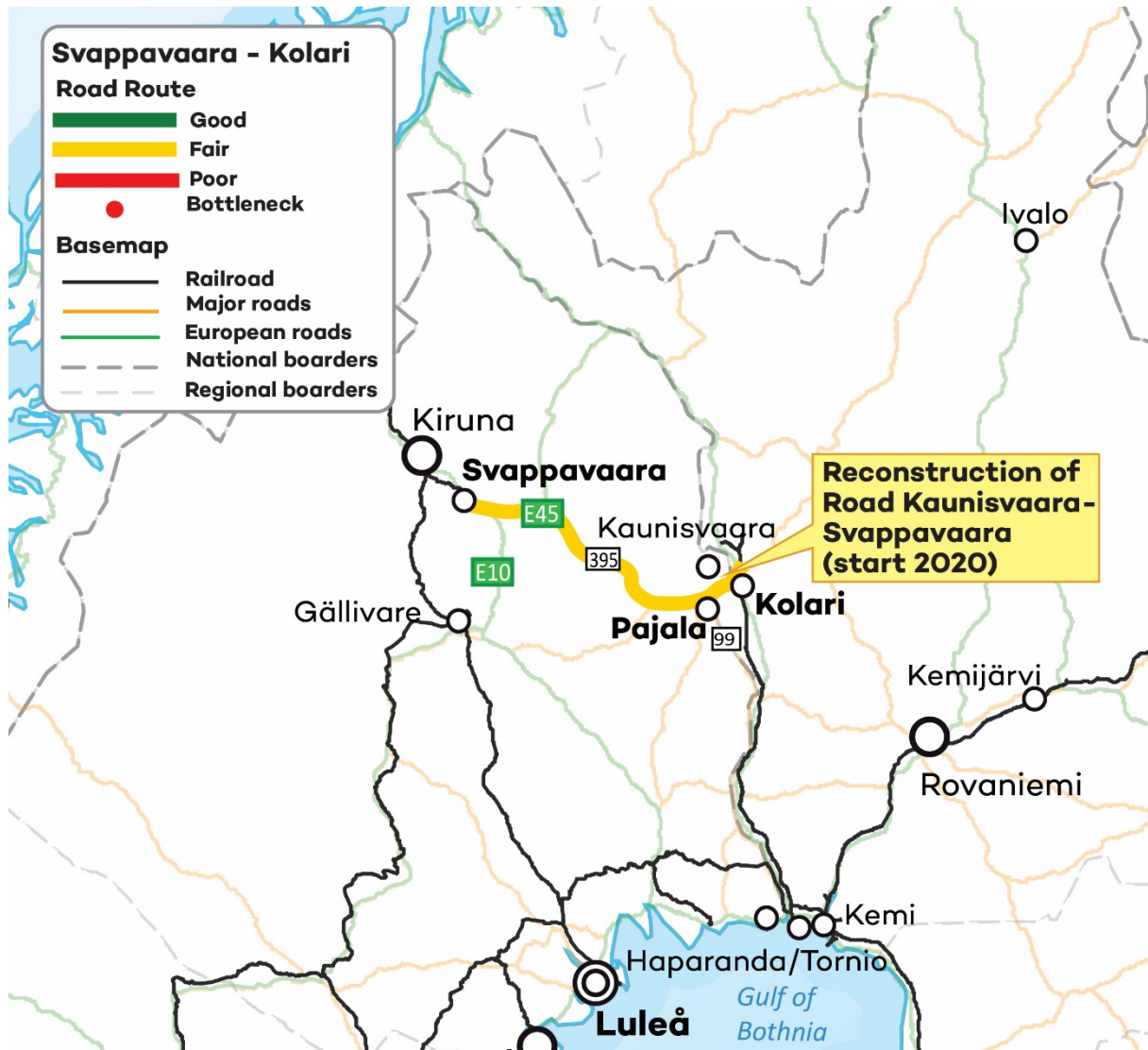


Figure 16.1 Svappavaara – Pajala – Kolari.

General description

An iron ore mine is re-opened 2018 in Kaunisvaara, Pajala, Sweden near the Finnish border. The plan is today to transport 2 million tonnes annually. In future up to 4 million tonnes annually.

Transportation is carried out on public roads in 90-tonnes trucks at a distance of about 160 km. In Svappavaara the ore is reloaded into cars for further transportation by the Ore Line (Malmbanan)/Ofoten line to Narvik.

In the coming years, with start 2020, the road between Kaunisvaara and Svappavaara is planned to be reconstructed in order to meet the mining industry's needs for a reliable infrastructure. At present, the remaining approximately 55 km reconstruction is planned and with that the whole corridor is upgraded.

There are also iron ore mine deposits on Finnish side that are a part of the same iron ore mine field stretching from Kiruna into Finland. The current knowledge indicates considerable mineral resource potential of the territory between Svappavaara and Kaunisvaara and further to the north of Finland.

Alternatively, in the future, a new railway could link the Svappavaara-Pajala area in Sweden and Kolari in Finland to go further to the north of Finland, where several mining companies are located. It can also be connected to the Tornio-Kolari line. The length of the section in Sweden is 110 km. Svappavaara is the terminal of one of the branches of the Swedish Ore line (Malmbanan).

The need to construct a new railway line will depend on several factors, including the expansion of future mining operations in the Pajala/Kolari - Sodankylä - Savukoski belt, and the choice of the place of shipment of ore and minerals from the region.

Another important aspect that requires attention in connection with the creation of a new railway line, is the choice of gauge for different railway sections, as well as the choice of location for a transshipment hub.

Planned development

Latest in year 2020 the construction of the remaining sections (55 km) on the road will be started.

17 Kajaani – Petrozavodsk

The Kajaani - Petrozavodsk Route is included into the Joint Barents Transport Plan on the initiative of the Finnish party on the basis of the proposal of the document “Cross-Border Traffic Corridors”, discussed at the High-Level BEATA Meeting held in Rovaniemi in 2015.

The corridor consists of the following.

Roads: Russia: National Road A-121 “Sortavala” Saint-Petersburg - Sortavala - road R-21 “Kola”, a section of National Road R-21 “«Kola»”.

Finland:

Railways: The Russian section of the railway from Petrozavodsk to Värttilä is part of the Oktyabrskaya Railway (October Railway) infrastructure - a branch of the Russian Railways, JSC.

Finland: The Finnish section of the connection is operated by VR, Finnish state-owned railway company. Freight traffic on the track can be handled by all operators.



Figure 17.1 Kajaani – Petrozavodsk.

Brief facts

Roads

Length

Total length: 559 km, of which 272 in Finland and 287 km in Russia.

Width

Width: 8-10 m in Finland, 6-15 m in Russia

Speed limit

Speed limit: 50-100 km/h in Finland, 40-90 km/h in Russia

Traffic

Number of vehicles crossing the border per day: 2,580

Average number of vehicles per day where traffic is at its peak:

20 000 Joensuu and 2 600 at the border, 10 240 on the approach road to Petrozavodsk

Railway

Petrozavodsk - Värtsilä line

Passes the stations: Tomitsy, Suojärvi Yanisyarvi, Matkaselkä.

Length: 283 km

Single track

Not electrified

Mainly freight traffic

Railway Värtsilä-Joensuu-Kontiomäki

The rail section Kontiomäki – Niirala (border)

- The freight transport volumes of the rail section Kontiomäki–Joensuu were 0.16–1.06 million tonnes and Joensuu–Niirala 0.94–2.32 million tonnes in 2014
- The passenger traffic volumes of the rail section Nurmes–Joensuu were 35 000 and Joensuu–Säkäniemi 380 000 in 2015. There are not any passenger traffic in the rail sections Kontiomäki–Nurmes and Säkäniemi–Niirala
- In 2015 Stora Enso Oyj transported pulp with 5 container trains from Uimaniemi plant to China.

In Finland

- The rail section of Joensuu–Säkäniemi is electrified and equipped with the section blocking system, the centralized traffic control system and the ATP.
- The rail sections of Kontiomäki–Joensuu and Säkäniemi–Niirala are not electrified, while the latter section has the centralized traffic control system and the ATP. The rail section Nurmes–Joensuu has the ATP.
- The allowed axle load is 225 kN, while the speed limit varies between 50–100 km/h for freight trains and 60–140 km/h for passenger trains
- Some sections between Kontiomäki–Joensuu have been renovated in 2014, but in some sections the superstructure needs renovation .
- The rail section Joensuu–Niirala meets the requirements of the current traffic, but the Joensuu rail yard is technically outdated.

Airports

Petrozavodsk Airport

Petrozavodsk Airport has one runway with a length of 2 500 meters. In 2016-2020 the construction of the airport complex has a capacity of at least 300 passengers per hour.

A regional civil airport is located in Petrozavodsk, where flights to Moscow and St. Petersburg can be committed. International Airport Petrozavodsk is a part of the national airfield-airport network of the Russian

Federation. In 2019, there are flights from Petrozavodsk Airport to Moscow, Arkhangelsk, Cherepovets, Simferopol, Sochi, and Anapa.

Joensuu Airport

Joensuu Airport has one runway with a length of 2 500 meters. Current construction of the airport complex has a capacity of at least 200 passengers per hour.

Joensuu airport is located about 11 km from city center of Joensuu. In 2019 there are several daily connections to Helsinki. Joensuu airport is also utilized by many business and tourist charter flights. Joensuu airport is own by Finavia and it is a part of the national airfield-airport network in Finland. Finavia operates 21 airports in Finland.

Kajaani Airport

Kajaani Airport has one runway with a length of 2499 meters. Current construction of the airport complex has a capacity of at least 200 passengers per hour.

Kajaani airport is located about 9 km from city center of Kajaani. In 2019 there are several daily connections to Helsinki. Kajaani airport is also utilized by many business and tourist charter flights. Kajaani airport is own by Finavia and it is a part of the national airfield-airport network in Finland. Finavia operates 21 airports in Finland.

General information

Population of the cities

Joensuu	76 577
Kajaani	36 978
Petrozavodsk	279 000

18 Routes in the Air: East-West flight services in the Barents Region

Introduction

Distances between the cities in the Barents Region are long. Air transport has therefore an important role to play in passenger transport within the Region. However, due to economic reasons, the air traffic system has a strong north-south structure in all countries. As the map below shows, air passengers between the northern parts of Norway, Sweden, Finland and Russia normally take a route through two capitals in the south to reach their destinations in the north. This means two-stop connection flights and long travel times.



Figure 18.1 Routes in the Air: East-West flight services is missing in the Barents Region.

Better east-west flight connections in the Barents Region could substantially improve the communications for passengers between the main agglomerations in the Region. This could contribute to a positive development for trade and industry, and support tourism and cultural exchange in the whole Region.

There have been attempts to improve the east-west flight connections, but these attempts and previous studies²⁶ on air transport in the Barents Region have shown that there are a number of challenges connected with air transport in the Region. Low population density and low demand for cross-border flights have resulted in low air-traffic flows. This has caused both financial and operational challenges for the airline companies which have been forced to reduce their air services. On the other hand, the lack of choice of air services has a negative influence on the number of passengers, thus creating a negative spiral.

There are other barriers hampering the development of Barents cross-border aviation²⁷. A kind of Public Service Obligation (PSO) may be necessary to incentivize new flight services which are not initially profitable.

²⁶ STBR (Sustainable Transport in the Barents Region) 2003-2007 aviation project, Inregia AB and WSP Civils (Sweden), TØI (Norway), LT Consultants (Finland), and RDIRDT (Russia)

²⁷ Source: STBR publications 10/2005: Barents Regional Aviation

The use of such PSOs is governed by EU-regulation 1008/2008²⁸. This regulation needs to be further analyzed regarding possibilities for cross-border flights both between the EU/EEA countries and between them and Russia.

Russia and the Nordic countries do not always have the same approach to international technical standards for safety, security, environmental performance etc. An example of this is the problem of de-icing procedures for the former Kirkenes - Murmansk route. Finally, international flights to and from Russia are regulated by bilateral agreements. If new agreements are needed, the negotiation could take time. However, the existing bilateral agreements, signed in 1956, are currently under re-negotiation between Norway and Russia, and Sweden and Russia.

In 2013 Avinor AS, the Norwegian National Airport Company, initiated a re-evaluation of cross-border flights within the Barents Region²⁹. The study shows that overall the socio-economic development in the Barents Region has been positive, but there are still large disparities between the Nordic countries and Russia, especially in terms of disposable income. The positive socio-economic development indicates that there can be an increased demand for cross-border flights. Interviews with major players in the Region may shed more light on potential demand and factors influencing the demand. On a general basis, the most important factors determining demand for air transport are ticket price, frequency of departures, total travel time and connections to/from the airport.

Based on the previous studies and on recent developments, the studies were focused on both cross-border air routes between the Nordic countries and Russia, and routes to connect the Atlantic Coast with the Northern Gulf of Bothnia.

Air services connecting Russia with the Nordic countries

The following routes have been investigated:

- Arkhangelsk – Murmansk – Tromsø
- Murmansk – Kirkenes
- Murmansk/Arkhangelsk – the Northern Gulf of Bothnia

Arkhangelsk – Murmansk – Tromsø

One of the most promising airlines is Tromsø - Murmansk - Arkhangelsk. Starting from 2014, the designated carrier is the Pskovavia airline.

This route was operated from 1996, but from October 2014 the flights were cancelled due to their poor profitability and low passenger traffic. From 2012 to 2014, more than 11 thousand people were transported along the route Tromsø - Murmansk and back.

The Russian Federation is considering the possibility to subsidize a part of the route.

The flight frequency before 2009 was three times a week, but since 2009 there have only been two flights a week. The reduction in frequency has reduced the load factor to slightly above 50%. The study concludes that frequency should be at least three times a week to improve performance of the route. Utilization of modern aircraft could further improve performance. Another conclusion is that connections between Murmansk/Arkhangelsk and the cities of Bodø, Alta, Harstad and Narvik via Tromsø can be improved through combinability of air fares between existing flights. The possibility for interline agreements and transfer fares depends on the policies of the airlines involved. If the demand for connection flights to/from Bodø proves sufficient, the next step may be to consider a direct flight from Bodø.

Murmansk – Kirkenes

This route was operated by Widerøe for about a year in 2007/2008. Few passengers and problems with different EU and Russian standards for de-icing procedures forced Widerøe to close the service. Airlines believe

²⁸ Source: Regulation (EC) No 1008/2008 of the European Parliament and of the Council

²⁹ Source: Frank Neumann, Aviation Consultant, Re-Evaluation of Cross-Border Flights within the Barents-Euro-Arctic Transport Area (BEATA), April 2013

that a possible restart of the route depends on the Shtokman project development which will increase the demand for full-fare tickets as the market today is mainly formed by price-sensitive leisure passengers. Another factor is that the road connection has improved considerably since 2007, thus making road transport a more attractive choice. The driving distance is 230 kilometers. The Avinor study points to the possibility of making this route part of a routing continuing to the Northern Gulf of Bothnia.

Murmansk/Arkhangelsk – the Northern Gulf of Bothnia

The Luleå – Rovaniemi – Murmansk – Arkhangelsk route was operated by Nordavia between 1996 and 2005. The route closed due to low demand and financial losses. The Avinor study concludes that there should be a possibility for a flight service between the large agglomerations both in Murmansk/Arkhangelsk and Luleå/Oulu/Rovaniemi. Oulu is the biggest Nordic city in the Barents Region with almost 200,000 residents. However, a multi-leg flight service including Luleå, Oulu and Rovaniemi is not viable operationally. Therefore, the study analyzes the possibility of using Kemi-Tornio airport as a geographical focal point for Luleå, Oulu and Rovaniemi. 500,000 people within 2-hour travel from Kemi Airport. With such a solution the total travel time between Oulu and Murmansk will be 3 hours 45 minutes, compared with more than 11-hour flight today via Helsinki and Moscow or 10 hours by car. The total travel time between Luleå and Murmansk will be 5 hours, compared with more than 17-hour flight today via Stockholm and Moscow or 10.5 hours by car.

Scenarios created in the Avinor study show that it is possible to operate the Kemi – Murmansk line without subsidies, but subsidies are probably necessary initially to launch a new flight service. Another interesting scenario is to extend this route to Kirkenes and operate it using aircraft based in Kirkenes.

There are also some other obstacles to overcome before these solutions can be a reality. Kemi must be accepted in Luleå, Oulu and Rovaniemi as the hub airport, and there must be an efficient and cheap surface transport to the airport. There is also a need for negotiation with Russia over traffic rights.

Air services connecting the Atlantic coast with the Northern Gulf of Bothnia

Tromsø – Luleå – Oulu

In January 2015, flights on the route Tromsø – Luleå – Oulu were launched.

The Avinor study concludes that it could be an option to operate this route with a larger capacity than was used between Tromsø and Luleå. More aggressive pricing could stimulate demand.

A flight schedule providing connectivity and combinability in Tromsø to flights to Bodø, Harstad, Narvik and Alta could attract additional passengers. There could also be a connection in Luleå to existing flights to Kiruna and Gällivare.

The study also considered the following routes:

- Tromsø – Kiruna – Luleå
- Tromsø – Murmansk – Kemi
- Tromsø – Kemi

Tromsø – Kiruna – Luleå

This route was operated three times a week by Barents AirLink in 2004-2008 and received EU subsidies for about two years. Due to low demand the route never made a profit. The Avinor study concludes that it appears difficult to establish a profitable operation for this route.

Tromsø – Murmansk – Kemi

A flight between Murmansk and Kemi would offer a one-stop connection to the Northern Gulf of Bothnia Region, but due to longer surface travel time from Kemi there would be almost no travel gain compared to a two-stop flight connection via Oslo and Stockholm. Due to this, the study does not recommend this flight service.

Tromsø – Kemi

A flight between Tromsø and Kemi would offer a nonstop connection to the Northern Gulf of Bothnia Region. Due to the longer time of surface travel for passengers from Oulu, Rovaniemi and Luleå, the overall gain in time

compared with the flight with two changes through Oslo and Stockholm will be less significant in comparison to the potential gain on the Kemi-Murmansk section (gain in time for a flight to Tromsø is 3 hours, and flight to Murmansk - at least 7 hours). Thus, the acceptance of Kemi as a point of departure and destination for this routing is expected to be lower and would require further evaluation.

Conclusions and recommendations for east-west flight connections

The experts make the following conclusions and recommendations regarding flight connections in the Barents Region:

- Improving East-West air traffic in the Barents Region can considerably facilitate transportation of passengers between the main agglomerations in the Region. It can promote development of trade, industry, tourism and cultural exchange in the entire Region.
- Responsibility for the offer of air transport services rests with the market economy and airlines. However, public authorities should promote the establishment of new air routes:
 - Within the EU/EEA the market is free for carriers to establish new connections on economic grounds that they find feasible. International flights to and from Russia are regulated by bilateral agreements. In case initiatives for new flight routes are dependent on new bilateral agreements, the public authorities should undertake the necessary negotiations.
 - Governmental subsidies may be necessary to incentivize new air connections at the outset. The European Community has guidelines on financing of airports and start-up aid to airlines³⁰. The European Commission has recently published a draft of new EU guidelines on state aid to airports and airlines. Therefore, there is a need to further analyze the possibilities of providing start-up aid and if that aid is not sufficient, the possibility of providing continual aid. Further analyses of the possible public service obligations for international flights should be therefore carried out.
 - If resumed, the Tromsø – Murmansk – Arkhangelsk route has a potential for more frequent traffic especially if the fare combinability can be improved to provide good connections with Bodø, Harstad/Narvik and Alta.
 - The Avinor study concludes that there are advantages in establishing Kemi as a joint airport for flight connections between Russia and Luleå, Oulu and Rovaniemi. In this context, authorities and other stakeholders in Sweden and Finland should conduct a further analysis in order to create a basis for open discussion of possible solutions.

At the same time, Kemi Airport is not included in the Table of Routes of International Flights between the Russian Federation and the Republic of Finland and the Russian Ministry of Transport has not received any applications from airlines for the use of this hub airport so far.

It is essential that the relevant authorities in Norway, Sweden, Finland and Russia maintain a continuous dialogue with relevant airline companies about the development of flight connections in the Barents Region. Implementation of new initiatives is impossible without close cooperation between state and local public authorities and the airlines.

³⁰ Application of Articles 92 and 93 of the EC Treaty and Article 61 of the EEA Agreement to State aids in the aviation sector. OJ C 350, 10.12.1994, p. 5 and Community guidelines on financing of airports and start-up aid to airlines departing from regional airports.

Appendix 2: Key studies, work and projects of strategic importance

1 Introduction

National objectives

The national objectives for the national transport systems of each country are similar, especially regarding the overall strategic objectives.

The strategic objectives for the development and operation of the transport sector in Russia is to ensure the increase in transport accessibility and quality for the population; to provide stable and safe operation of the transport infrastructure and to enable implementation of projects aimed at removing infrastructure restrictions of the socio-economic development of the constituting entities of the Russian Federation. The following priorities for the medium term were outlined - maintain the level of accessibility; ensure the quality and safety of transport services; ensure stable and secure functioning of the transport infrastructure; continue the implementation of strategically important infrastructure projects and improve the efficiency of the transportation industry operation.

The overall objective in **Norway** is to provide an efficient, accessible, safe and environmentally friendly transport system that covers society's needs for transport and as well as promoting regional development.

In **Sweden** the overall objective is to ensure the economically efficient and sustainable provision of transport services for people and businesses throughout the country.

The mission of the transport policy in **Finland** is to provide safe and smooth travel facilities; maintain the competitiveness of businesses and to mitigate climate change by reducing emissions. Transport policy is seen as part of a larger system comprising businesses, the economy, employment and regional development.

In 2018, the Government of the **Russian** Federation adopted an Integrated Plan for the modernization and expansion of mainline infrastructure for the period up to 2024. The implementation of the Integrated Plan will ensure the development of the West-East and North-South transport corridors for the transportation of goods, it will also increase the level of economic connectivity of the territory of Russia through the expansion and modernization of railway, aviation, automobile, sea and river infrastructure, and guaranteed provision of affordable electricity.

In each country, these very similar strategic objectives are divided in main and secondary objectives. The objectives vary in form and structure, but contain functional objectives such as service level, mobility, reliability and accessibility, as well as impact objectives such as traffic safety and environmental sustainability.

In **Norway** four main objectives have been developed:

- Improved access and reduced "transport distance costs"¹ to enhance competitiveness for industry and to contribute to maintaining the main features of the settlement pattern.
- Transport policy must be based on a vision that there should be no transport accidents where people are killed or seriously injured.
- Transport policy should help to limit climate gases, reduce the environmental effects of transport, and meet the national environmental objectives and international environmental obligations.

¹ That include not only financial costs, but time and effort consumption associated with travel

- The system should be accessible for all users.

In **Sweden** the main objectives are divided between:

- Functional objective: Accessibility
- The design, function and use of the transport system will contribute to providing everyone with basic accessibility of good quality and functionality and to developing capacity throughout the country. The transport system will be gender-equal, meeting the transport needs of both women and men equally. Under this objective there are seven specifications.
- Impact objective: Health, safety and environment
- The design, function and use of the transport system will be adapted to eliminate fatal and serious accidents. It will also contribute to the achievement of environmental quality objectives and better health conditions. Under the impact objective there are five specifications.

The National Transport Plan in **Finland** is guided by the following main objectives:

- Service level objectives (whether the transport system meets the citizens' need for mobility)
- Economic development objectives (transport system development that cuts the transport costs of companies).
- Traffic safety objectives
- Climate and environmental objectives
- Equality objectives
- Cost–benefit objectives

In **Russia** the following main objectives have been developed:

- Harmonization (single transport space creation based on balanced and effective development of transport infrastructure);
- Competitiveness (availability and competitiveness of transport services for freight owners, logistics companies and other customers);
- Mobility (availability, accessibility and quality of transport services for people);
- Integration (into world transport space and Euro-Asian linkages system);
- Safety and security (increasing the level of transport safety and security);
- Sustainable development (reduction in the harmful influence of transport on the environment).

The conclusion is that the overall main national objectives for the development of the transport system in each country are similar and that it should therefore be possible to develop a joint objective for the Joint Barents Transport Plan based on the national objectives.

2 Multilateral agreements and forums for cooperation

During the last decade, several national, bilateral and multilateral initiatives have produced research materials and other documents relevant to the development of the Joint Barents Transport Plan. Some of the studies are ongoing while some are completed. This chapter will provide an overview.

Multilateral cooperation in the region also has to a large extent taken place through EU programs, such as the Northern Periphery Program, the Baltic Sea Program and the Kolarctic ENPI. Because Russia is not part of the eligible area for the first two programs mentioned, the Russian side have not taken part in these projects to the same extent as the Nordic countries. Russian participation has been possible on associate partner terms.

Another important multilateral cooperation forum is the Northern Dimension Partnership on Transport and Logistics (**NDPTL**). The participants of the Partnership are Belarus, Denmark, Germany,

Latvia, Lithuania, Norway, Poland, Russia, Finland, Sweden, Estonia, the European Commission. NDPTL activities are aimed to promote improvement of transportation and logistics in Northern Europe, including support for major infrastructure projects in the early stages, with the aim of promoting sustainable economic growth in the region. The partnership has adopted NDPTL Regional transport network based on Russian and Belorussian proposals to the EU Trans-European transport network (TEN-T). The NDPTL strategic management is carried out by the Ministers of Transport and Infrastructure, who conduct annual meetings; current management is performed by the Steering Committee, with working groups being subordinate to the former. The Secretariat of the Partnership is located in Helsinki (Finland).

There are other formats of cooperation in the region:

The Kirkenes resolution is an agreement signed in 1993 at the Conference of Foreign Ministers on Cooperation in the Barents Euro-Arctic Region. Among many issues, the Declaration focuses on regional transport infrastructure and the importance of improving this infrastructure.

The New Kirkenes resolution, adopted in 2013, emphasizes the need for improved transport networks in the Barents Region and in particular the further development of east-west transport networks.

The Barents Euro-Arctic Council (BEAC) is the forum for intergovernmental and interregional cooperation of Norway, Russia, Finland, Sweden, EU, Denmark and Iceland in the Barents Region, established in 1993. In 1998, Norway, Russia, Finland and Sweden signed the Memorandum of Mutual Understanding on the Development of the Barents Euro-Arctic Transport Area (BEATA). The BEATA Steering Committee on the federal level and the Barents Working Group on Transport and Logistics on the regional level are functioning as the BEAC working bodies.

The interregional level includes Barents Regional Council, which consist of 13 regions and their authorities and regional politicians. Under that the regional working group on transportation and logistics, BRWGTL. BRWGTL cooperates with both NDPTL and BEATA.

The Arctic Council is the high-level intergovernmental forum that addresses issues faced by the Arctic governments and the indigenous people of the Arctic. The council has eight member-countries: Canada, Denmark, Finland, Iceland, Norway, Russia, Sweden and the United States.

Observer states + working groups (PAME and AMAP) under which MOSPA and SAR agreements were negotiated.

The Conference of Peripheral and Maritime Regions of Europe (CPMR) comprises 160 regions from 28 countries that work together to ensure that EU institutions and national governments take account of their common interests. They also cooperate on practical projects. The Transport Working Group of the Baltic Marine Environment Protection Commission (HELCOM) is focusing on challenges and tasks, connected with the requirements of Annex 6 to the MARPOL Convention on sulfur content restriction in fuel, effective from January 1, 2015. It will also prioritize efficient rail transport and look into the possibilities for subsidized international air services as well as investigate further the possibilities for “fly on demand” routes in peripheral areas.

The **Barents Traffic Safety Forum** is a stakeholder organization intended to promote the work on road safety in the Barents Region. It was originally founded in 2001 by road authorities in the Barents Region and has developed into an umbrella organization for road safety endeavors. All players active in the field of road safety are welcome to become members.

The Barents Regional Road Directors Meeting is a permanent forum for discussions on different road-related issues in the Barents Region.

The Council of the Baltic Sea States (CBSS) is a forum for inter-governmental cooperation in the Baltic Region, established in 1992. Its members are Germany, Denmark, Iceland, Latvia, Lithuania, Norway, Poland, Russia, Finland, Sweden, Estonia, European Union. The Expert Group on Maritime Policy was established in 2010 within the CBSS framework (renamed as Expert Group on Sustainable Maritime Economy). Besides, starting from 1992 five meetings of Transport Minister have been held under the CBSS aegis (the last one - in 2012 in Moscow).

3 National plans and studies

Previous studies and work constitute the basis for this Joint Barents Transport Plan. The most relevant are the following:

NORWAY

- The Government's White Paper No. 33 (2016-2017) : National Transport Plan for the period 2018 – 2029.
- Sustainable Blue Economy in the Norwegian Arctic, Centre for the Ocean and the Arctic. (2019)
- Finnmark County : "An Arctic Railway Vision"
- The Finnish Transport Infrastructure Agency : "Arctic Ocean Railway ". Report 2018
- Norwegian Railway Directorate : "The Northern Line". Report 2019
- Norway's Arctic Strategy – between geopolitics and social development, Norwegian Government, 2017.
- New infrastructure in the North, the National Transport Administration (2010-2011)
- Part 1: Trends in key industries and transport needs up to 2040 (2010)
- Part 2: Proposed measures for transport infrastructure (2011)
- Proposal for a new National Transport Plan 2014-2023 from the National Transport Administration (2012)
- Maritime Infrastructure Report for Spitsbergen, Finnmark, Troms and Nordland, The Norwegian Coastal Administration (2012)
- Railway study on the Ofoten Line, The Norwegian Railway Administration (2012)
- The Government's White Paper No. 26 (2012-2013): National Transport Plan for the period 2014-2023 (2013)

SWEDEN

- National plan for the transport system 2018-2029 (2018)
- Forecast of Swedish freight flows in 2040 (2018)
- Regional plan for the transport system in Norrbotten 2018-2029 (2018)
- Regional plan for the transport system in Västerbotten 2018-2029 (2018)
- The Government's Bill. No. 2016/17:21: Infrastructure for the future - Innovative solutions for strengthened competitiveness and sustainable development (2016)
- Minerals in Barents (2014)
- Transport needs for capacity building - 2025-2050 (2012)
- Investigation of capacity and efficiency in the Swedish transport system - analysis of capacity challenges up to 2025, Trafikverket (2012)
- Raw material and communications in the Barents Region (2011)
- Supply of Raw Materials, Transport Needs and Economic Potential in Northern Europe (2010)

FINLAND

- Finnish Government's Transport Policy Report (2012)
- Finland State of Logistics (2012)
- Transport Needs of the Mining Industry (2013)
- Regional Transport Plan of Finnish Lapland (2011)
- Regional Transport Plan of Oulu Region
- Regional Transport Plan of Kainuu Region (2018)
- Joint transport and logistics plan of Northern Finland (2017)
- Joint Transport Plan of Eastern Finland
- National traffic and transport statistics

RUSSIA

- The Strategy of Development of Railway Transportation in the Russian Federation for the period until 2030²
- The Federal Target Program "Development of the Transport System of Russia (2010-2020)"
- The Transport Strategy of the Russian Federation for the period until 2030³
- The Government Program of the Russian Federation "Development of the Transport System"⁴
- The Russian Maritime Doctrine⁵
- The Strategy of Development of the Maritime port infrastructure in Russia until 2030
- The Strategy of Development of Maritime Transportation in the Russian Federation for the period until 2030⁶
- The Strategy of Development of the Arctic zone in the Russian Federation and national security for the period until 2020
- Integrated Plan for the modernization and expansion of mainline infrastructure for the period up to 2024
- The Strategy for Socio-Economic Development of the Northwest Federal District in the period until 2020⁷
- Federal target programme "Development of the Republic of Karelia until 2020"
- The Complex Program of Industrial and Infrastructural Development of the Republic of Komi, Perm Region and Arkhangelsk Region

² Approved by the Directive of the Government of the Russian Federation No. 877-r, dated June 17, 2008

³ Approved by the Directive of the Government of the Russian Federation No. 1734-r, dated November 11, 2008

⁴ Approved by the Directive of the Government of the Russian Federation No. 319, dated April 15, 2014

⁵ Approved by the President of the Russian Federation in June 17, 2015

⁶ Approved by the Decree of the Government of the Russian Federation No. 2205-r dated December 8, 2010

⁷ Approved by the Directive of the Government of the Russian Federation No. 2074-r, dated November 18, 2011

Appendix 3: Identifying Possible Measures (Four-stage principle)

This appendix presents possible measures discussed by the experts. The next chapter will present the actual proposals of the experts.

1 Measures in accordance with main objective

In chapter 1 a joint strategic objective of the Joint Barents Transport Plan is formulated, based on the national objectives in each country:

“The effects of climate change are discussed worldwide and in order to address the challenges of climate changes, the global economy needs to be adapted. For the Barents Region to be competitive in the coming decades also means being competitive in this transition.

The transport system should facilitate the Barents regional development and create new opportunities for the key industries.

Norway, Sweden, Finland and Russia have the ambition to develop an efficient and sustainable transport system in the Barents Region with good internal connectivity between the Barents countries and with good external links to world markets. Apart from the national objectives, the development of the transport system should be in line with the United Nations global sustainable development goals (Agenda 2030) including road safety”.

These objectives can be achieved by different measures. The next chapter is dedicated to the analysis of the measures in accordance with the four-stage principle.

Step 1: Measures affecting the demand for transport and the choice of modes of transport.

Step 2: Measures providing more efficient utilization of the existing transport network.

Step 3: Improvement of infrastructure.

Step 4: New investment and major rebuilding measures.

2 Analysis of advisory measures in accordance with the four-stage principle

The mandate of the Expert Group, which worked during the Norwegian chairmanship in BEAC, requires advisory measures in the Barents Region to be analyzed in accordance with the four-stage principle. This principle is in use in Finland, Sweden and Norway and should be viewed as a general approach to the analysis of advisory measures related to the transport system.

The principle has been in active use for 10-15 years. Initially it was a tool to stimulate increased use of information technology in transport and, to focus on the fact that infrastructure is occupying an increasing share of undamaged nature. The principle has over time developed into a planning principle for general management of resources and reducing the negative effects of the transport system.

The principle is designed to handle all modes of transports but has so far primarily been used when dealing with deficiencies and problems within the road transport system. The basic idea is that advisory measures, instead of building new infrastructure, can be sufficient to handle present or future transport demands.

The four steps involve analysis of measures in the following order¹:

¹ Source: Publication 2002:72 of the Swedish National Road Administration

Step 1: Measures which affect the demand for transport and the choice of modes of transport

This step covers planning, control, regulation in the transport sphere accounting for social needs in general and development of safer and more environmentally friendly means of conveyance.

Step 2: Measures that provide more efficient utilization of the existing transport network

This step covers planning, control, regulation measures in the transport sphere, directed towards various components of the transport system with the aim to use the existing infrastructure more efficiently, more safely and in a more environmentally friendly way. By for example the introduction of digital technologies in transport, advanced technical and technological solutions, including the use of global navigation satellite systems, personnel training for work in the transport industry at high latitudes.

Step 3: Improvement of infrastructure

This step covers improvement measures and rebuilding of existing segments, for example traffic safety measures or load-bearing capacity measures.

Step 4: New investment and major rebuilding measures

The step covers reconstruction and construction measures, which often demand new land, for example new segments of road.

The four-stage principle means first considering whether one can fully or partly attain one or more of the objectives with the help of the measures in step one. After that, measures in step two are considered, etc. When all the steps for relevant transport modes have been analyzed, the measures are weighed up and prioritized with various timelines, accounting for cost-effectiveness and long-term sustainability.

Even if a measure is found which partly fulfils the objectives, there may be measures at a later stage that address all the issues or which are more cost-effective, and therefore are preferable in terms of all the factors. Due to budget restrictions and other priorities, they may still not be possible to implement in the short term. All steps should consequently be analyzed if it is not obvious that the goals are attained in a cost-efficient manner that is sustainable in the long term. Measures in the various steps are not alternatives, but they can complement one another. The result may therefore be a combination of measures from the different steps.

3 Advisory measures in accordance with the four-stage principle in BEAC

The experts have discussed the following examples of measures or categories of measures as a basis for their proposals presented in Chapter 7.

Step 1: Measures which affect the demand for transport and the choice of modes of transport
Measures in this category are typically spatial planning measures, measures related to improving efficiency of logistical systems (for instance systems that improve cargo balance and the filling rate of cargo on trucks), measures to increase the inter-modality of different transport modes, measures to reduce the need for travel (such as easy access to information technology for video meetings etc.), measures related to taxes (road taxes, port taxes).

The above measures are primarily those which are possible to implement on a national level. No measures are identified in this category for the Barents Region by the experts. (One might think that prioritizing development of sea and rail transport over development of road and air transport is a step 1 measure because this can affect the choice of measures. However, since such development is

either improvement, major rebuilding or new investments, they are not step 1 actions in the opinion of the experts.)

The coming Sulphur Emission Control Area (SECA) regulations will be a measure that can affect the choice of modes of transport, but this is initiated by the International Maritime Organization (IMO), not by the BEATA experts.

Step 2: Measures that provide more efficient utilization of the existing transport network
This step also considers air transport. The following measures are therefore advised in step 2.

Rail transport

- Increased capacity on railways and synchronized and harmonized plans for railway development in designated corridors.
- Common technical standards for rail transport including a solution to the challenge of different gauge in Finland and Sweden. Several solutions have been tested and rejected, but the work² continues in order to find an efficient way to solve this technical problem.
- A harmonized and operational and maintenance standard on railways
- Implementation of ERTMS/ETCS³ in the railway system

Sea transport

- Measures to increase safety at sea
- More efficient administrative routines and customs clearance at ports
- Measures that facilitate new passenger and cargo services by sea between Russia and Norway in the Barents Region, e.g. efficient procedures in ports and modern facilities for passengers (terminals), waste handling etc.

Road transport (see more in chapter Deficiencies in the Cross-border routes, Road transports)

- Prolongation of bilateral agreements on traffic safety
- Making information on road conditions and road weather in the Barents Region more easily accessible to tourists and cargo carriers by taking such measures as increased sharing of such information between the countries, increasing mobile phone coverage along the roads and for instance producing a mobile application which allows to obtain updated information on Barents roads. The development of Intelligent Transport Systems (ITS) and Accident Emergency Response Systems is crucial. Therefore, efforts should be made to take advantage of this technology in the Barents Region. Increasing the use of GPS/GLONASS opportunities.
- Increasing the number of rest areas along the roads for both heavy goods vehicles and tourists.

Aviation

- Improvement of flight connections in the Barents Region

All modes of transport

- Measures to increase accessibility for the disabled, children and the elderly
- More efficient administrative routines, visa procedures and customs clearance at borders

² The Swedish Transport Agency is conducting a research on the issue.

³ European Rail Traffic Management System/European Train Control System are standardized systems for signaling, control and train protection to enhance cross-border interoperability. ETCS is a component of ERTMS.

- Environmental measures
- Introduction of digital technologies in transport
- Measures in the field of training and retraining transport specialists

Step 3: Improvement measures

The experts have proposed to consider the following measures in step 3:

- Increased bearing capacity of the road network
- Synchronized and harmonized border roads development plans
- Traffic safety measures
- Measures at prioritized airports to increase the possibilities for air cargo and to meet demands for international passenger transport
- Development of prioritized ports with modern facilities and investments in increasing the fairway depth for larger vessels

Step 4: New investments and major rebuilding measures

This step consists mainly of large railway investments. The experts have discussed a few large railway projects. If such projects were to be realized they would be step 4 measures.

Appendix 4: Facts and figures

Planned investments

Russian Federation

Complex development of the Murmansk transport hub ¹	EUR 790 million
Reconstruction of objects of the second cargo area of the Murmansk maritime port ²	EUR 21 million
Reconstruction of objects of the third cargo area of the Murmansk maritime port ³	EUR 13 million
Implementation of investment projects of PJSC "Murmansk commercial maritime port" ⁴	EUR 160 million
Construction of LNG maritime transshipment complex in the Murmansk region, including Federal property (navigation safety objects) ⁵	EUR 970 million
Construction of an auxiliary icebreaker with a capacity of 12-14 MW ice class Icebreaker 7 for the Arkhangelsk maritime port ⁶	EUR 92 million
Reconstruction of infrastructure facilities of the fleet maintenance base of the Northern branch of the Federal State Budgetary Institution "Marine Rescue Service" ⁷	EUR 17 million
Implementation of activities for construction and reconstruction, overhaul and repair, maintenance of federal roads and artificial structures on them in the Barents region (Federal budget funds) ⁸	2018 r. – EUR 270 million 2019 r. - EUR 221 million 2020 r. - EUR 131 million 2021 r. – EUR 111 million
Reconstruction of the airport complex "Talagi" in Arkhangelsk in 2021-2024 ⁹	EUR 64 million
Reconstruction of the airport complex "Murmansk" in Murmansk in 2019-2023 ¹⁰	EUR 40 million
Reconstruction of the airport complex "Solovki" of the Arkhangelsk region in 2018-2020 ¹¹	EUR 39 million
Reconstruction of the airport complex of Naryan-Mar in 2020-2024 ¹²	EUR 56 million
Reconstruction of the airport complex in Amderma, Nenets Autonomous district in 2019-2021 ¹³	EUR 11 million
Development of transport complex and automobile road construction of the Republic of Karelia in 2016-2020 ¹⁴	EUR 139 million

¹ Federal project "Maritime ports of Russia" of the Integrated Plan for the modernization and expansion of mainline infrastructure for the period up to 2024 (approved by the Government of the Russian Federation, dated September 30, 2018 No. 2101-p) (hereinafter- the Federal Project "Maritime ports of Russia")

² Federal project "Maritime ports of Russia"

³ Federal project "Maritime ports of Russia"

⁴ Federal project "Maritime ports of Russia"

⁵ Federal project "Maritime ports of Russia"

⁶ Federal project "Maritime ports of Russia"

⁷ Federal project "Northern Sea Route"

⁸ State programme of the Russian Federation "Development of the transport system"

⁹ The passport of the federal project "Development of Regional Airports and Routes" was approved by the protocol of the meeting of the project committee of the transport part of the Integrated Plan for the modernization and expansion of mainline infrastructure for the period up to 2024, dated January 1, 2019 No. 1 (hereinafter referred to as the Federal Project Passport)

¹⁰ The passport of the federal project

¹¹ State programme of the Russian Federation "Development of the transport system"

¹² The passport of the federal project

¹³ The passport of the federal project

¹⁴ The federal target program "Development of the Republic of Karelia for the period until 2020" approved by

Co-financing of construction (reconstruction) of objects which are providing infrastructure with long payback period, are the part of investment projects about creation tourist clusters in Russian Federation (Republic of Karelia, Arkhangelsk region, Komi Republic) is planned ^{15,16}.

Finland

Lapland:

Industry

MangaLNG Oy, Tornio, LNG-terminal, first phase	150 m€
Kaidi Finland Oy, biofuel plant, Kemi	1.000 m€
Boreal Bioref Oy, Kemijärvi, bio product plant	800 m€
Kemi-Tornio- region industry maintenance projects	150 m€
Total:	2.100 m€

Mining Industry

Agnico Eagle Finland Oy, Kittilä gold mine expansion, second phase	200 m€
First Quantum Minerals, Kevitsa mine expansion	200 m€
Yara Suomi Oy, Sokli mine	1.000 m€
Gold Fields Arctic Platinum, Suhanko mine	1.500 m€
Anglo American /AA Sakatti Oy, Sakatti nickel mine and smelter	5.000 m€
Mawson Resources, Rompas gold mine	600 m€
Hannukainen iron mine project	600 m€
Pahtavaara gold mine reopening	20 m€
Total:	9.120 m€

Hydro Power

Kemijoki Oy, Sierilä power plant	135 m€
Kemijoki river salmon ladder projects	30 m€
Kemihaara project	140 m€
Total:	305 m€

Resolution of the Government of the Russian Federation, dated June 9, 2015 N 570

¹⁵ Federal law "About Federal budget in 2019 and the planning period in 2020 and 2021" dated November 29, 2018 No. 459-FZ

¹⁶ State program "Development of culture and tourism in Komi"

Wind Power

IKEA, Kemi, Ajos new mills and reconstruction	130 m€
Impax Asset Management, Kuolavaara-Keulakkopää	110 m€
Impax Asset Management, Joukhaisselkä	55 m€
Tuuliwatti Oy, Löylyvaara	15 m€
Tuuliwatti Oy, Kitkiäisvaara	50 m€
Tuuliwatti Oy, new projects, Simo/Tervola	210 m€
Tuulikolmio Oy, Rajakangas	100 m€
Tuulikolmio Oy, Pakisvaara	190 m€
Taaleritehdas Oy, Posio	180 m€
Innopower Oy, Ajos	390 m€
Rajakiiri Oy, Tornio	270 m€
Wpd Finland Oy, Kemijärvi	55 m€
Wpd Finland Oy, Salla	100 m€
Wpd Finland Oy, Palovaara-Ahkiovaara	150 m€
Posion Energia, Aneenkumpu	40 m€
UPM Kymmene Oyj, Reväsvaara	90 m€
Total:	2.135 m€

Bio energy:

Rovaniemen Energia Oy, Mustikkamaa bio power plant	220 m€
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Energy transfer networks:

Fingrid Oyj, Sokli and Hannukainen lines	270 m€
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Trade:

Rovaniemi South Center	50 m€
Kemi-Tornio region projects	50 m€
Total:	100 m€

Public investments:

Lapland Central Hospital expansion	100 m€
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Finnish Lapland investment potential, total: EUR 16,7 billion, incl. tourism excl. transport infrastructure.

Source: Visit Arctic Europe, Interreg Nord.

Sweden

Norrbotten:

Industry

SSAB, Luleå, blast furnace	200 m€
Facebook, Luleå Porsön, project 2	500 m€
Facebook, Luleå Porsön, project 3	500 m€
Total:	1.200 m€

Mining industry

LKAB finalizing iron mine expansion project	2.500 m€
Hannans Reward/Rakkurijoki iron mine	1.000 m€
Hannans Reward/Lannavaara iron mine	1.000 m€
Hannans Reward/Pahtohavare gold-copper mine	500 m€
Jokkmokk Iron Mines AB, Kallak iron mine	1.000 m€
Boliden AB, Laver copper mine	1.300 m€
Pajala iron mining expansions	600 m€
Total:	7.900 m€

Hydro power

Vattenfall AB, power plant capacity upgrade Luleälv	1.500 m€
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Wind energy

Piteå, Markbygden wind park	6.720 m€
WPD Luleå	300 m€
WPD Kalix, Bergön	170 m€
Kraftö Vind AB, Piteå	140 m€
Kraftö Vind AB, Arvidsjaur	95 m€
Total:	7.425 m€

Energy transfer network

Norrbotten network	200 m€
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Trade

Barents Center, Haparanda	120 m€
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Norrbotten investment potential: EUR 19,3 billion, incl. tourism excl. transport infrastructure.

Source: Visit Arctic Europe, Interreg Nord.

Norway

Industry

Aluminium smelter and plant, Hammerfest	1.500 m€
DRI steel mill, Hammerfest	1.000 m€
Gas power plant, Hammerfest	300 m€
Carbon black plant, Hammerfest	150 m€
Fishing industry investments	100 m€
Total:	3.050 m€

Mining industry

Sydvaranger Gruve AS, Kirkenes, iron mine expansion	300 m€
Nussir AS , Kvalsund, copper mine	350 m€
Arctic Gold, Bidjovaggen gold-copper mine reopening	70 m€
Total:	720 m€

Oil and gas

Statoil & Co, Johan Castberg oil field	15.000 m€
Statoil & Co, Veidnes oil terminal	1.000 m€
Statoil, Aasta Hansteen gas field	5.000 m€
Statoil & ENI Norge, Skarv, Skuld, Goliat-oil fields	7.000 m€
Lundin Petroleum, Alta oil field	7.000 m€
Lundin Petroleum, Gotha oil field	5.000 m€
Kirkenes Oil terminal	300 m€
Sandnessjön base, Nordland	150 m€
Brøndre base, Nordland	150 m€
Nordlys project, Harstad	120 m€
Polarbase, Hammerfest	30 m€
Total:	40.750 m€

Northern Norway investment potential: EUR 45,3 billion, incl. tourism excl. transport infrastructure.

Source: Visit Arctic Europe, Interreg Nord.

Hydro power

Finnmarken mountain plants and small power	3.000 m€
Nordland and Troms projects	1.000 m€
Total:	4.000 m€

Wind power

Statkraft Development AS	2.000 m€
Varanger Kraft AS	700 m€
Statoil ASA Finnmark	850 m€
Norsk Miljøkraft AS	1.100 m€
Vindkraft Nord AS	350 m€
Nordkraft Vind AS	200 m€
Finnmark Kraft AS	1.400 m€
Fred Olsen Renewables AS	1.800 m€
Troms Kraft AS	3.000 m€
Nord-Norsk Vindkraft AS	1.500 m€
Nord-Norsk Havkraft AS	3.500 m€
Total:	16.400 m€

Energy transfer networks

Nordland network	350 m€
Ofoten-Hammerfest network	400 m€
Finnmarken network	600 m€
Statnett, other network projects	1.000 m€
Total:	2.350 m€

Public investments

Regional hospital and health care projects	2.000 m€
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Northern Norway investment potential, total: 70 billion Euro, incl. tourism excl. transport infrastructure.

Source: Visit Arctic Europe, Interreg Nord.

Finland

Lapland:

Tourism:

Laatumaa /Lapland Hotels Oy, Ylläs, new resort	600 m€
Saariselkä resort expansion	450 m€
Levi Summit, center and hotel expansion	200 m€
Hotel Santa Claus, Rovaniemi, expansion	30 m€
City Hotel, Rovaniemi, expansion	10 m€
Lapland Hotels Oy, Pallas, hotel expansion	20 m€
YIT, Kemi Sarius hotel project	120 m€
Rinimex Oy /Noitatunturi project start, Pyhäntunturi	500 m€
Santa Park, hotel and tourism resort, Rovaniemi	30 m€
Sallatunturi slalom slope project	10 m€
Suomu ski flying hill and infrastructure, Kemijärvi	30 m€
Aavasaksa ski flying and jumping climate hall, Ylitornio	60 m€
Small lodging investments up to 2020	200 m€
Test world indoors	50 m€
Total:	2.310 m€

Source: Visit Arctic Europe, Interreg Nord.

Sweden

Norrbotten:

Tourism/winter testing

Arjeplog, car test climate center	560 m€
Railtest Nordic, Jörn/Arvidsjaur, trains testing center, Norrbotten side	150 m€
Träkronan hotell, Piteå	35 m€
Spaceport Sweden, Kiiruna space tourism	220 m€
Total:	965 m€

Source: Visit Arctic Europe, Interreg Nord.

Norway

Tourism

Målselv Fjellandsby ski center	500 m€
Other hotel and resort projects	300 m€
Total:	800 m€

Source: Visit Arctic Europe, Interreg Nord.

Appendix 5: Funding

Along with the national and regional budgets the following sources of funding can be used:

- Internal and external loans
- Freight charges
- Public-private partnership (PPP)
- Funding from industrial enterprises
- International funding
- Loans from a consortium of banks
- International capital markets (stocks, bonds, etc.)
- EU grants
- Assistance and support from the international organizations (including the Support Fund of the «Northern Dimension» Partnership in the area of transport and logistics)

Use of national and foreign loans is a common practice in all the countries of the Barents Region. Freight charges are mainly used in Norway, while PPP are used in Finland, Norway (three projects) and Russia.

International financing is more common in Russia and the two EU countries (Finland and Sweden) than in Norway. However, international funding can play an important role in ensuring development and growth dynamics.

5.1 Funds of industrial enterprises

Construction of infrastructure using funds of industrial enterprises is uncommon but requires further study. In Finland there is a system of loans extended by industrial enterprises. Each investment project is considered separately, but in many cases mining companies provided funds for construction of access railway branches to mines, and received, a few years later, reimbursement from the budget after the mines were put in operation. This allows to speed up construction of the necessary infrastructure.

5.2 EU grants

TEN-T/CEF

The EU member states may receive EU grants, while the European Union finances several projects and programs. For example, the EU has allocated grants totaling EUR 500 billion for the development of the Trans-European Transport Networks (TEN-T/TEN-T) for the period 2014-2020. Those grants may be used for co-financing of studies related to projects (not exceeding 50 percent) and for the direct execution of works (not more than 20 percent, 30 percent for cross-border sections). There are other forms of support, for example in the form of preferential interest rates, and venture financing. Finland and Sweden have received small grants under the TEN-T for their respective countries.

The Connecting Europe Facility (CEF) is a key EU funding instrument to promote growth, jobs and competitiveness through targeted infrastructure investment at European level. It supports the development of high performing, sustainable and efficiently interconnected trans-European networks in the fields of transport, energy and digital services. CEF investments fill the missing links in Europe's energy, transport and digital backbone.

In addition to grants, the CEF offers financial support to projects through innovative financial instruments such as guarantees and project bonds. These instruments create significant leverage in their use of EU budget and act as a catalyst to attract further funding from the private sector and other public-sector actors.

The CEF is divided into three sectors:

- Energy
- Telecom
- Transport

CEF Transport

The Connecting Europe Facility (CEF) for Transport is the funding instrument to realize European transport infrastructure policy. It aims at supporting investments in building new transport infrastructure in Europe or rehabilitating and upgrading the existing one. The total budget for CEF Transport is EUR 24 billion for the period 2014-2020.

TEN-T policy objectives foresee:

- completion by 2030 of the Core Network, structured around nine multimodal Core Network Corridors.
- completion by 2050 of the Comprehensive Network to facilitate accessibility to all European regions

CEF Transport focuses on cross-border projects and projects aiming at removing bottlenecks or bridging missing links in various sections of the Core Network and on the Comprehensive Network (link), as well as for horizontal priorities such as traffic management systems. CEF Transport also supports innovation in the transport system to improve the use of infrastructure, reduce the environmental impact of transport, enhance energy efficiency and increase safety.

In 2018, the EU Commission published a proposal for a CEF regulation for an interconnected Europe for 2021-2027. EU Commission proposes extension of TEN-T's core network corridor Scandinavia-Mediterranean (ScanMed) on the route Narvik /Oulu-Luleå-Umeå-Stockholm and an extension of the North-Sea Baltic Corridor on the route Luleå-Oulu-Helsinki-Tallinn.

5.3 European Structural and investment Fund

European Structural Funds and the EU Cohesion Fund also play an important role in the financing of TEN-T. The EU- Cohesion Fund finances strategic investments in the transport field of the member states, which gross national income per capita is less than 90 percent of the EU average. The European Regional Development Fund (ERDF) provides funding for development of regional transport infrastructure to ensure access to the TEN-T network, communication between the center and the rest of the country, as well as for development of regional public transport. ERDF has financed small projects in Finland and Sweden.

5.4 Northern Dimension Partnership on Transport and Logistics

Northern Dimension Partnership on Transport and Logistics (NDPTL) is a platform for cooperation in the field of transportation and logistics by eleven member-states and the EC. The main objective is to improve major transport links, and logistics in the region of the Northern Dimension for promotion of sustainable economic growth, at the local/regional and global levels by focusing on a limited number of priority areas, accounting for the balance of state and regional interests. Within the NDPTL, a support fund was created to allocate funds to perform research necessary for preparation of the project implementation, including preliminary, feasibility, evaluation studies and validity analysis as well as other technical measures of support, such as examining plots of land in question and preparation of a package of financial documents. The NDPTL can also support projects of organizational and informational nature, aimed at eliminating/reducing the impact of the limiting factors not related to the infrastructure, such as traffic congestion at the national borders and

inefficient operation of logistics hubs. The NDPTL support fund provides up to 50 percent of the project cost for the member countries. Finland, Norway, Russia and Sweden are members of the NDTLP and therefore can apply for grants from the NDTLP support fund.

5.5 Russia

In Russia, funding of transport infrastructure is mainly carried out at the expense of the budgets of different levels (federal, regional and municipal), intended for the development of transport infrastructure. In 2011, the Russian Direct Investment Fund (RDIF) was established to invest funds in the most promising sectors of the economy. There are also two other main sources of funds for large-scale infrastructure projects in Russia: Bank for Development and Foreign Economic Affairs - VEB (Vnesheconombank) and the financial holding of VTB group (Vneshtorgbank).

Kolarctic CBC

Kolarctic CBC is a financial Russia-EU cross-border cooperation programme to support cooperation between North Calotte and North-West Russia. The overall objective of the Kolarctic CBC is to promote a viable economy and the attractiveness of the region, where inhabitants and visitors can enjoy the arctic nature and where the natural resources are used in a sustainable way.

The total budget of the Kolarctic CBC 2014-2020 is EUR 63.5 million.

5.6 New financial methods/instruments

The Iron Ore line/Ofoten line can become an example of innovative approach to financing large investments in cross-border infrastructure projects. If the next National Transport Plan defines the project to create a second track as a priority, the Norwegian authorities will be open to joint investments and co-financing with Sweden. The agreement, defining distribution of costs and obligations between the parties, will form the basis of such joint development.

Cooperation is likely to include the coordination of maintenance, selection of technical solutions and common regulatory standards on either side of the border. Norwegian public authorities are also open to innovative approach to finance construction of railways by private investors, which is used in construction of motorways, ports and airports. Toll roads are very common in Norway, while the railways were traditionally built with 100 percent state budget funding. Three sidings at Ofoten line are already in the development stage, with financial participation of the major non-governmental users of that railway. Prolongation of sidings length that is currently taking place, was due to the demand of the non-state industrial enterprises to use trains with length of over 750 meters.

Appendix 6: List of sources

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